A NOVEL APPROACH FOR PATTERN ANALYSIS OF HUMAN BIOFIELD

A THESIS SUBMITTED TO THE
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

FOR THE AWARD OF

DOCTOR OF PHILOSOPHY

IN

COMPUTER SCIENCE ENGINEERING

BY

GUNJAN CHHABRA

September 2020

SUPERVISOR (s)

Dr. Ajay Prasad
Dr. Venkatadri M.

UPES

SCHOOL OF COMPUTER SCIENCE
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES,
DEHRADUN-248007: UTTRAKHAND

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(SAP ID 500041521)

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Internal Supervisor
Dr. Ajay Prasad
Associate Professor and Head of the Department- Computer Application
School of Computer Science
UPES, DEHRADUN

External Supervisor
Dr. Venkatadri M.
Professor and Head of the Department- Computer Science and Engineering
Amity School of Engineering and Technology
Amity University, Madhya Pradesh

UPES

SCHOOL OF COMPUTER SCIENCE
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES, DEHRADUN-248007: UTTRAKHAND

I DEDICATE MY PH.D. THESIS TO

My Family, Friends, Colleagues and My Supervisors for their endless and unconditional support, guidance and blessings

DECLARATION

Hereby I declare that this thesis, which is submitted by me to University of Petroleum and Energy Studies, Dehradun, for examination in consideration to the award of a higher degree Doctor of Philosophy in School of Computer Science is my own effort. Whereas, any of the content presented is the result of input or data from a related collaborative research program this is duly acknowledged in the text such that it is possible to ascertain how much of the work is my own. Furthermore, I took reasonable care to ensure that the work is original, and, to the best of my knowledge, does not breach copyright law, and has not been taken from other sources except where such work has been cited and acknowledged within the text.
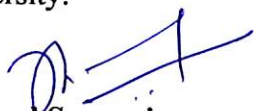
Signature of the Candidate:

SAP ID: 500041521

Date: 27-2-2021

CERTIFICATE

I certify that the thesis entitled **"A Novel Approach for Pattern Analysis of Human Biofield"** by **Gunjan Chhabra, (SAP ID: 500041521)** for the award in partial completion of the requirements for the award of the Degree of Doctor of Philosophy in School of Computer Science is an original work carried out by him under my supervision and guidance. It is certified that the work has not been submitted anywhere else for the award of any other diploma or degree of this or any other University.

Internal Supervisor

Dr. AJAY PRASAD
Associate Professor
Head of the Department- Computer Application
School of Computer Science
UPES, Dehradun.

CERTIFICATE

I certify that the thesis entitled **"A Novel Approach for Pattern Analysis of Human Biofield"** by **Gunjan Chhabra (SAP ID: 500041521),** research scholar at University of Petroleum and Energy Studies, Dehradun, submitted thesis in partial completion of the requirements for the award of the Degree of Doctor of Philosophy in School of Computer Science is an original work carried out by him under my supervision and guidance. It is certified that the work has not been submitted anywhere else for the award of any other diploma or degree of this or any other University.

External Supervisor

Dr. VENKATADRI M.
Professor
Head of the Department- Computer Science and Engineering
Amity School of Engineering and Technology
Amity University, Madhya Pradesh.

ABSTRACT

Every material system have potential to perform, to make, or to become but not by itself. Each system is associated with invisible energy, within itself, that helps in performing these functionalities. In living organisms, there exists similar kind of vital force that is independent of physical and chemical forces but one of the major factor for their development and evolution. These are hypothetical forces discarded by science centuries ago but it preserved the concept of undetectable physical forces in spite of numerous objections by researchers. Hereafter, vital forces are often regarded as epitome of life. Human body system is one of the perfect example of combination of matter and energy.

Recent research comes up with the concept of an imperceptible energy field around the human physique. This energy field is emerged due to the exchange of energies between the human body and surrounding as well as within itself. Hence, the biophysical and biochemical changes within the human body is the origin of an invisible vital force known as "biofield". Biofield can be defined as an invisible, massless electromagnetic field that contains biological information about an individual. Human biofield is also known as Human Aura or Human Energy Field. The information with biofield is related to the mental and physiological activity. The physiological and psychological activities information state about his or her well-being. The biofield is a field of energy around every living being and holds central information of his existence. It is one of the most complex waveform in this universe and contains lot of information within itself. The frequency of biofield is quite low and falls under the electro-magnetic spectrum; hence cannot be perceived through naked eyes and difficult to measure. Various evidences and scientific trails shows the importance of human biofield in healthcare informatics. Due to the lack of technical advancement and measuring devices in this field, the measurement and interpretations of human biofield is quite difficult. To decode this information, measure and understand ones' biofield, there is a need of computational model.

The main objective of this research is to design and implement of an algorithm to visualize and interpret the human biofield through an image. For this purpose, image-processing techniques are used by designing new color-space for the visualization of human biofield. As stated earlier, human biofield cannot be seen through naked eyes, as its frequency is very low. To visualize those low frequency pixel values, new color-space is required which is further mapped with RGB values of visual spectrum, to make it visible. Next, after the color pattern is visible, it is important to understand the meaning behind those patterns. As this is again a very rigorous task, so for the interpretation of meanings, linear regression and analytical method is used. The human energy field is recently getting higher attention in various domains; hence, the application areas of human biofield with AI and future trends been highlighted.

Keywords: *Human Biofield; Human Aura; Human Energy field; Biological field; Electromagnetic fields; Alternative medicine; Image Processing*

ACKNOWLEDGEMENT

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Famous equation E=mc², given by Albert Einstein in 1905, shows that energy and matter are exchangeable and are different arrangements of the same entity. Broadly, at atomic level, everything that exist is considered as vibrations of energy. Every object around us vibrates and form different energy patters to differentiate itself into different shape and size. This concludes that interaction of objects is nothing but the interaction of energy patterns produced by them. It not only includes physical objects but also human mind and thoughts [1] [2]. Electromagnetic spectrum consists of visible range of light, known as visible light i.e. visible to an individual, which is responsible for ones' vision. On the other hand, matter is also one form of energy as light in compressed form [3] [4]. Every individual, at its microscopic level, performs absorption and discharge of sufficient amount of energy that is invisible via normal eyes, then again can be observed and quantified through numerous other ways. The human body comprises of plenty cell bodies, atomic particles, and molecules. In higher complexity, the individual body is a group of bones, fibers, tissues, and organs. An immense arrangement of complicated regularities, including functions, networks of intermingling elements, also signals, forms a complicated energy system. Physics quantum theory exposes that the matter and the light reveal the behavior of duality i.e. wave as well as particle-like nature. It also states that the whole thing in this universe is coupled via the web of inter-connected relations [5] [6] [7].

The invisible layer of energy around every human being is stated as human energy filed of human aura or human biofield. It is very complex and dynamic in nature, therefore not easy to measure and analyze. It changes with time, thoughts and even with influence of environmental effects but carries lot of physical and psychological information along with itself. Hence it is very important to study and decode these information so unfold the hidden characteristics of human life [8] [9]. Previous

research shows its direct relationship with human health and mental activities and study also reveals that one can predict the status, health and psychological, of an individual in early stages of it's happening [10]. This will further help to solve the various mysteries related to human health which is unsolved till now in medical field. Not only in the field of healthcare but it will open up the gateway to various other futuristic technologies, elaborated in coming chapters.

An extensive study in this field shows that bioenergy patterns are associated with the physiological and psychological properties of living beings and carry a lot of information related to it. This information is related to the changes happening at an atomic level. Changes observed are because of the emission or absorption of energy that results in a shift in biofield pattern around an individual [11]. These changes in the energy pattern, further, causes harmonic changes that are measured by medical diagnostic methods. Presently, medical diagnostic systems have limited capacity to measure or identify the energy level changes in the body, hence only able to detect the harmonic changes. These changes may bring out some grave illness or disease in an individual at the alter stage that may or may not be curable. Hence, to overcome this significant issue, CAM researchers and practitioners suggested studying energy level changes, i.e., biofield of an individual. Pieces of evidence of previous research show that a study on biofield brings exceptional support to the medical diagnosis. Still, there are many unfold in this area that needs to focus on for more reliability, accuracy, and belief. Biofield not only links physiological and bioenergy changes but also carries information related to the psychology of an individual. The biofield connected with the seven chakras, namely, Crown Chakra, Third Eye Chakra, Throat Chakra, Heart Chakra, Solar Plexus Chakra, Sacral Chakra and Root Chakra, which carries various emotions of an individual, as shown in figure 1.1. [12] [13]
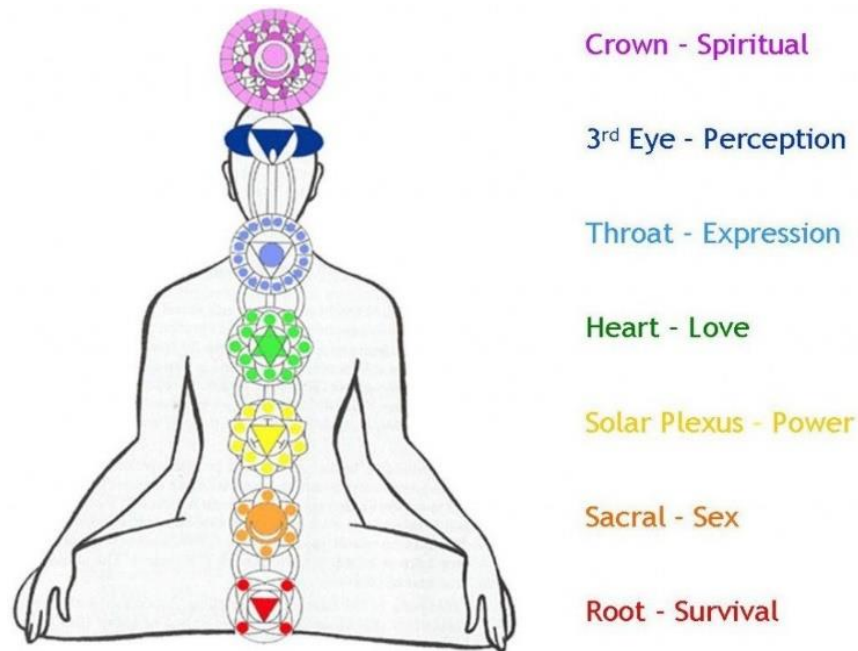
Figure 1.1. Relation between chakras and human emotions

Therefore, an in-depth study of biofield may also provide the current mental state of an individual, which may further help in the diagnosis of his or her non-medical related issues like anger management, lack of motivation, leadership quality, and stress level and so on. In identifying human psychology, it will be easy to detect that the person is harmful to society or not. Moreover, the psychic study will also help us in understanding ones' mental ability power, which may further help us to identify the weak students, i.e., may help us in improving the academic outcomes of an institution. Thinking beyond this, one can able to handle public relations, love relations, quiet life, and various other personal things that are related to the psychology of an individual directly or indirectly [14].

There are various benefits of biofield's study and research in the future; therefore, there is a requirement of system or methodology, which should be able to solve the related issues. If one should highlight these issues, in studying biofield, those are visualization of biofield, unfolding complex structure of biofield, decoding color patterns, examining and generating facts, analysis of patterns, understanding of dynamic and nonlinear behavior of biofield and many more. Research, in decades, comes up with various solutions but with certain limitations that make people hard to believe and understand the concept and importance of human aura or biofield [15]. Hence, to overcome this situation, this research shows a methodology, which will

help in visualizing the human bioenergy field for better understanding and accessible analysis of the same. Thus, the present research focuses on designing of a methodology by using image processing techniques, to visualize and analyze the invisible layer of human energy field. In the coming chapters, detailed methodology and related components are elaborated.

1.2 Problem Statement

The human aura or biofield is a field of energy that exists around the human body that helps to connect not only with another human being but also with the surrounding environment. Along with the energy characteristics of a body, the aura also incorporated the body functions that individual experiences i.e. states of consciousness, feelings, physical sensations, thoughts, etc. The energy field can be observed by different means that could be considered to be more refined characteristics of the five senses. Psychic power or "subtle sight" is one of the ways. An individual who is sensitive to the energy field may also sense it kinesthetically (clairsentience), hear it (clairaudience), or even have capabilities of subtle smell and taste.

Following problems were encountered while understanding and capturing aura:

1. Users of existing instruments are unable to find out the parameters based on which radiations and body organs have been mapped.

2. Although, present systems describe numerous ways of capturing differences in frequencies of energy fields. However, the varying capacities of the observers' makes aura perceiving more difficult.

3. The structure of auras may also vary from person to person that depends on their particular "energetic makeup" as well as "state of mind". Besides, different persons might describe the same phenomena with different prototypes.

4. Biofield research is in its infancy, but the absence of sufficient standard documents in the aura detection field encounters following problems: (a) Technological limitations; (b) scientific bias; and, (c) faulty hypotheses.

5. Biofield concept is an attractive concept, but the lack of substantiation in terms of its detection, measurement and subsequent analysis; we remain unable to make any progress in formulating definitive systemic behavioral models.

6. Human Aura changes its color and electro-field arrangement, depending upon the psychological state of mind and environment.

Capturing human field incorporates various issues. Captured image is analyzed by the experts that deduce a conclusion on the human physiological state of mind. The major application of aura detection is in the field of healthcare informatics [8] [16].

Thus, the main focus of this research is to propose an algorithm that captures the human aura by utilizing image processing techniques. Further, the observed outcomes will be explored and used in the domain of healthcare informatics.

1.3 Need and Motivation

Every individual is surrounded by various entities and every entity is associated with some sort of energy, which can only be either transferred or transformed but can't be destroyed. Every living and non-living object either absorb or emit energy in some form. Human Body is one of the best system, made up for millions of atoms, that emits or absorb energy. Countless past philosophies in physics like quantum electrodynamics, quantum field theory, and electro-magnetism gave rise to the belief for the presence of an unseen field i.e. bioenergy or biofield, in living things. In living being, due to many chemical, physical and biological activities, energy is released that is invisible and dynamic in nature but can be observed and measured through various other means. This organized structure of layers of energy is known as Human Aura or Human Bio-field. In addition to that, past studies clarifies that measuring such energies is capable of providing detailed perceptions of one's well-being. Not only that, it carries information about ones beliefs, inter-physiologic, emotions, and thoughts, which may impact on the functioning of the human body [17].

Initially there was a belief that the human body is like a machine and is self-governing w.r.t mind. Later studies proved that beliefs, emotions, thoughts and attitude prodigiously stimulus the functioning of individual's immune system, cells and performance of organs. These studies gave rise to mind body medication plus none can refute that insignificant attribute of one-selves as thought, hopes, and beliefs have ability to change the chemistry of an individual's body. These findings opens up new pathways and motivates to find the rules, relationships, processes and mechanisms that express and conclude our state of being [9]. Inside the human body, different functionalities, change in states and phases, renovation of body parts and tissues into atoms and molecules also carried out by itself. In the next level, these atoms are sub-divided into sub-atomic particles, and illustrate that the bones, blood, the brain and other organs of the human body gives a means to imperceptible fields and forces

whose interactions inspires the whole matter. Consequently, one can state that human forms do not entirely govern through some rules concerning ordinary chemistry, however, including the incongruous philosophies of quantum electrodynamics [18].

The individual body structure is acknowledged as a complicated energy system, and a collection of millions of cells, atomic particles, and molecules. According to the law of relativity, the individual physique additionally emanates different types of signals, as in both observable and hidden patterns like ECG, thermic energy, brain signals, including the formation like an electromagnetic field. It portrays that the human body is surrounded by an undetectable field known as the Human Biofield or the Human Aura or bio-magnetism [19].

Although, due to lack of supporting evidences it is hard to believe on the existence of auras. But many researchers have done a deep study in neurological, optical and psychological effects that proves the presence of aura. There exists various instruments and devices like Kirilian photographic camera, Gas Discharge Visualization and others, required high training skills [19] [20]. Looking forward, as a way out, methodological revolution in the domain of Artificial Intelligence (AI) optimistically provide approximate affirmative outcomes. Artificial intelligence, sub-domain of computer science, tries to replicate the human intelligence such as reasoning, problem solving, understanding, and intelligence processes. This research deals with Aura Visualization and its Interpretation as a solution to fill the research gaps.

1.4 Research Gaps

The current research aims to provide an algorithm for the visualization and interpretation of human biofield that should be cost-effective and easy to use. For the same, investigation has been carried out and the following gaps have been identified:

- Lack of standard measuring tools and markers (energy field) confines the advancement in the Biofield.

- Correlation between the energy fields with respective diseases and other body parts are not properly documented with Biofield.

- Lack of reliable devices for the visualization of aura pattern.

- No standard procedure, parameters, or analysis algorithms are there in existing commercial devices.

- Existing devices are costly and required a high amount of skills and training period

1.5 Scope of Research

The human biofield recently attains attention and being in use in the field of medical sciences and healthcare informatics. Biofield contains both psychological and physiological information that supports clinical data for ones' wellbeing. However, due to the lack of exact methodologies, it is very difficult to visualize and analyze with a high level of reliability. Therefore, before using biofield in various applications, biofield imaging and its pattern analysis is a very crucial task. Additionally, it is quite important to understand the meaning of each color obtained for the generation of the final report.

The focus of the present work is to design and implement an algorithm, which should be able to visualize the biofield (as shown in figure 1.2) from a digital image, under a controlled environment. Further, the algorithm should analyze the color codes and able to predict the psychological and physiological condition of an individual.
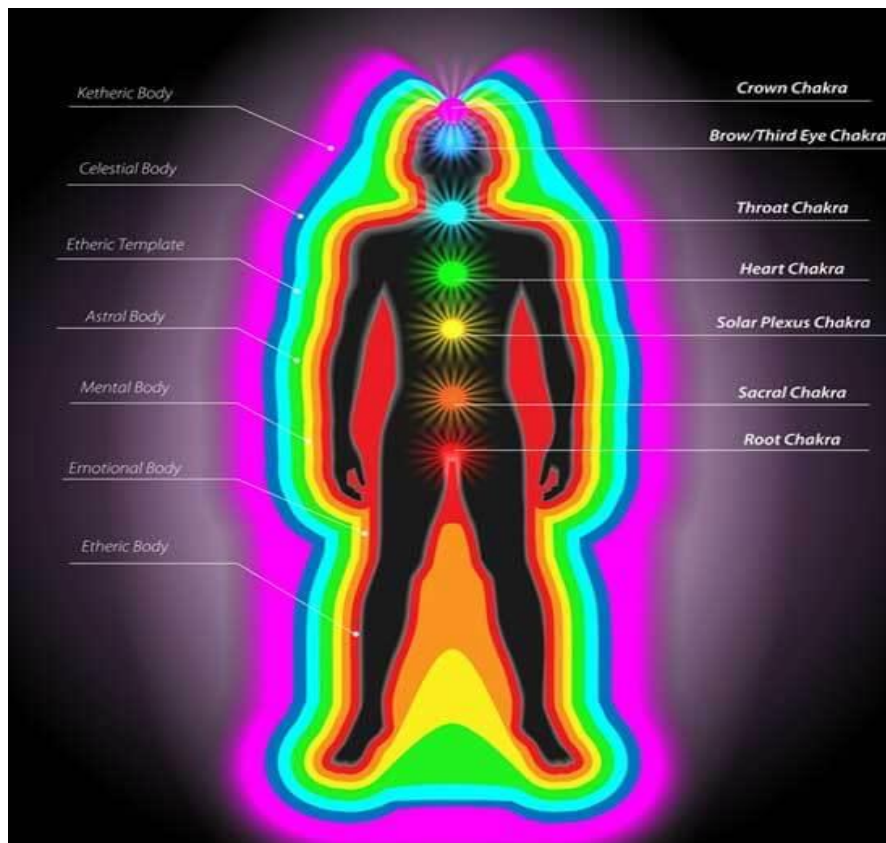
Figure 1.2. Visualization of human biofield and chakras

1.6 Objective of Research

The main objective of this research is:

- To design and implement an algorithm that will convert a digital image into a biofield image for its interpretation.

The sub-objective of the research are:

- To design a new color-space for biofield visualization and chakras identification.

- To develop a method for the understanding of color patterns and decode the meaning of colors.

- To develop a system for human health assessment based on energy emission and aura pattern obtained with its study.

- To compare and validate the proposed methodology with some of the existing techniques.

- To generate an overall report of an individual with interpretations that will further help in understanding his or her current physical and mental state.

1.7 Applications of Human Biofield

This study reveals that everything is connected through energy, which just gets transformed; hence lot many mysteries of life can be solved by decoding the information with these energies. This chapter is to elaborate on the futuristic applications based on the human energy field in different domains. The past study reflects the biofield carries in and out information about the human body, which can be used for various purposes. Thus, unfolding these and other hidden facts will give birth to many research opportunities and the development of numerous applications. This will act as a gateway for the new phase of research and development in various domains in the coming future. Some of the expected applications are mentioned below.

The study on human biofield is not a new concept rather it was a debatable area for many scientists. In the past decades, various researchers developed so many methods to obtain its abstract level information but others always marked a question on the same. Recent studies conclude that human biofield carries a lot of information related to ones' life and lifestyle and regained the attraction. Many aspects of the human

energy field are undiscovered due to the lack of accurate measuring techniques, lack of proofs, and human beliefs. Modern advancements in the field of technology, such as Artificial Intelligence (AI), Machine Learning (ML), and so on, gave a new ray of hope and build a variety of ideology, opens up new opportunities in his domain. Some of the applications, challenges, and opportunities are elaborated below that will give thoughtfulness to the researchers to explore and develop new applications using the human biofield [14] [21].

1.7.1 Application in Medical Science

The number of past studies shows the relationship between the human biofield and human health. One can analyze the wellbeing status of an individual by understanding these energy fields similar to the analysis of other signals **like** ECG, EEG, and others.

In the domain of healthcare informatics, a huge amount of data is analyzed, and based on the predictive model results, conclusions are made, whereas medical analysis is very critical, therefore, it requires a huge amount to data for accurate analysis. The human biofield carries such huge information, which may become a supporting fact to drive conclusions. The human biofield contains psychophysiological information and by using AI techniques these can be decoded and can be utilized for clinical analysis. Let us consider a scenario, as a person wakes up and capture his/her energy field using a smart device and get the analysis report based on the input. This device will highlight the physical, mental, emotional, and spiritual status of the person and compare it with previous ones. This device may also help in suggesting the exercise, medication, required change in eating habits, and other lifestyle modifications. This is to recover or to preserve the ideal health level. So many other applications can be thought of in a similar domain [21] [22].

In addition to that, with the rise of data science and AI, many new outcomes and developments came into the picture. Similarly, many predictions can be revealed by passing and computing stored biofield's large datasets to the AI-based predictive models. The existing techniques and methodologies that are in use to extract the biological information from the biofield are not capable enough to perform such a high level of computations. Therefore, to understand, compute, and to extract those complex data, high-end calculus models are required, now thinkable by integrating AI and ML techniques. In the future, this will help in the early diagnosis of diseases and

illnesses, lifestyle balancing, emotion management, clinical trial support, and many more [14] [22].

1.7.2 Biofield Signature

For human identification and recognition, biometric systems are highly in demand and gain market in the past decades. Nowadays, biometric is used in various applications like mobile access, banking, ATM withdrawal, and others. Along with many advantages, biometric systems have many concerned issues like spoofing, tampering, health-related issues, FAR, FRR, and so on. To overcome these issues many multimodal systems came into the picture but too need high computing power, storage issues, and many more. After studying the features of the human biofield, one can observe it in a way of a new biometric trait as "human signature". As it is very dynamic so it can be considered under the category of Biometric Dynamics [14] [23].

Looking ahead positively, being so dynamic and complex it will be very difficult for anyone to spoof or bypass the security based on biofield signatures. Hence, the crimes and other related issues in the domain of biometric systems may decrease. The foremost challenge under this class is that human energy field changes with surrounding activities and effects; hence **"Aura dynamics"** will be a new area of research. Again, this can be integrated with artificial intelligence and its sub-domains to deal with such a complex and large dataset to identify the distinct and unique features. Thus, the human biofield may become the next human trait for identification, verification, recognition, and authentication [14] [23].

1.7.3 Wearable and IoT based applications

The recent market is trending with the Internet of things (IoT) based products as well as wearable devices. By clubbing these techniques with biofields will be a new trend and way to analyze the human body. For instance, a home installed device to capture the biofield information and send it to a dedicated mobile application for computing the information to generate various outcomes. Also, these time to time generated reports can be shared with personal doctors or experts who can analyze these results and can suggest their expert advice. This will help anyone to maintain their healthy life and will begin a new trend in the domain of informatics and telemedicine [24].

Another trending technology, i.e., wearables like fitness bands, smartwatches, and others are commonly used for recording health information. They are capable of

gathering information by analyzing skin, pulses, sweat, geo-locations, etc. by in-built sensors and display required outcomes. However, this information is not very accurate and works on probabilities, so one cannot rely 100% on, yet quite useful. Till now these devices are unable to detect the human biofield because of less advancement in this domain. Now, by using AI methods one can think of such a device that may capture these bioenergy signals in real-time and map it with current physical and mental status to present better results than normal fit bands [14] [24].

The latest technological news declared that wearables may detect diseases like cancer by analyzing skin surface at early stages. On the other hand, the human biofield research also declares that such diseases can be predicted by analyzing the energy patterns. Hence, by combining these two techniques may give extraordinary outcomes and a huge success. The accuracy of the prediction by wearables may increase surprisingly in merging. The study states that the change in biofield is directly concerned with a person's health and thought processes, at so early stage than medical machines. Hence, this will be remarkable to detect illness at so early stage and can be cured beforehand. This will be possible by using AI-based techniques.

1.7.4 *Human-machine interface applications*

Artificial intelligence-based systems are highly in demand and widely accepted by every human for various applications. Human-computer interaction is another sub-domain of AI that deals with smooth interfacing between humans and machines. There are many ways to interact with machines by yet issues like delay in response time and other errors affect people while dealing with AI machines. To overcome these issues, by using AI methods, direct communications between intelligent machines and humans may be possible. This will become a new milestone achievement in the AI domain. Due to the complex and dynamic nature of human energy filed, one can think of AI bots that will be capable of decoding the information and respond quickly [21] [24].

1.7.5 Emotion dynamics

Building intelligent machines, intelligent bots, and humanoids are gaining pace and deployed in many businesses. Also, these bots are programmed to understand the human sentiments and emotions to react accordingly. The emotions expressed by these humanoids are known as artificial emotions, whereas emotions by humans are

classified as natural emotions. With the enhancement in technology and designing of super-intelligent bots, it will become difficult for anyone to detect the difference between artificial and natural emotions. This gave rise to the field of emotional intelligence and became a new area of research [14] [25]. By using machine learning, humanoids are intelligently programmed to learn the emotions of humans by their activities, voice modulations, and real-time expressions. Then these bots are asked to imitate and respond accordingly indicating the degree of their understanding. With a lot many other improvements, in the future, it will be very difficult to segregate natural and artificial emotions. Since, the human biofield is also associated with psychology, which is not available in bots, it can be utilized to distinguish and solve this type of problem. Machine learning and other AI techniques may help identify these properties and will be able to provide some acceptable solution. Such systems may be defined as dynamic field emotion detectors [14] [24].

1.7.6   Social applications

The human biofield can also be useful at a social level, as it carries psychosomatic information that is directly concerned with the thoughts of an individual. This information might be useful to will defines the present nature of the individual. The human energy field patterns have various colors indicating specific meaning, say deep red color reflects the anger. Such information may help to identify the nature and criminal attitude of a particular person. But such applications need a huge amount of data and computations, which can be achieved by AI techniques. Hence, one can classify the destructive and constructive natured people [14] [26].

By the year 2030, researchers are looking forward to deploying humanoids and replace humans for various tasks. These humanoids will look alike humans and perform similar tasks, such that it will be difficult for anyone to differentiate between them. As the electromagnetic signals generated by the machines and humans are very dissimilar, the analysis of human biofield and machine will help in differentiating them [14] [26].

The past studies state that the brainwaves changes while any person is under drugs of alcoholism, also with the change of brain signals human biofield also get affected. Therefore, by analyzing these energy signals of an individual, one can predict about the habits of drug intake or alcohol intake. Even, as discussed wearable technology,

one can think of a smart wearable device, which is capable of extracting consciousness state, generate alerts, and advice not to drive under such circumstances. In addition to that, the conscious state can also be affected by restlessness, extra workload, high stress, etc. therefore AI technology should be used to differentiate between these classes. Lot more applications can be thought of under the same domain [14] [26].

Another social issue in society is maintaining a healthy relationship and for that compatibility is an important factor. To understand this factor think in a way that everyone meets several people daily. Among those, some of them are liked and accepted, ready to talk, and wants to stay in touch for long. But on the other side, many of them are disliked and become the opposite scenario. The study reveals that this happens because of the interference of two opposite human energy fields. Some of these interferences spread positivity and some will give negative effects, Hence, concluding that the human biofields play a vital role in building compatible relationship among humans. This phenomenon is quite natural and therefore one can segregate the positive vibes people and negative vibes people. Thus, the analysis of human biofields will help in maintaining healthy relationships among people. It is important to maintain balanced energy around ourselves to spread positivity in society [14] [21] [24].

1.7.7 Other applications

Thinking about some other applications by using information about the human energy field is to balance life, which includes lowering down negative emotions like anger, sadness, and so on. Along with these, it is also crucial for everyone to reduce stress, restlessness, overthinking, etc., this will help an individual to enhance their working potential and improve their work performance. Not only this, but people may also analyze the energy field of their kids, and balancing their energy field will improve their performance in education and other activities. These things are only possible by keeping a record of biofield and analyze regularly using smart technologies [27] [28].

Countless applications can be expected in the domain of sports management, business, technologies, astrology, self-improvement, healthcare, self-development, fitness, and many more. Thus, this chapter reveals the numerous benefits and application areas of the study on the human energy field. This will bring the

revolutionary change in the research and development and a gateway to the new era of research [29] [30].

1.8 Contribution of the Research

The research work in this thesis has made some important contributions to the knowledge in the field of Human biofield visualization and interpretation

Framework and Algorithm for detecting the presence of Biofield

The human biofield is one of the biometric measures found around the human body. It includes biological information within itself and supports in medical and physical analysis of an individual. The frequency strength of biofield is quite low, therefore it cannot be seen through the naked eye as well as very difficult to measure. Past research comes up with some measuring devices but due to the lack of exact shreds of evidence and study, those instruments are not much reliable. After the detailed study on characteristics behavior and features of the human biofield and its importance in various domains, recently, researches have started working on this area. Nevertheless, before applying biofield in various applications, the foremost task is to visualize and analyze it for a deeper understanding of its patterns.

The aim of this research is to develop an algorithm, which should be able to highlight the aura pattern from a digital image captured in a controlled environment. In order to visualize the colors of the human aura, a basic framework and methodology have been designed, which includes the image processing technique. This will reduce the cost of visualization and analysis of human biofields and produce the color outlines around the human body. Hence, it will help the scientist and researchers in better understandings of human life; biological and physiological nature of humans.

Implementation of Aura Visualizer Algorithm

This research section presents the implementation of a new algorithm for the visualization of the human biofield. The human body carries various measurable characteristics that are used for his or her identification, verification, and validation. Along with those metrics, there are certainly more features available, which supports solving mysteries related to mental and physical activities such as EEG, ECG, thermal energy, and others. A few decades ago, a new characteristic of the human body attains attention known as "Human Biofield". The human energy field includes various evidences linked to the human body that may be further used for numerous

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applications in medical sciences and informatics. Due to the several challenges for its measurement, the research in this field is quite slow and did not attain much attention in previous years.

After the technological advancements and need of unfolding human life mysteries, research in biofield understanding again appears in the picture. Now the foremost and important task is to visualize the aura patterns to understand its features and characteristics more accurately. Hence, as a solution to this problem "Aura Visualizer" algorithm is implemented using a new color-space that will help in generating aura colors in RGB color.

Performance evaluation and competitive study of biofield visualization algorithm

This research section presents the performance evaluation of aura visualization algorithm and results are further compared with some of the existing techniques available in the market. Over several years' various scientists studied and gave their contributions to analyze the human biofields and generated many pieces of evidence as proof of its presence. Research also shows the applications of biofield in the field of medical science. Due to various limitations, those instruments are not highly in use; hence, more advancement is required to overcome these limitations and for better results.

Current research focuses on the development of a novel methodology to resolve some of those issues and a comparative study is performed. This research section represents the outcomes of the procedure stated for the visualization of the human biofield. Additionally, the completion of the presented product has been calculated through accurateness and compared with the existing methods i.e. Biopulsar Reflexograph, Quantum Resonance Magnetic Analyser, and trained yogic eye method.

Implementation of technique for chakras identification and generation of final report

This research section presents the chakras identification and generation of reports based on the aura color obtained after analysis. The human aura is generated due to the presence of seven chakras present on the human body. Every chakra has its own property and there are various organs associated with each chakra. The change in color and pattern of the auric field around any organ is due to the disturbance or imbalance occurrence in the related chakra. Hence, to identify the chakras linear

regression methodology is used. The information available with biofield is very crucial that will help in analyzing ones' current thought and physical status but it is not so easy to understand the color code of the aura field. Therefore, a method based on linear regression is designed for the prediction and generation of a report of an individual. This will interpret the secret facts in relation with human psychology and his/her current health situations. Those interpretations will further act as a piece of supportive information in diverse means beyond one's thoughts. The exposure of ethereal energy in the form of visible colors, which is emitted by the individual physical body, will begin a novel revolution in the system and community. The human biofield act as a connection and represents the esoteric dimension among health and life. The disruption of the energy field may succeed in dysfunction including disorder of the human body that cannot be cured only by chemicals or drugs.

Study on futuristic applications of Human biofield and related challenges.

This research section presents the futuristic applications of the human biofield in several provinces. To identify the individual's healthiness status, numerous signals are scanned such as brain-waves, heart-rate signals, and others that are extremely beneficial in medical scrutiny. Likewise, there exists a prearranged energy field allied with each and every single person labelled as the human biofield. The human biofield consists of preeminent evidence about the healthiness and psychological state of an individual. In contrast to other biosignals, for instance, heart signals, brain waves, and others, the human energy field is not yet clearly drafted i.e. computation procedures are not prepared for computing and analyzing the influence of biofields in medical investigation and remedy. This examination section deals with the record of the heretofore journey of the biofield including its theories, imaging, and reinforcements.

1.9 Organization of Thesis

The thesis is structured into eight subdivisions as follows:

Chapter-2 describes literature review on Human biofield along with its historical background, followed by the evidences related to the existence of human biofield. In addition to that, the description on existing techniques for the measurement of human biofield and related issues are summarized. Further, the application areas in which human biofield is currently in use, related challenges, limitations are presented.

Chapter-3 introduces the proposed algorithm and framework, including brief description about every step used in algorithm. Subsequently the summary of methodology used for the visualization and interpretation of human biofield is discussed.

Chapter-4 describes the overall design and implementation of algorithm along with its outcomes, controlled environment and other constraints.

Chapter-5 discusses about the comparative study of proposed algorithm and the existing techniques. In addition to that, discussion on the performance evaluation of the algorithm and further required enhancements are presented

Chapter-6 describes the overall results and discussion on the research outcomes.

Chapter-7 concludes the thesis by discussing the future directions related to the work.

CHAPTER 2

LITERATURE REVIEW

In this chapter, a detailed description of the related literature to this research is presented. Furthermore, this chapter provides the historical background, detail on existing techniques, and methodological contributions, including their limitations and drawbacks within the scope of human biofield analysis.

2.1 Background of Research

Investigation about the human energy field is not much prominent, however by the significant improvement in the growth of technologies, this is accumulating considerations. The human energy field is an antique procedure adopted via Vedic and Yoga practitioners to classify physical fitness and psychic status about an individual. To achieve the same, people practiced hand-operated techniques, which demands some level of practice and learning. During the year 1660, Sir Newton explained opinions about some flow of dynamic energy field within individuals. In addition, this energy filed accounts for existence capabilities that initiated the unprecedented transformation in the thought of the person anatomy. Succeeding in the year 1733, Stephen Hales represented a vibrant energy field as electric current and nervures as electricity carriers [5].

In the past 1820, Oersted accidentally discovered that when electricity is passed through any object, it gives rise to a magnetic effect on its surroundings. Later in 1831, origin of a fundamental law of electromagnetism explained by Michael Faraday popularly known as Faraday's Law of induction. The experiment showed that (figure 2.1) the magnetic field can cause a flow of current inside a conductor [31].
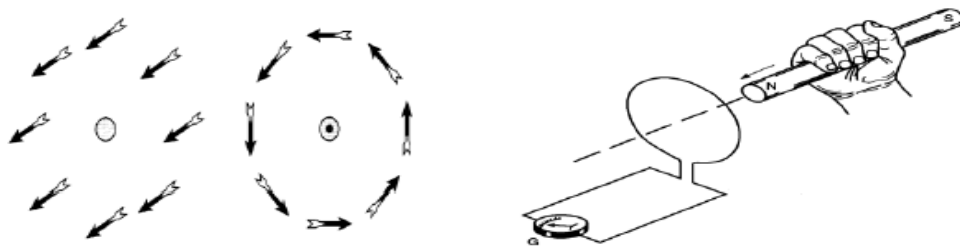
Figure 2.1. Showing Electromagnetism experiment by Michael Faraday

The circulatory method observed within human anatomy is a good illustration of electromagnetism. During 1826, the birth of Ampere's Law, the flow of charge within the blood vessels, and additional fluid chambers inside the body must, consequently, generate magnetism in the space near the body. The magnetic field gives rise to electricity, whereas, on the other hand, electricity give birth to magnetism. Similarly, biological electricity must, therefore, give rise to bio-magnetism, (as illustrated in figure 2.2) and the other way round [31] [32] [33].
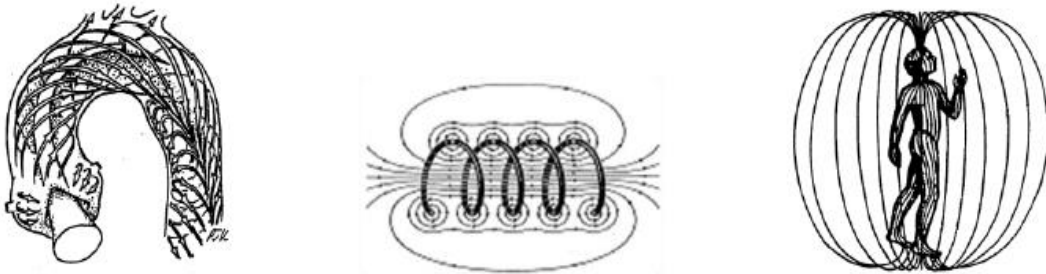
Figure 2.2 (from left to right) Electromagnetism, Magnetic field around a conductor, Bio-magnetism

In addition to the studies, in the succeeding decades, countless improvements have been observed. Likewise, in the year 1924, Einthoven W., Nobel Prize winner, for the invention of a heart signal measuring device (ECG machine). Later, again in 1924, Robert B. inferred the association among the cognition, acupuncture, biological electricity, and extremity generation. The body's largest bio-magnetic field is generated and found near space around the heart. To measure the space around the body, a machine named Superconducting Quantum Interference Device (SQUID) is practiced [34]. Based on the previous analysis, the vibrations generated by ionic movements, including, the retina, brain, the heart, and by the other muscles, and organs, results in the electrical field. Those electric fields can be measured at the body surface. All physiological methods of human anatomy, therefore, comprised of several procedures, including any degree of electrical activity. In 1985, a book by Robert Becker named "The Body Electric: Electromagnetism and the Foundation of Life", illustrates the muscular actions, including the heart, produces electrical activity [35]. In, "Basis for a Holistic Theory in Medicine" authored by A. Pischinger, during 1991, mentioned that electric activities everywhere in the human body are likewise proven to take place during the deformation of these combined collagen fiber net [36]. In 2000, J. Oschmann in his writeup, "Energy Medicine: The Scientific Basis",

expresses views on the electrical nature of cell depolarization throughout venation signal transmission [37] [38].

During the 1970s research by one of the Noble prize nominees, Fritz-Albert Popp declares that every natural organism emits light energy at the cell level, named as bio-photons. On the other hand, every living organism absorbs light energy and perform some internal processing. In his research, he also stated that faded, color-coded transmissions of the light energy emitted by the cells are the source of inter-cellular communication in every living being [39] [40].

Two methods in classical physics, the "Faraday effect" (1845) & "Kerr effect" (1875), elaborates about photons and bio-photons get affected by magnetic and electric fields. Both concepts express the variation of polarized light in electric (Kerr effect) and magnetic (Faraday Effect) fields. As an analogy, one can assume that one photonic change within any connective tissues of the being, say epidermis or it's correlated structured proetids similar to collagen, show effect on both the fields, magnetic as well as electrical fields, in and throughout the area of migration [41].

Above whole erudition next confers guide to Einstein's concept that everyone is certainly beings of light. On summarizing, based on past studies and as an opinion, living beings and its infinite number of cells not only produce electromagnetism, but also emitting light photons. Also, as a view, magnetic fields, bio photonic fields, or electric fields are classified under the same category and directed in the same direction i.e. electromagnetism radiations. They are all energetic, interrelated, and all are influencing one another. In simple saying, define the energy transmitting methods making up the bioenergy field, as a composite structure of dynamic electromagnetism emissions or oscillations. These fields are continuously interacting with the seen or unseen individuals' surrounding fields and growing in and outside of human bodies what we recognize as existence!

Succeeding in year 1939, S. Kirlian invented a photographic system named as Kirlian photography that works upon the theory of the high-voltage transmission. He performed number of experiments, in which a conducting plate is overlapped by the photographic film on top, and the extra electrode was connected to any body part of the subject, a leaf, or other living object. The photographic illustrations typically presenting an object's shadow enclosed by a fields of light, exposed by the electrodes

powered by a high-frequency high-voltage power source. Based on the same principles, Prof. KG. Korotkov invented a system termed as Gas Discharge Visualization (GDV, elaborated later). This progress clarifies the path for systematic investigation and increased velocity. It successfully set a benchmark for numerous applications in physicians and the physiological method. Numerous building blocks have been developed in past research based on GDV methodology, and many gaps have been filled under the umbrella of healthcare informatics. The previous studies show the importance of the study of the human biofield but left out many debatable scenarios due to which still it is under a question mark in terms of its acceptance [42] [43] [44].

Following are the history timeline of bioelectric research:

Table 2.1. Historical Background

S. No.	Year	Remark
1.	1570	William Gilbert testifies the existence of an electrostatic force by scrubbing two distinct elements together and suggest that the earth has made up of magnets [45].
2.	1660	Sir Isaac Newton discussed Descartes and elaborates the dynamic energy field is flowing in our nervous system which is responsible for life function [46].
3.	1733	English clergyman, Stephen Hales extends the work of sir Isaac newton by elaborating the function of nerves. They suggest that nerves act like a conductor and dynamic energy field is electricity [47].
4.	1818	Mary Shelley's Frankenstein motivated by the Galvani's research with animal electricity [47].
5.	1831	Carlo Matteucci testify the generation of electricity from the wounded tissues [47]
6.	1859	Charles Darwin discussed the origin of species in the context of bioelectric organs [47].
7.	1868	D'Arsonval published a research and suggest that if the change in energy field applied to the human mind then it will result in the perception of light. Luis Bernstein suggests the theory of nerve action, in which he discussed how the ion has transported from the neural membrane [47].

S. No.	Year	Remark
8.	1924	Willem Einthoven, Nobel prize winner for the invention of heart signal analysis device. Robert Becker concludes the association between bioelectricity, limb generation, psychic phenomena, and acupuncture [47].
9.	1939	Kirlian photography presented a simple technique for capturing electromagnetic bio field. High voltage current has passed between metal plates, object, and record the coronal discharge. Recorded electric discharge has drawn on film. This technique is heavily dependent on hardware and system setup cost is moderate [48].
10.	1980's	Oldfield developed poly-contrast interference photography (PIP). The developed techniques analyze and able to distinguish between the electromagnetic light intensities. Oldfield claims that PIP helps for medicinal diagnosis. Here aura has generated after going through various observations in the static environment. This is not productive, hardware dependent and not readily utilized by the society [49].
11.	2006	Katherine, Creath in an article discussed Comparative study of three techniques for imaging bio fields. They elaborate three techniques for imaging bio fields. First technique utilizes charged coupled device, second technique is termed as Dynamic Interferometry (DI), which is used for tracing thermal field that exists around the body and the third technique utilizes an imaging technique for measuring infrared field (IR) emitted from the biological object. A noteworthy observation was that proposed technique is hardware dependent and economically expensive [50].
12.	2011	Aura reader developed copyright software, utilizes the photographic technique. Involves scanning of the digital image, apply AR filtering technique termed as 'selective pixel manipulation' on it and reveals energy spectrum (after applying adobe Photoshop). The remarkable observation was that although it is less hardware dependent but uses adobe Photoshop, image-editing tools. Thus, the realization on such editing tool brings researcher in disbelief of research [51].
13.	2015	Shreya Prakash et.al, in an article discussed on the overview of human health monitoring by analyzing. They had discussed the scientific techniques for capturing human aura and the symptoms of disease prior to its appearance in the human body. This is not economically productive and no benefit to the society, because it is hardware dependent and highly probable to electromagnetic interference by the environment [52].

2.2 A Review on Human Biofield

As previously mentioned that the study of biofield is not new, it is a center of attraction form thousands years ago. The given figure 2.3 illustrates the existing studies on human biofield. The brief elaboration on each are discussed below section:
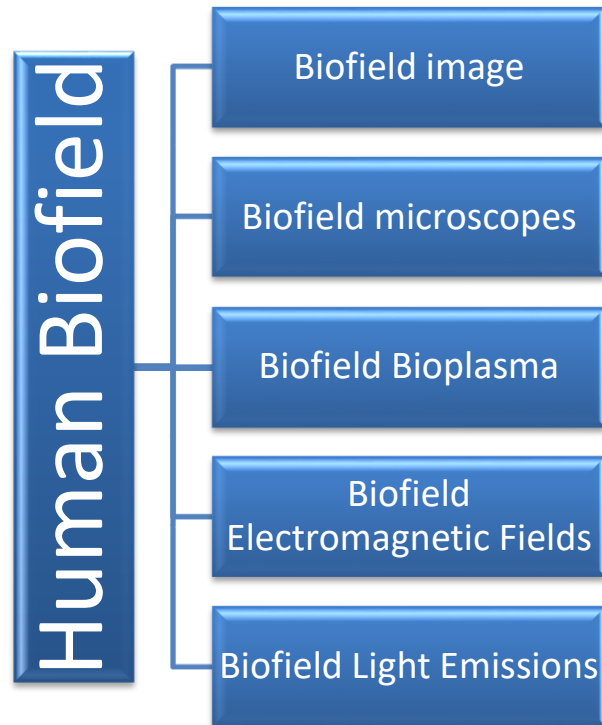
Figure 2.3 Existing Human Biofield studies

2.2.1   Biofield Imaging

Around 1911 Dr. Walter Kilner documented his findings of visualization of the human energy field and named it Aura. As per his report, three distinct layered glowing mist was observed around the person's body. During this experiment, dicyanin dye stains were used on a colored glass screen to create different filters. The structure of three layers is, first and the nearest layer is one-fourth inch distant to the skin. Second, one inch wide, more vaporous streaming of the body through a right angle. Last, the third layer six inches wide, glowing, and have infinite edges. Additionally, as per the report, the formation of the human energy field varies from individual to individual based upon their psychological and physic status [53].

Later in 1939, a new process termed "Kirlian photography" methodology came into the picture. The method was introduced by a Russian scientist Semion Kirlian. Since the pulse was delivered, there was a subsequent ionic discharge around the object that

could be captured on a photographic plate. Using a special optical instrument Kirlian was able to show a difference in the biofield of a person harbouring a disease that had not yet manifested any symptoms! The GDV device is an advanced digital version of Kirlian photography that eliminates the need for a photographic plate and uses glass electrodes instead [47] [53] [54].

2.2.2 Biofield Microscopes

Between the years 1930 and 1950 Dr. W. Reich, a psychoanalyst, and psychoanalyst studied the universal energy field which he called orgone. He studied the changes or imbalances in the orgone flow concerning physical and psychological diseases. Reich experimented with these energies using the latest instrumentation of that time to observe the energy fields of animate and inanimate objects. He used a high power microscope to observe the energy field of microorganisms and human blood cells in the laboratory [55].

2.2.3 Biofield Bioplasma

During the era of 1950s, Dr. Victor Inyushin in Kazakh University has been directing a thorough investigation of Bio-energy fields. According to his beliefs, the energy field to be bioplasmic in nature containing ions, free protons, and electrons. He also concludes that the bioplasmic energy field should be categorized as the 5th state of matter. His experimentation proves that these particles forming up this field uniformly and get renewed by the chemical changes. Due to the major imbalance of particles included inside the bioplasma appears to generate irregularity in the medical condition of the person [56].

2.2.4 Biofield Electromagnetic Fields

During the era of 1930-1960, H. S. Burr, an Educator of Anatomy at Yale University, showed that all living things had a life field, which he was able to analyse and measure with his special electronic instruments. He showed that these life fields (he called them "L-Fields") could be used to predict illness by noting variations within them. He described the state of the energy field as being able to indicate the appearance of cancer. Also, able to illustrate that the behaviour of cancer caused notable differences in the electromagnetic field near the body [57] [58] [102].

2.2.5 Biofield Light Emissions

During the transition years 1970-80s, Dr J. Pierrakas invented a method of the analysis and cure of psychosomatic illnesses based on pendulum-derived and pictorial interpretations of the Biofield. The statistics of those interpretations combined with body psychotherapeutic methods eventually developed into "Bio-Energetics", otherwise known as "Core Energetics". His work suggested that the light emissions from the human body are closely related to health [56].

In 1978 Dr John Pierrakos, Dr Richard Dobrin and Barbara Brennan published Instrumental Measurements of the Human Energy Field which correlated clinical energy field observations with emotional response and low light level darkroom measurements were correlated to human presence. Light levels were taken in a darkroom before, during, and after there were people in that room and results showed an increase of light when people were in it. Amazingly light levels dropped when someone tired or emotionally sad was in the room [56].

2.3 Existing Techniques to measure Human Biofield

This section elaborates some of the existing techniques to measure the human biofield. The hierarchy shown in the figure 2.4 represents the few famous methodologies to measure human energy field around the human body and give the analytical results. The detailed elaboration of each is extended in below sub-sections.
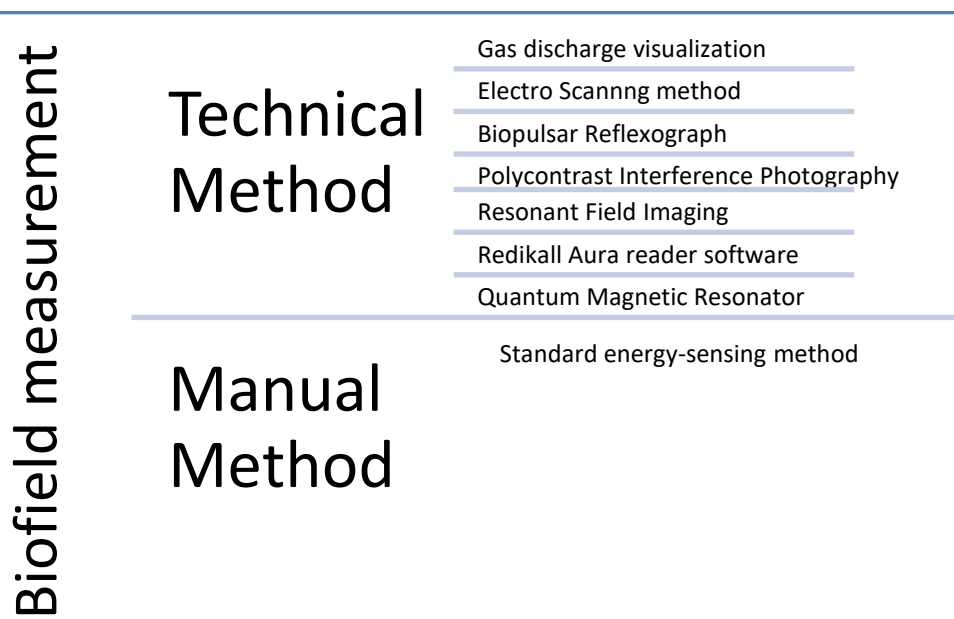
Figure 2.4 Techniques to measure human biofield

2.3.1 Standard energy-sensing method

An old-fashioned method used by skilled persons, i.e., needs special training to sense the auric energy of the other person. The energy-sensitive people practice this method for *Pranic healing*. Pranic healing is a way to the body's inherent healing capability to improve all stages like emotional, psychophysical, spiritual & mental. During this mechanism, there is a requirement of any device for the analysis of aura. One can sense the aura of the other on attaining the appropriate skills. Aura is represented as an organized energy field near the human body that imitates the state of physiological and psychological status. The study says that, during the analysis, two regions of an aura can be sensed, firstly, Inner aura that reflects the physical and mental health. Secondly, Outer aura that symbolizes the spiritual and emotional health. Both the regions, inner and outer, are evolved because of the effects of seven chakras, and previous research proves that physiological and psychological impact is due to the imbalance of chakras.

Katherine Creath proposed a research article, in which they elaborate three techniques for imaging biofield. In the first method, it utilizes CCD that is very sensitive, low noise sensitive to radiation ranges (400- 1000) nm. Biological processes undergo some oxygen metabolic changes and produce self-bioluminescence. The major drawback of first technique is that it allow only low resolution, low-noise imaging and short-exposure. In the second method is identified as Dynamic Interferometry (DI), which is used for tracing thermal field that exists around the body. The major drawback of second technique is that cannot directly and accurately measure the biological objects, due to following reasons [50]:

a) if there is any fluctuation in temperature then there is a minor change in the refractive index. b) Sensitive to temperature variation.

The third technique utilizes an imaging technique for measuring infrared field (IR) emitted from the biological object. Much advancement has been done in this field. Modern technologies have advanced to an extent which makes easy usage of the high resolution infrared imaging device. However, these devices efficiently work in daylight and relative variations in time, temperature.

2.3.2 Gas Discharge Visualization

Gas Discharge Visualization (GDV) (Electronic Photonic Imaging (EPI)) is a superior class of Kirlian photography designed by a Russian scientist Prof. Korotkov. This device employs a high-frequency electrical space that excites ionic gas discharges from a target under observation. This process is named as corona discharge. The GDV Camera produces a high-intensity electric field nearby a fingertip located on the top of the specific fiber-optic plate of the apparatus. The electricity field creates visual, gaseous ion discharge glow throughout the target and a picture is clicked spontaneously on a computing device [10] [47] [58].
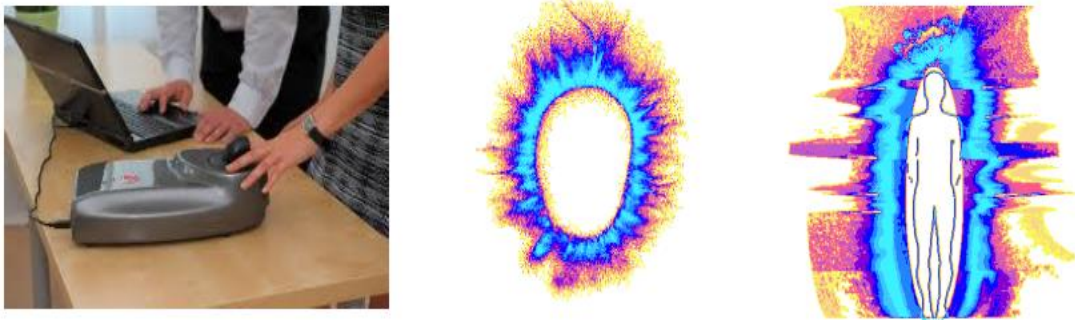
Figure 2.5. Gas Discharge Visualization device and outcomes

This device, GDV, triggers a very low electric current (high voltage) charge via a charged-couple device (CCD) on which every hand's finger is located. This creates a visible pattern around every finger, as illustrated in figure 2.5, which is transformed into a computer file by CCD and optical system. Certain conclusions and analyses are obtained after calculating predefined parameters and significant interpretations. An aura image of respective fingers is obtained using Indian and Chinese physic philosophies. In the next step, these images are correlated with organ system function, reasoned to show the health status of an individual [10] [47] [59].

A 2D amplitude-modulated fractal image is obtained, after the complete processing and different transformations. For the correlation of the image, fractal, matrix, and probabilistic interpretations are then applied. Briefly, the magnitude, consistency, and the uniformity of the bioenergy (aura), calculated with the GDV device, appears to interrupt, in case of negative factors like stress. Hence, as a result, the GDV device illustrates the energy leakages [10] [60].

Thus, the GDV imaging device is a practice to represent the energy field distribution throughout the human body. The energy field of a healthy person would be visible as vibrant, symmetrical, dense, and uniform with even variation of colors from yellow to orange to blue. On the other hand, a person with negative energy or with any disorders on organ, functional or mental level, and aura appears to be dull and asymmetric with heterogeneities, outbursts, and holes [58] [59].

2.3.3 Electro Scanning Method

The Electro Scanning Method (ESM) was developed by Dr. Harry Oldfield, setup shown in figure 2.6 below, who has also created PIP (another device to analyze the human aura, elaborated later in the section). This machine was the simplest to use and function in comparison with the others. This device was able to detect the strength of the field of energy around the living beings and was inspired by the working of another device RFI (elaborated later) [47].
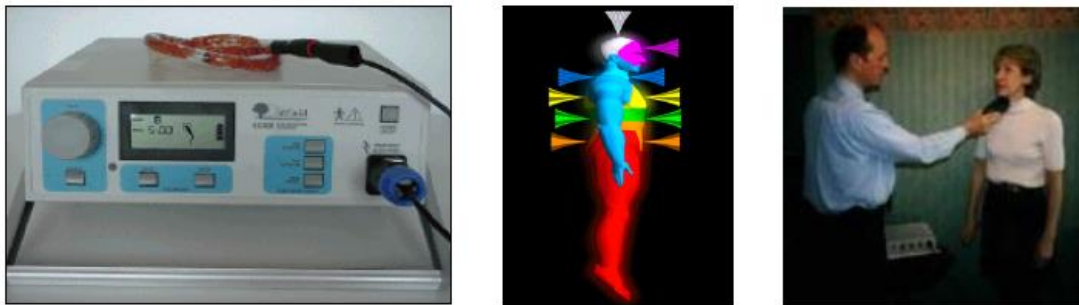
Figure 2.6. Electro Scanning device and experimentation

The procedure of measuring the human energy field is a conductor, held by the subject, and a high-frequency pulse is applied. This generates a resonant field nearby the body of living being. The variations in this field are recognized by applying usual sound level meter. This helps in identifying the strength of the signal, i.e., amplitude, in contrast with a control site, say, the forearm. It is a process of measuring the sound signals of several spots in the energy field [47] [61].

Dr. Oldfield states that the overall energy states, measured at seven reference points, correspond to chakra locations. These energy states symbolize state of the energies of organs and another physical anatomy in that region. Let us say, an interpretation at the third eye (brow center) reflects the relative health status of the brain as well as the eyes. The stress, overexcitation, or acute pain in that region is measure by positive

readings. Opposite to that, i.e., negative readings direct towards the low energy or continuous distress [47] [61].

2.3.4 Biopulsar Reflexograph

Another popular technique for the measurement of the human energy field in the pictorial form is Biopulsar Reflexograph. This technique follows the concepts of alternative energy and medical sciences of both eastern and western culture. As an output, it generates the result in the form of body aura image, organ-wise graphs, and chakra activities. Its working includes the collection of electromagnetic waves through reflex-zones on the hands. These reflex-zones are associated with the body organs, which contributes to the creation of the overall human biofield [62].
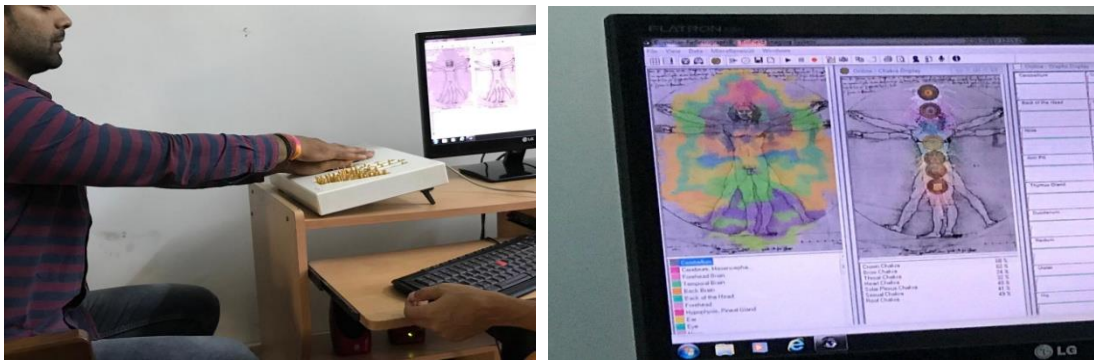
Figure 2.7. Biopulsar Reflexograph experimentation

The working principle of Biopulsar Reflexograph describe that the reflex-zone available on our hands not solely correlated among the organs and mindfulness, also with subtle energy centers and meridians. The device accepts the energy values, as shown in the figure 2.7, from every reflex-zone and convert them into visual colors. Then the dedicated program converts these inputs into a human visible biofield image. The human brain is a central processing unit of the body, and every organ is associated with it; it resonates certain emotions and thought processes. Biopulsar Reflexograph detects different types of illnesses, symptoms, and disorders, along with understanding the thoughts' power and inter-connection with the physique. A threshold graph generated by the algorithm indicates the present status as well as foresight about the problems using built-in computations. The energy graph splits the axis within the range 0-10 and uses the threshold value of 70%. If the value obtained after the experiment is lesser than the threshold, it represents the weak functionality of

the organ, and otherwise. Thus, based on the same procedure, the whole body is analyzed to generate the overall status of an individual [62].

2.3.5 Polycontrast Interference Photography

Polycontrast Interference Photography (PIP) invented by Dr. Harry Oldfield, was a remarkable computer imaging method. PIP device can visualize the state of the human energy field using 3D-imaging. Using these images, one can depict and distinguish between the energy breaks and its free flows. These outcomes can be visualized by the patterns obtained, and the color spreads in the image [47].

Polycontrast Interference Photography (PIP) is an energy field video processing technique, as visualized in figure 2.8, to unveil the light patterns that are not perceived by naked eyes. Oldfield believed that the energy field (Aura) intervenes with photons (which is considered as energy packet that consists of light). He infers that ambient light intervenes with the energy fields in both the cases when light incident falls on the objects, or it gets reflected from the objects. Oldfield designed the procedure that examines and distinguish different light intensities reflected from the objects. Oldfield believes that PIP will help medical practitioners that can find an imbalance in the field of human energy first then the any illness in the subject [47] [63].
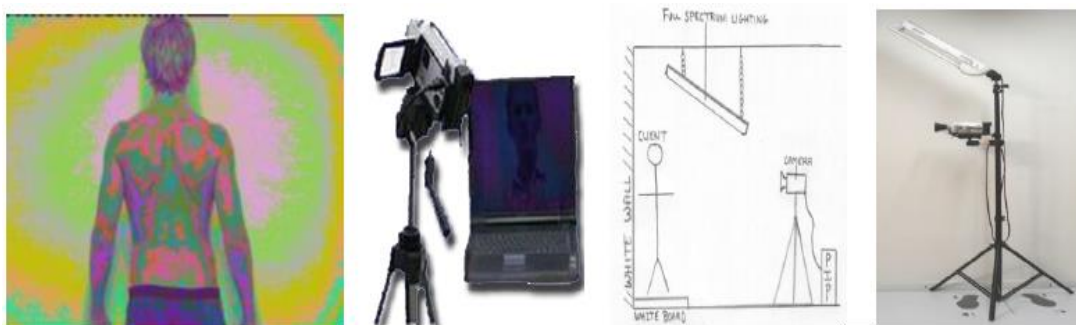
Figure 2.8. Polycontrast Interference Photography experiment and results

PIP works on the principle of light-based scanning technique to analyze intercommunications between environment light and energy released by an individual. These interactions result in certain patterns around the human body, indirectly, information perceived is the intensity of light. Based on these intensities, specific colors are assigned by computer software. To obtain effective outcomes, it is preferable to wear undergarments during the scan. The pattern generated by the energy field absorbed and reflected energy, in and out, which is of interest [47].

The PIP device generates energy patterns around and within the human. Significantly, blockages in the energy field patterns can be observed externally over the particular part of the body under examination. It is assumed that the weak portion of the human body receives more light (reflect less) in comparison with the remaining parts of the body [63].

Working with the PIP is quite easy and simple. Initially, an individual is asked to stand in front of the white colored wall. A full white spectrum light, not natural light, is placed 4-foot above the subject's head. If required, the lighting is adjusted to make it consistent, and to standardize the overall light intensity effect. In the next step, a video camera is focused on the person that is embedded with a CCD. This CCD is an integrated circuit sensitive to light that helps in converting the light signal into an electrical signal. The intensities of these electrical signals represent the colors in the color gamut and thus a colored image can be generated [63].

Further, as the camera is connected to the computer systems, these electrical signals are inserted into the system. A computer program then converts these electric intensities into numeric values. Based on their intensities, values are allotted from 0 to 255. If the brightness of the light hitting a specific cell is high, the higher number is assigned by the computer program. In any case, if there is any unknown signal value is obtained, instead of primary colors, the image is degraded to black and white colors. Finally, the electric intensities received by the computer, are replaced with computer display color numbers from 0 to 255. In computer color gamut, the specific number always has a specific color value. In this way, the false colors represent the fine degrees of light intensities and display on the screen [47] [63].

As a result, the display of low-frequency light intensities by assigning the appropriate color values to them. Hence, the invisible light intensities are defined and made visible, otherwise, it was an impossible task to visualize the same via the human eye.

2.3.6 Resonant Field Imaging

Resonant Field Imaging (RFI) is an energy field imaging technique, which is capable enough to construct the full-color bioenergy spectrum representation of animals, plants, and objects. This technique provides an informative interpretation of the bioenergy field. RFI Digital Frequency Counter is used for the identification of frequencies around the human body. Digital Frequency Counter comprises the

antenna that detects the frequency value in the standard unit. This frequency value entered as an input to the software program, which constructs the bioenergy field around the object [64] [65].

Figure 2.9. Resonant Field Imaging experiment

The RFI is developed by Matthew Greene, an American scientist. The RFI requires a specifically designed, shown in figure 2.9, dedicated software for the analysis of frequency values emitted by the human body. These frequency values are detected by a frequency counter, throughout discrete parts of an individual. Then, the dedicated software transforms these frequency values into specific colors, associate with the biofield of the body. This information is then further connected with the physical and psychical status of the person. The RFI device does not require any external power supply and is counted as a passive device, only for detecting frequency values [64].

The frequency counter can detect a broad spectrum of frequencies (1MHz to 1GHz). On the other side, the dedicated software is designed for RFI, is capable of assigning colors to these frequencies. The red color, one of the primary colors, resembles imbalance. The other colors like yellow, burgundy, orange, and black, are assigned to identified or symptomless physiological anomalies. The remaining colors resemble to signify healthy sections [47] [64].

The physiological processes include cell-based activities, especially signal transmission via the nervous system, electrical activities, and atomic level transitions that generate electromagnetic fields. Any dysfunction results in a decrease in the strength of an energy field. Yet in some exceptional cases, for example, presences of pathogens correlated with any illness, also release their frequencies. This may lead to an increase in the strength of the energy field in a specific area. Moreover, it is

noticeable that the field strength also increases during inflammation or immune response [47] [64] [65].

2.3.7 Redikall Aura reader software

Aura reader software is a technique to convert a digital image into an energy field photographic image, using a dedicated computer program. It utilizes Adobe Photoshop to reveals the energy spectrum that is not visible by bare eyes. Firstly, it converts the digital image into the aura reader image compatible with the software by using filters. AR filters perform recoloring of the intensities of light by selective pixel manipulation. Selective pixel manipulation performs subtitle changes in color pixel values, which are further converted into an aura image [51].

Figure 2.10. Aura reader software results

Redikall Aura reader software does not require any advanced skills to operate. It is ready to use and easy to use a computer program that scans a digital photograph. This digital photograph get converts into an aura image via software, as shown in figure 2.10 above. By using this software, one can record the energy field of an individual, an object, or a given space [51].

By using specially designed image filters, this computer software converts a digital image to an aura reader image. The final image exposes the aura colors (false colors assigned for visualization) around the human body/object/space. The energy field obtained around the living being is termed as the human energy field or the biofield.

Aura reader computer program is an easy and reliable way to understand the subconscious evaluation process by Chakra Reading. Aura imaging scans aura of a person or an environment that provides an aura photograph for the interpretations.

These interpretations further help in resolving personal and professional life issues [51].

The unbelievable variations observed between the aura images before healing and after the healing process. The healing process includes aura healing by meditation, sound therapy, spiritual healing, and others.

2.3.8 Quantum Magnetic Resonator

The Quantum Magnetic Resonance (QMR) analyzer is a device used to evaluate and examine electromagnetic signals for estimating the health status of a person. The human body consists of trillions of cells that continuously grow, split, develop, die, and regenerate, automatically. Past research confirms that every second more than twenty-five million cells get splits, whereas the renewal rate is hundred million per minute. During this autonomous procedure, happening inside the body, human cells continuously releases electromagnetic signals. The reason behind the whole procedure is that the cell body consists of a charged nucleus and electrons, emits, and absorbs energy during each process. Further, these electromagnetic signals from the body, reflect the health status of a person, i.e., variations in EM waves symbolize the good or bad health status [66].

Figure 2.11. Quantum Magnetic Resonance

QMR analyzer, setup shown in figure 2.11, is another technique to examine the health status of an individual. It can monitor more than thirty parameters in a minute. The QMR analyzer accepts the released energy and magnetic signals, from the body, by

using a sensing device. As these input signals are very weak, the inbuilt amplification and microprocessor calculation, increase the signal strength. These signals are equated with the standardized quantum spectrum, embedded within the computing system. The Fourier strategy is applied to execute a comparison, hence, the final health report, about the person, is revealed. The QMR analyzer can detect more than thirty functionalities, including, kidney, liver, heart, and other organ's functionalities. The QMR device also detects the status of minerals and vitamins, blood sugar, and so on [67].

2.4 Previous research findings on Biofield

The author Zahran SK (2019), in his paper stated that, the human biofield as a human umbrella or atmosphere that represents human physical and psychological status and connect one to his/her surroundings. This umbrella contains information, and detect information too unconsciously, that help human adaptation to his/her environment. Bioenergy field radiates away from body, resonates and interacts with others- in a complex radiated communication system- to maintain coherence. Studying such Bioenergy field with its all components, may help scientist develop not only healing procedures, but also human psychical system, and how does it work [68] [69].

In a research by I. Jerman *et.al.* (2018) stated that the phenomenon of the biofield deserves a thorough scientific and medical investigation and a broad use in integrative medicine. Their research also concludes that there is a new potential that by skillful management of the biofield we may conquer some still incurable illnesses, like Alzheimer's and other neurodegenerative ones. The logic is that if the bioenergy field signifies an unseen dimension of wellbeing and life, its disturbances may lead to bodily dysfunctions and diseases that cannot be stably remedied only with chemical or mechanical manipulations. Actually, many present day dysfunctions that are cured by use of drugs with more or less heavily side effects may be cured in a much more stable and satisfactory manner. There could be a great positive reinforcement between integrative medicine on one side and the biofield research and use on the other one [70].

In (2017) a research article by Korobka IE *et.al.* was based on an analysis of gender inequality, by comparing the activities of the automatic nervous systems of healthy and hypertensive patients among Russians. For this purpose, heart rate variability and

Electro-Photonic Imaging (EPI) analysis methods were used to examine subjects. For analyzing the results, hundred and thirty eight patients' group data of, with varying stages of arterial hypertension, 20 to 70 years of age, and thirty-seven healthy data was collected. The final analysis states that the parasympathetic activities are responsible for the variance in parameters, but not hyperactivity of the sympathetic center [71] [72].

In (2015) an article by Beverly Rubik mentioned that the biofield, an essential link between the body and the mind. The bio-physical standard includes a "field" view of life, whereas parallel to that, according to the biomedical paradigm, may be counted as the predominant "particle" view. The biomedical worldview says that life is involved in a progressive system of efficient anatomical sub-structures down to the degree of bio-molecules and genes. While the bio-physical worldview pronounces that the basic idea of being is like consuming issues into vitality, moving like a fire intelligible yet marginally disorganized. The biofield is a field of vitality personally associated with every living being that holds primary evidence to its higher-degree of existence. This must be recommended as holding mind-like characteristics as a super-regulator of the natural chemistry and physiology of the creature, regulating all life-functions, and a fundamental aspect for understanding life's integral wholeness. Even though Western science has basically ignored the field concept of existence in recently, at present more researchers embrace it for its integrative and illuminating powers [9].

In (2007) a research article, documented by Korotkov KG et.al. presented an experimental study on the development of an efficient technique for the prior identification regarding practicing drugs and alcohol among athletes. The Electron-Photon Capturing (EPC) Analysis, work on the principle of Gas Discharge Visualization (GDV) used to perform this experiment. The comparative study between 600 athletes, with high endurance, and a group of 120 patients (98 men and 22 women), suffering from constant alcoholism were examined. The research uses the image and artificial intelligence analytics methods to unveil a set of traits of the parameters, specifically for the people who are drug addicts or alcoholics. On analysis, it has been found that athletes addicted to alcohol have disorders in psychophysiological conditions. This opens extensive perspectives for deep medical studies for the improvement of new technology [73].

In (2002) an article by Beverly Rubik stated the human energy field hypothesis, about its biophysical basis and its importance in the medical field. The author claims that the human biofield is unobservable via bare eyes, and it cannot be separated or interpreted comprehensively. As the complexity of the energy field is very high, it cannot be computed from fundamental laws. Similarly, many other unobserved aspects of nature are known in a roundabout way in physics with the aid of their consequences. Although, several outcomes of the biofield can be determined from cautious computations. However, its characteristics are clarified by the presence of some phenome. To elaborate more regarding the human energy field and healing, one needs a human energy funding project and adequate dedication to the research society. In this article author also conclude some predictions and several features of the human energy field hypothesis are introduced that need more examination for legality [74].

Various other researchers have performed different experimentation by using different techniques in the field of medical science. Some of the key outcomes are highlighted in the below table 2.2. These results clearly show that the biofield carries numerous amount of information which may help and enhance medical researchers to revel new information related to human body and life. Following table shows the outcomes of research taken place in previous years:

Table 2.2. Early pathological examinations based on Aura interpretation

References	Number of applicants	Medical Studies
(Alexandrova, 2003) [75]	Total 303 patients are participated in this analysis, out of which 247 is suffering from bronchial asthma and remaining are healthy.	Experimental analysis performed on Bronchial asthma patient.
(Gimbut, 2004) [76]	Total 20 patients are participated in this analysis,	Experimental analysis on factor responsible for uterus imbalance.
(Alexandrova, 2003) [77]	Total 43 patients are participated in this analysis, out of which 23 is suffering from allergic reaction and remaining are healthy.	Experimental analysis performed on allergic reaction risk.
(Gedevanishvili, 2004) [78] [79]	Total 57 patients are participated in this analysis; out of which 22	Experimental analysis performed for optimal

References	Number of applicants	Medical Studies
	is suffering from lung cancer and remaining is suffering from breast cancer.	assessment of patient during cancer (lung and breast) radiotherapy treatment.
(Alexandrova, 2003) [80]	Total 87 patients are participated in this analysis, out of which 30 is suffering from Chronic viral hepatitis, 25 is suffering from chole-lithiasis and remaining are suffering from primary biliary dyskinesia.	Experimental analysis performed on Chronic viral hepatitis.
(Gagua, 2004) [81] [82]	Total 347 patients are participated in this analysis, out of which 249 is the cancer patient and remaining are in control group.	Experimental analysis performed for determining state of a cancer patient.
(Krashenuk, 2006) [83]	Total 21 patients are participated in this analysis.	Experimental analysis of monitoring the therapeutic effect.

There exist many more applications and outcomes related to the research on the human biofield. Thus, shows the importance of its study and the need of research in this area. After the detailed study on human aura, some of its key benefits are enlisted below.

2.5 Benefits of Biofield Analysis

The need for analyzing aura is that to understand our environment better and connected with nature. The ability to visualize and deduce aura pattern and its colors would help in several ways. Few benefits of evaluating aura are as follows:

Table 2.3. Benefits of Evaluating Aura

Health	The colour of Aura get changed much earlier than the physical symptoms noticed in the body
Mental Conditions	Depression, anxiety, anger, all such type negative circumstances that affect the one's state of mind may able to get controlled by aura analysis and remedial.

Relationships	Each colour has its own natural affinity. Visualizing the aura of the other person would make it effortless to comprehend the compatibility issues.
	It helps to determine the compatibility and chemistry between the people. Henceforth it helps in nurturing an enriching relationship as per the choice and requirement.
Healing	Healing the affected body is time consuming, traumatic, challenging and less economical. While on the other hand healing through aura is much easier and more effective. This is due to aura can shows the illness earlier than it revealed. Thus, healing can start at the very early stage, which is less painful and faster.

After studying the characteristics and features of human aura, it is interpreted that the human aura consists of both medical and psychological information about an individual, which can bring incredible revolution and can solve various conundrum of human body. Due to its highly convoluted pattern and dynamic nature, it is very difficult to understand the exact information of one's aura. Therefore, a new approach is required which may enhance the expected outcomes and gives the better understandings related to the domain. Past research shows the importance of biofield in various areas, thus more advance study, research and detailed outcomes are required to utilize and unfold to its hidden information.

CHAPTER 3

PROPOSED METHODOLOGY

Based on the previous studies, limitations, characteristics, and challenges explained in the earlier section, proposing an innovative framework, which will help in visualizing human biofield through a digital image. This framework is simple and easy to understand in comparison to already available methods. Also, the focus of this research is to develop cost-effective approaches to generate biofield imaging.

3.1 Proposed Methodology

On analyzing the limitations and challenges related to the visualization of the human biofield, there is a need for a better approach to display bio-images. This section deals with the details about the framework used for the visualization and analysis of human biofields, and lastly to generate the final report. This methodology includes the techniques of image processing and artificial intelligence. Existing methods require both hardware and software, with a high level of operating skills and purchasing costs. Therefore, the current research focuses on reducing the overall cost and developing a more reliable technique to solve the stated issues.

The schematic architecture of the proposed technique is shown in the below figure 3.1. The complete division of the execution of the method is into three phases. The first phase is a capturing phase, in which a single task is performed, i.e., capture image frame. In the capture image frame phase, an individual's image is clicked by using a standard digital camera, not to use professional cameras such as DSLR. The pixel quality of the camera should be greater than five megapixels and acceptable up to 16 megapixels.
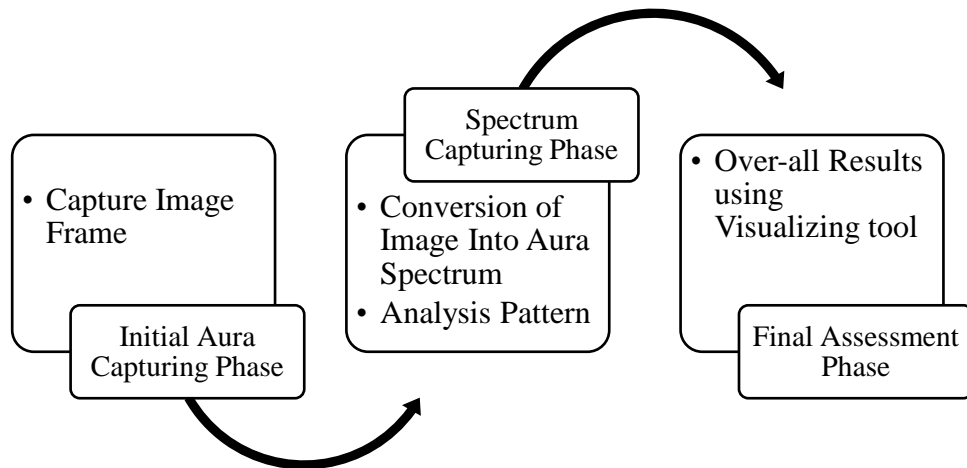
Figure 3.1. Schematic architecture of proposed technique

The second phase is the spectrum-capturing phase. In this phase, the image captured of an individual and is converted into a visible aura spectrum, by aura visualizer algorithm. This conversion is performed by using image processing techniques. The output of the aura spectrum is taken as an input that is further used for the analysis and final report generation. The biofield image reflects various colors around the human body, indicating the mental and physical status of the subject.

The third phase is the final assessment phase. In this phase, the aura visualizer algorithm determines the intensities of light waves and assign the color values accordingly. Their colors are then spread over the image and generates a new image highlighting biofield around the subject. Finally, the algorithm will generate a diagnosis results of the individual by using predefined interpretations.

The working of the second phase, i.e., the spectrum capturing phase is further divided into three sub-phases, as shown in figure 3.2. In the first sub-phase, the image of an individual is clicked using any standard digital camera (preferably 5MP to 16MP). In the second sub-phase, the identification phase includes pre-processing of an image, calculations of light-wave intensities, and application of image processing techniques (elaborated in the coming sections) to identify the aura spectrum of the captured image. In the third sub-phase, the analysis phase performs the aura spectrum interpretation, based on color values, to prepare the final report of the subject.

The whole process is performed under the controlled environment, i.e., under a specific environmental (elaborated later) conditions. This algorithm works on the

digital colored image to identify the biofield around the human body. The inspiration behind this idea is based on the aura-reader software, Resonant Frequency Imaging, and Polycontrast Interference Photography techniques (explained in the previous chapter).
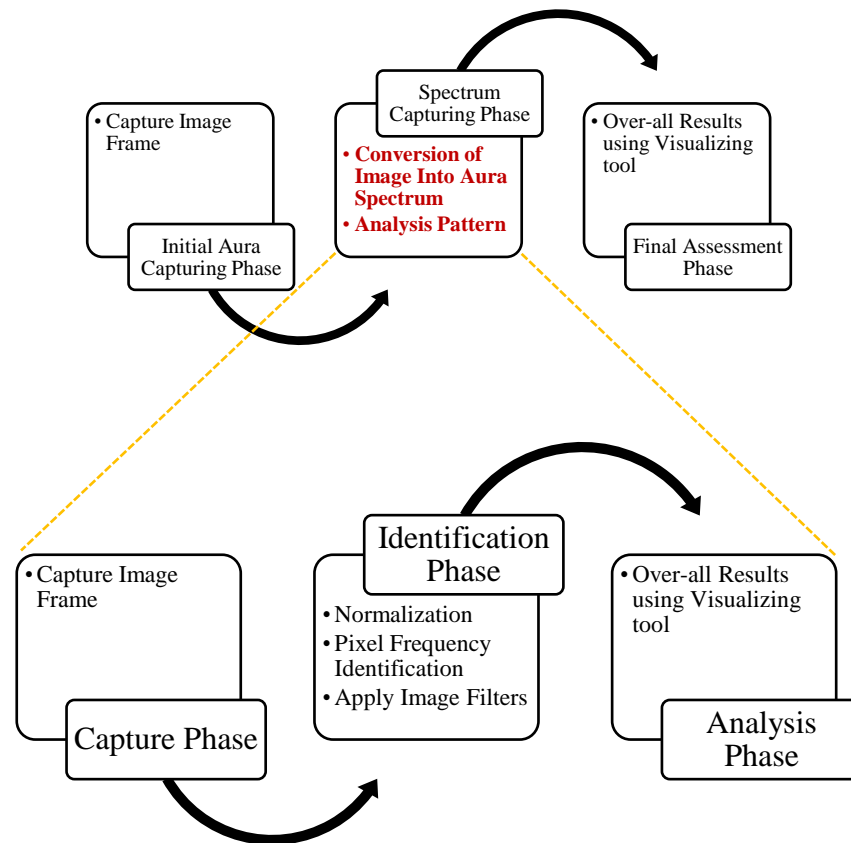
Figure 3.2. Detailed workflow diagram of proposed technique

During the second phase of the process, the pixel intensities of an image are calculated to examine and distinguish different light intensities reflected from the subject. Next, the algorithm performs the mapping between these intensities and the color values. In this process, these intensities are assigned to the specific values between 0 to 255. In a color gamut, the specific number represents a particular color value, hence, based on the intensity values, color distribution is initiated. This process is known as selective pixel manipulation that helps in visualizing the invisible energy field around humans. The previous research shows the interpretations of these color codes, shown in the table below that helps in generating the final report of the subject. These interpretations elaborate and provide valuable suggestions on the psychophysical status of an individual.

Table 3.1. Chakra Pattern Analysis (source: Internet) [84] [101]

S.No.	Position of Chakra & its life Effect	Associated organs	Representing color	Psychophysiological effect	Its Origin
1.	**Root Chakra** coccyx between anus and genitals **Life Energy**	Spinal bone, legs, intestine, blood	Red	reinforce life energy, sexual potence, power of enforcement	origin: life energy, trust in yourself, relation to material world, stability, vitality
2.	**Sacral Chakra** 3 inches under naval **Creativity & Relationship**	genitals, kidney, lymphatic system, digestion	Orange	stimulate creativity, eroticism, appetite and digestion	origin: feelings, sensuality, eroticism, creativity, wonder and enthusiasm
3.	**Solar Plexus** Chakra 3 inches above naval **Wisdom**	liver, stomach, gall bladder nervous system	Yellow	redeem emotions, helps by depressions, helps to forget bad feelings and experiences	development of own personality, process of bad feeling and experiences, influence and decision power, wisdom
4.	**Heart Chakra** middle of breast **Harmony & Love**	heart, lung, circulation, skin, hands	Green	balance mind, body, soul, supports love, compassion, healing	communication, creative self-expression, development of heart qualities, love, healing
5.	**Throat Chakra middle of the throat** **Inspiration**	**voice, throat, bronchial, lung**	**Blue**	**active communication, self-expression and independence**	**frankness, compassion, tolerance & forgiveness, unselfishness, devotion, inspiration, access to the finer levels of existence**

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6.	**Brow Chakra** forehead **Intuition**	nose, eyes, ears, face brain	Violet	stimulates mind power	spiritual power, development of inner power, knowledge, intuition, projection of will, imagination
7.	**Crown Chakra** middle of the head **Spirituality**	cranium, brain	White	activates spiritual growth, self-realization	perfection, union with the universe, universal awareness

3.2 Environment Setup

To transform a digital image into an auric image, the present research is carried out in a controlled environment. The detailed explanation related to the environmental setup is provided in the upcoming sub-sections. The environment setup is static to reduce the overall computation cost and to attain accurate interpretations. The dynamic environment requires more number of computations than the static one, hence increases the computing cost. This is one of the constraints applied in the present research, which can be further transformed into dynamic environments. A human biofield is a form of electromagnetic field released by humans while their body performs some physical, mental biochemical, and other similar tasks [85] [86] [58]. Therefore, as elaborated before, it is very dynamic and frequently changes its structure. In parallel to such characteristics, this energy field interacts with environment fields to generate a specific pattern that can be captured by various means. The algorithm proposed in this research can compute the intensity of the light in an image and make the biofield visible by allocating specific color values. The figure drawn below, figure 3.3, reflects the overall environmental setup for the experiment [85] [86].
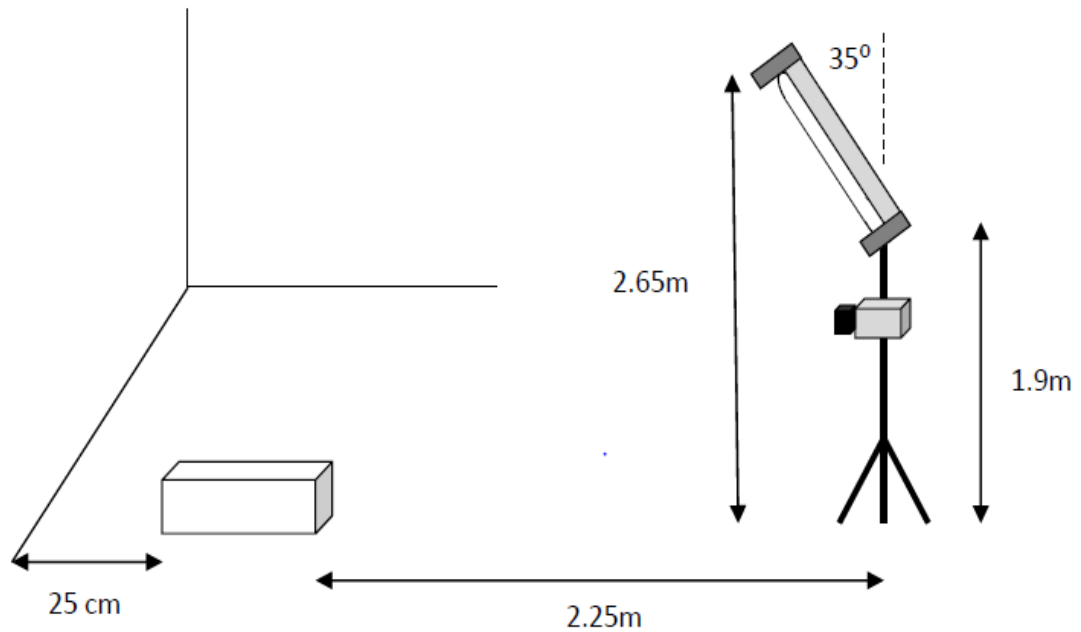
Figure 3.3. Environment setup for the experiment

3.2.1 Background

The aura analysis can be done for living beings including, plants, animals, and others. However, the accuracy of the aura interpretations of chakras highly depends upon how well the picture is clicked by the examiner. Therefore it is necessary to set up the required environmental conditions before proceeding. One of the pre-requisites is setting up the right background for the aura photography. Here are the few points that one should keep in mind:

- Whitewashed or matt finished, a white-colored wall is a perfect choice for aura photography. This is because the white color is a reflector of all the colors, therefore, it will be easier to percept all the colors by using a white background. In case, if anyone is not having a whitewashed wall, a projector screen or light-colored wall would be a good substitute for the same.

- To create a monochromatic environment wall should be clean, uniform, smooth, and non-reflective.

- The background should be wrinkle-free surface, therefore, avoid using white cloths or bedsheets as it will generate uneven color distribution due to the presence of ripples.

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- Background surface should not contain cracks or gaps or folds. This will affect the interpretation of aura readings.

- One should not capture the image near any electronic gadget like computing devices, TV, Wi-Fi devices, or any other. This will cause interference in the aura field of the human.

3.2.2 Camera Setup

While taking the picture, another constraint is the choice of a camera. Therefore, while choosing a camera for aura photography, one should make the right choice. For this, the following points should be kept in mind:

- A camera should a standard digital camera of 8 to 16 megapixels. If anyone is having a DSLR camera then it should switch to the raw image form. If anyone is carrying a high megapixel camera, then one should adjust the megapixels for the aura image capturing.

- It is recommended not to use a mobile phone camera for this purpose because it will modify and alter the images which will further result in inaccurate interpretations.

- The distance from the subject and the camera should be 5 feet. Also, based on skin complexions, distance can be change to 4.5ft or 5.5ft as required.

- The distance should be maintained and important as it will determine the amount of light on the subject. This will avoid the problem of overexposed and underexposed issues. Therefore, it is advisable to maintain the same distance while capturing multiple images.

3.2.3 White Light Setup

Another important factor to be considered while clicking the image of the subject is the lighting effect. Full Spectrum Light (FSL) includes ultra-violet, visible, and infrared energy. This spectrum dispersed a wide range of visible frequencies. Hence, from the literature, one can say with confidence that full-spectrum light has a great impact on energy-field (Boyce's 1994). Single FSL of size (4.0 feet/48'') has recommended for experimenting.

However, there is no direct relationship with the other environmental conditions (room temperature) is observed with the human psychological state (angry, upset,

etc.). Hence, environment setup is necessary to minimize the frequency interference of electronic gadgets.

Above all, the lighting effect is the most critical and crucial aspect of aura photography, as the interpretations are very much dependent on the lighting effects. As a rule, room light should be adjusted with white light, as shown in the figure 3.3. There should not be any interference of direct sunlight, therefore, it is advised to use window shades or curtains, if required. There should not be a shadow effect at the background of the subject.

3.2.4 Instructions for the subject

For accurate photography, it is also important for the subject to follow a few instructions related to the dress code, and other dos and don'ts. Below are the important instructions for the subject:

- The subject is advised to wear a solid white-colored dress, preferably. The dress should not have any pattern or embroidery and it should be the open neck, i.e., no collar or collar inverted and turned inside. It is also advised for the maximum skin exposure but one should take care of the culture and comfort of the subject.

- It is also advised to remove the metallic accessories like jewelry, spectacles, gemstones, and others, as it will affect the results.

- It is advised to remove the makeup like eyeliner, lipsticks, and other and one should tie the hairs for the maximum exposure of the skin. Otherwise, they will alter the overall aura readings.

- Leather material and dark-colored clothes should be avoided.

- The subject should stand next to the white wall, almost leaned to minimize the shadow effects.

3.2.5 System and other setup

Along with the above-mentioned environmental set-up, some system-related requirements are discussed in this section for the execution of the proposed algorithm. Below mentioned are the system requirements:

- Operating system: Windows 7 and above

- Processor: i3/i5 and above, @ 2.00 GHz (more powerful system enable higher performance).

- Memory: 512MB RAM, 1GB free hard drive space

- USB port and graphics card

3.3 Proposed Algorithm: Aura Colorspace Visualizer

Once all the arrangements and the pre-requisite, as mentioned in the previous section, are applied the next step is to design a stepwise execution plan using image processing techniques. The image clicked as per the required constraints is transferred to the computing device via USB cable or card reader. The overall working of the algorithm is shown in the figure3.4 below. In the first step, a pre-processing technique applied to remove noise in the input image. To reduce the computations, in the second step, the colored digital image is converted into a grayscale image. Thirdly, image enhancement and normalization methods will improve the quality of the raw image, and the algorithm will locate the seven chakras on the human body, for visualization purposes only [87] [88] [89]. Next, the intensity of light will get evaluated, and the color values will get assigned to them accordingly. These stepwise process will form a new colorspace that will help in the visualization of the biofield. These color codes are then used to interpret the psychophysical status of an individual.
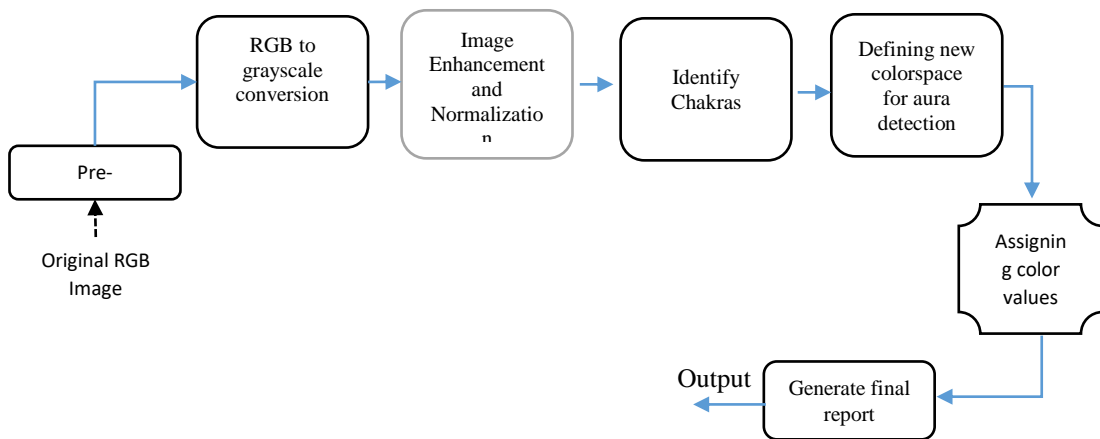
Figure 3.4. Stepwise methodology plan of the technique

Further, the preplanned methodology is shown stepwise below, the major computations used to obtain the final outcome. The overall algorithm includes six major steps and other intermediate processing to obtain the final result. In addition to them, various calculations are required for the generation of the final analysis report to show case the present status of an individual. Hence, the detailed working and implementation of the Aura Colorspace Visualizer algorithm are explained in the next section.

> **Input : Camera captured image of an object (living or non-living) in pre-requisite environment**
>
> **Output : Detect and Highlight the biofield (aura image) around the object**
>
> **Begin**
>   1. Import the captured image
>   *Orig$_{img}$ = imread('imgage.jpeg')*
>   2. Convert the image RGB to grayscale image
>   *Gray$_{img}$ = rgb2gray(Orig$_{img)}$*
>   3. Remove the noise and perform normalization
>   *Gray$_{img}$ = imadjust (Gray$_{img}$)*
>   4. Call the image to "*Aura Colorspace Visualizer Algorithm*". A new color space to visualize the aura field.
>   5. Perform mapping with Original image.
>   6. Expected outcome as Aura image
>
> **End**

The main idea behind this approach is to visualize the invisible biofield using image processing approach. In addition to that, to analyze the final report illustrating the physiological and psychological status of the individual. The success of this novel approach not only reduces the overall cost but also opens up new paths for various other research opportunities. This method will also act as a supporting document in the field of medical science and help in unfolding life mysteries.

CHAPTER 4

IMPLEMENTATION – Aura Colorspace Visualizer Algorithm

This chapter elaborates the designing techniques and implementation of proposed framework discussed in previous section. Implementation includes image-processing and machine learning techniques to get the solution for given problem statement and to achieve the objective of this research.

4.1 Ideology: Behind the scene

The main idea behind the designing of proposed method is shown in the figure (previous section). The following steps are involved for the overall results:

1. Make use of a standard digital camera to capture the image of the subject.

2. Convert the colored digital image into a gray scale image.

3. Proceed by applying pre-processing, image enhancement, and normalization techniques to improve the image quality.

4. Next, to locate the seven chakras on the human body, apply machine-learning technique, for visualization.

5. Apply image processing techniques to generate a new colorspace, for the visualization of the aura patterns.

6. Map the new colorspace with the evaluated light intensities, to associate it with primary color values.

7. Generate the final aura analysis report based on the pattern obtained, detailing the effects of aura pattern on the psychology and physical status of the subject.

As mentioned above, the step by step process and setting up the milestones to achieve the objective of this research. The present research is based on the image processing methodologies, to make a simple and easy solution for the existing problems in this domain. There are various techniques available as a solution, elaborated in previous chapters, but they also have their respective limitations. Hence, present research focuses on to develop a cost effective, less hardware requirement and non-complex

solution so that everyone can easily use it and get benefits. The main focus of this examination is to visualize the human energy field and to show its effect on the psychological and physiological health conditions on an individual. The human energy field is well organized electromagnetic signal emitted by the humans, but invisible, very complex, and dynamic in nature. Hence, to make it visible a false colorspace is designed, based on the intensity of light, color values will be assigned to make it visible. The life cycle of this methodology and the overall idea behind its working is shown in the figure 4.1 below. The home icon represents the starting point of the process, where user is allowed to provide the required input. Whereas "generate report" provides the final output and redirect the screen to the home screen ensuring that system is ready for the next process.
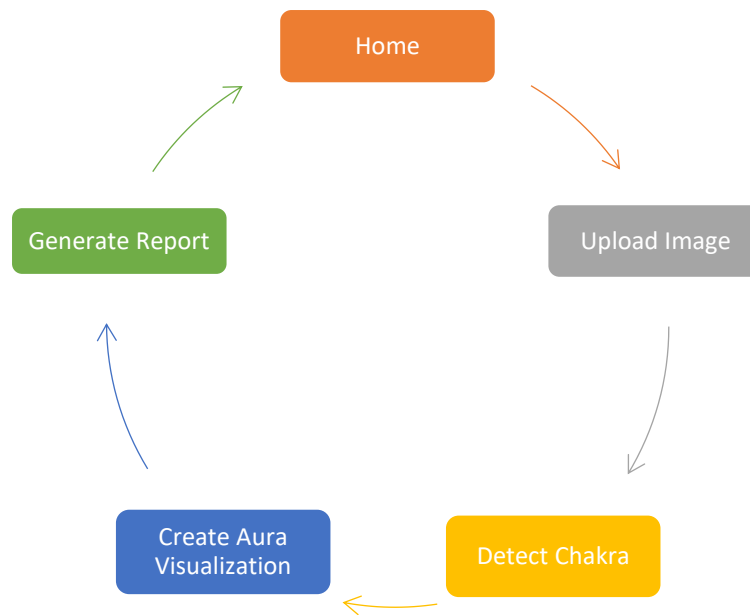
Figure 4.1. Life cycle of the proposed technique

Moreover, the research in this domain is progressively increasing and achieve heights in various domains. Starting from Kirlian Photography concept, gas discharge visualization, PIP, RFI, Radikall aura imaging, and many others helped in proving the existence of auric field and its junction with human health and emotions, directly and indirectly. The past studies also shows the evidence of variation in human energy field from one person to the other. Therefore, the aura imaging can be utilized in various applications of medical and other domains. Similar results will open up new pathways for the development of numerous applications in variety of domains. This makes it

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more interesting, and another key trait of the human being. It is believed that human energy field carried lot of hidden information that may reveal and help in resolving number of other complexities of life.

4.2 Features of Aura Visualizer

1. User can upload custom image for Aura Visualization:

To upload the image, open the Aura Visualization program and click on upload button to select the image. The selected image would be visible in the box below selection button.

2. Machine Learning based Chakra Detection:

As soon as user selects the image, the application automatically locates the seven chakras on the human body. Chakras identified are marked using small circles over the image. This is just for the visualization purposes.

3. Aura Visualization:

The application uses multiple steps to visualize the aura field in the image. Firstly, the image is converted in to grayscale. Secondly, the grayscale image is used to visualize a new colorspace for aura visualization. Thirdly, a final image using original and the new colorspace image is displayed.

4. Generating report:

For generation of the aura analysis report predefined color interpretations are used to interpret meanings of each color values assigned for aura visualization. The final report is able to display the chakra-wise interpretations and based on the color pattern obtained, algorithm is able to display the present psychophysical status of the subject.

4.3 The Concept: Implementation

For implementing above mentioned ideology and the key features, there is a need for the implementation of various techniques and sub-techniques. This section deals with the technical elaboration of all the steps, including intermediate steps, along with the stepwise outcomes at each step.

Step 1: Pre-processing

As mentioned in the ideology, first step states that the image is captured in the pre-requisite environment with all the predefined constraints. The image shown below,

figure 4.2, is the image captured for the execution of this algorithm. The colored image then undergoes with other intermediate steps, including pre-processing, grayscale conversion and image enhancement and normalization [90] [91] [92].

Input : Camera captured image of an object (living) in pre-requisite environment   **Output : Grayscale Image**
Begin   1. Import the captured image for further processing.   2. Identify the number of rows and columns of an import image.   3. Applying mathematical formulae to convert RGB image into a grayscale image $for\ i\ in\ range(y):$ $for\ j\ in\ range(x):$ $gray[i][j] = int(round(0.2989 * rgb[i][j][0] + 0.5870 * rgb[i][j][1] + 0.1140 * rgb[i][j][2]))$ 4. $Return\ gray$ **End**
Input : Grayscale image   **Output: Remove the noise and normalize the brightness and contrast of grayscale image**.

Begin
 	
 1. Remove the noise and normalize the brightness and contrast.
 	
 $Norm_{img} = imadjust(gray)$ // call the imadjust function
 	
 2. Following illustrates the definition of imadjust
 	
     2.1. Create the local copy of the input image.
 	
     2.2. Compute Histogram of the gray image
 	
     2.3. Compute Cumulative histogram after creating local copy of the histogram of grayscale image.
 	
     2.4. Compute Lower and upper bounds for enhancing the image.
 	
 3. Return normalize image.
 	
 End

Figure 4.2. Input original Image

Step 2: Visualization of Chakras

The next step, as mentioned, is to perform certain computing to visualize the seven chakras on the human body. For this purpose feature extraction method is performed by Haar Cascade classifier using AdaBoost [93]. There are seven life chakras around the human body that are responsible for balancing human well-being and stabilizing an individual's mental process. This includes following steps:

Input : Camera captured image of an object (living) in pre-requisite environment **Output : Chakra representation**

Begin
   1. Import the captured image for further processing.
   2. Import Haar_Cascade frontal face classifier.
      $face\_cascade = cv2.CascadeClassifier\left('haarcascade_{frontalface_{default}}.xml'\right)$
   3. Compute height, img_width and channels of an image
      $height, img\_width, channels = img.shape$
   4. Convert RGB image into gray image
      $gray = cv2.cvtColor(img, cv2.COLOR\_BGR2GRAY)$
   5. Detect faces using haar cascade
      $faces = face\_cascade.detectMultiScale(gray, 1.3, 5)$
   6. Import Haar_Cascade eye classifier.

```
        eye_cascade = cv2.CascadeClassifier('haarcascade_eye.xml')
```

7. Compute feature points and allocate all the chakra
    7.1.   Crown chakra
    $print(crown\_chakra)$
    7.2.   Throat Chakra
    $print(throat\_chakra)$
    7.3.   Heart Chakra
    $print(heart\_chakra)$
    7.4.   Eye Chakra
    $print(eye\_chakra)$
    7.5.   Sacral Chakra
    $print(sacral\_chakra)$
    7.6.   Solar Chakra
    $print(solar\_chakra)$
    7.7.   Root Chakra
    $print(root\_chakra)$
8. Save the chakra image
    $cv2.imwrite("marked.jpg", img)$

End
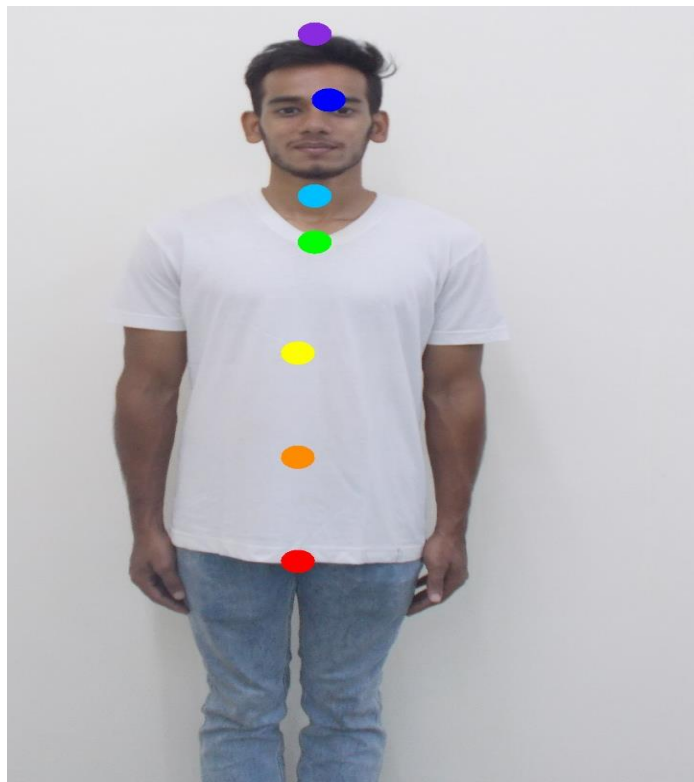
Figure 4.3. Chakra representation and visualization

The colored dots shown in the above image, figure 4.3, represents the seven chakras available on human body. Every chakra have its own importance and responsible for human's health, emotions, though and spiritual conditions. The imbalance of these chakras have major effects on individual's life. These effects are elaborated in the coming sections.

Step 3: Aura Colourspace visualizer algorithm

In this process, a new colorspace is a design for the visualization of aura-colors. As mentioned in the previous section, the aura energy field is an invisible layer around the human body; hence, to visualize the same, a new color model is required. The systematic steps for the computation of the aura image are mentioned below.

Because the gray image has only 256-color values, build the new color space accordingly. As 0-72 gray image pixels are pure black, pixel values beyond 240 are pure white, whereas pixel value between 73 and 240 shows the grayscale variations. Hence, keeping that into consideration following computations are used.

1. when the gray value is lower than 72, set the new color values to following value, i.e.,

    aura_color((x - 1) * 6 + y , :) = [0, 0, 35];

    aura_color(x * 6 + y, :) = [x * 10, 0, 0];

    aura_color((x + 1) * 6 + y, :) = [1, 0, 35];

    aura_color((x + 2) * 6 + y, :) = [x * 20, 0, x * 20];

    aura_color((x + 3) * 6 + y, :) = [x * 10, x * 5, x * 5];

    aura_color((x + 4) * 6 + y, :) = [x * 10, 0, x * 4];

y = 1,6

when value is 1~6, color is Blue (eg.[0, 0, 35]), when value is 7~12, color is Red (eg.[x * 10, 0, 0]) and similarly other values will be evaluated.

2. when the gray value is larger than 240, set the new color values to following value, i.e.,

    aura_color((x-1) * 6 + y, :) = [0, x * 10, 30];

    aura_color(x * 6 + y, :) = [0, x * 10, 30];

    aura_color((x + 1) * 6 + y, :) = [0, x * 10, 30];

    aura_color((x + 2) * 6 + y, :) = [x * 10, 0, 0];

aura_color((x + 3) * 6 + y, :) = [x * 10, 0, 0];

aura_color((x + 4) * 6 + y, :) = [x * 10, 0, 0];

y = 1,6

when value is 241~246, color is Green (eg.[0, x * 10, 30]), when value is 247~252, color is Green (eg.[0, x * 10, 30]), when value is larger than 253, color is Red (eg.[x * 10, 0, 0]) where x >= 240.

3. when the gray value is 73~240, set the new color values to following value, i.e.,

aura_color((x - 1) * 6 +y, :) = [0, 0, x * 6];

aura_color(x * 6 + y, :) = [0, x * 6, x * 6];

aura_color((x + 1) * 6 + y, :) = [0, x *6, 0];

aura_color((x + 2) * 6 + y, :) = [x * 6, x * 6 , 0];

aura_color((x + 3) * 6 + y, :) = [x * 6 , 0, x * 6];

aura_color((x + 4) * 6 + y, :) = [x * 6, 0, 0];

y = 1,6

Thus, obtain the colors with the period of 36 but the period color is more strong color value when x value is increase. At the final step, mix the origin image and the new color values according to the gray image.

for n = 1:wid

for n1 = 1: hei

InputIMG(n, n1,1) = int16((InputIMG(n, n1, 1) + aura_color(grayIMG(n, n1) + 1, 1))) / 1.2);

InputIMG(n, n1, 2) = int16((InputIMG(n, n1, 2) + aura_color(grayIMG(n, n1) + 1, 2))) / 1.2);

InputIMG(n, n1, 3) = int16((InputIMG(n, n1, 3) + aura_color(grayIMG(n, n1) + 1, 3))) / 1.2);

end

end

Here RGB colorspace is used to represent aura-colors based on the pixel values obtained after the above computations. RGB code has a 24-bit format that serves 0 to 7 as blue, 8 to 15 as green, and 16 to 23 as red values. Hence, based on the energy

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frequencies obtained, RGB and their respective variations of colors have been assigned accordingly. Outcomes have been discussed in the upcoming section.

The algorithm is executed with the pre-requisites setup, as detailed in the previous chapter. The static setup reduces the computation cost as well as the issues related to overexposed and underexposed of the image. The auric image obtained is highly accurate. The outcome of this step is shown below:
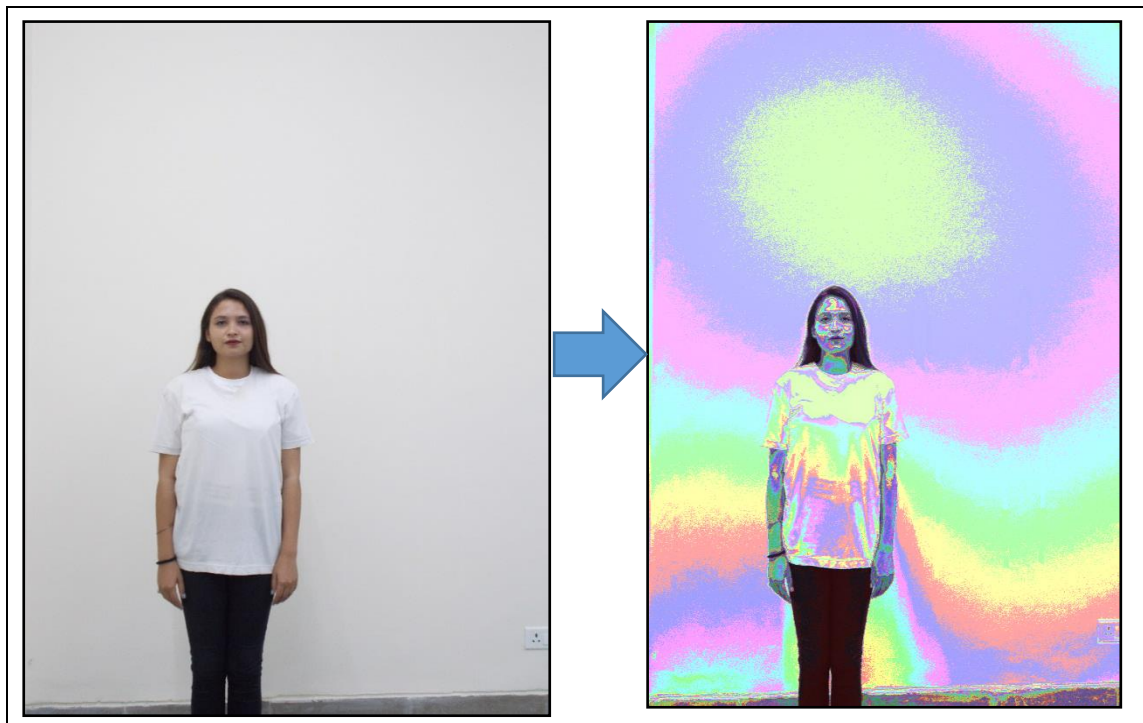
Figure 4.4. Original Image (left) and Aura visualization (right)

The figure shown above, figure 4.4, illustrates the outcome of Aura colorspace visualizer algorithm. The pattern and the colors obtained have their specific meaning that reflects the health and mental status of the subject. These interpretations are explained in the next sections.

Step 4: Representation of Aura colors & its interpretations

In this process, colors obtained at different chakras have been represented in the form of a pie chart. The pixel values obtained at every chakra indicates the physical and mental status of an individual. Hence, the report has been generated, indicating the details about the current well-being status of the person. Every chakra has its meaning, functioning (both physical and mental) attached, and interpretations are made as per the table given below. These interpretations of chakras are obtained during previous researches in this field. The computations involved are shown below:

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Input : Aura representation of input image
Output : Visual representation of colors in aura image
Begin   1. Import the aura image for further processing.   2. Resize image to speed up processing time   3. Reshape the image to be a list of pixels   4. Cluster the pixels and assign labels   5. Count labels to find most popular   6. Subset out most popular centroid   7. Plot pie chart using value and labels   8. Save the visual representation of colors (Pie charts)   **End**
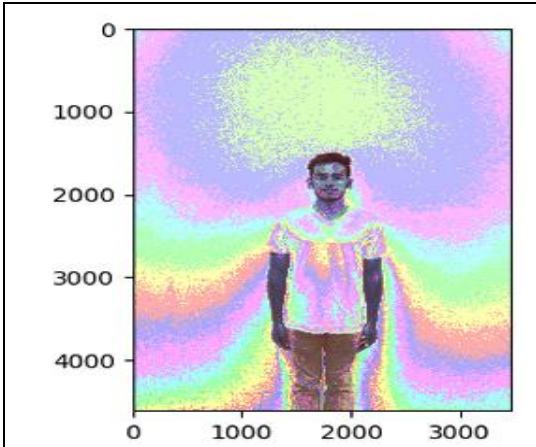
Figure 4.5 Aura image colors outcome
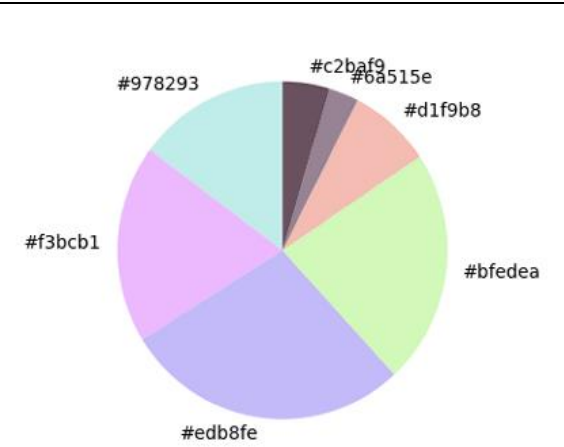
Figure 4.6. Representations of colors in a pie-chart

The figure shown above, figure 4.5 and figure 4.6 represents the aura colors obtained and its conversion into a pie chart form, respectively, by using k-means clustering algorithm to proceed further for the interpretations about the subject. The table below above is to provide the details about the chakras, their location, related actual colors and emotions. In addition to that, table also illustrated the effect of chakra

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unbalancing can effect on both, psychological and physiological status of an individual.

Table 4.1. To illustrate the effect of chakra unbalancing

Name of Chakra	Location	Color	Emotions	Psychological Functions			Physical Dysfunction
				Deficient	Balanced	Excessive	
Crown	Top of head	White/ Violet	Bliss, Spirituality	Lack of creativity, Indecisive, lack of joy	No fear of death, miracle worker, open to the divine.	You are frustrated, Depressive, migraines, manic.	Depression, Mental Illness, Neural confusion.
Third Eye	Between Eyebrows	Indigo	Imagination, Intuitions	Undisciplined, afraid of success, oversensitive	Non-material, no fear, total vision, master of oneself.	Egoistic, arrogant, manipulative.	Blindness, vision, headaches, earaches, migraines, fear, sleep disorder.
Throat	Centre base of the neck	Blue	Self-expression, Healing	Unable to express thoughts, unreliable, manipulative	Excellent speaker, artistic, live in the now, centered.	Will force opinions on others, arrogant, talks excessively	Thyroid, flu, fevers, infections, itching, toothache, speech disorder, PMS, mood swings, Tonsillitis.
Heart	Centre of chest	Green	Balance, love	Feels unloved, afraid of letting go, sorry for oneself	Unconditional love, emotionally balanced	Very critical, mood swings, tense, demanding, depressive.	High blood pressure, Passiveness, Asthma, breathing problems, tension in muscles, various issues related to heart, chest infections

Name of Chakra	Location	Color	Emotions	Psychological Functions			Physical Dysfunction
				Deficient	**Balanced**	**Excessive**	
Solar Plexus	Below sternum and above the navel	Yellow	Purpose, self-definition	Lack of personal energy, confusion, insecurity	Joyful, good, self-esteemed, multi-skilled, relaxed	Workaholic, too intellectual, resents authority.	Ulcers, diabetes, Hepatitis, blood sugar disorders, Constipation, Jaundice, poor memory.
Sacral	Between the navel and above genitals	Orange	Emotions, Desires	Very shy, un-trusting, buries emotions, sexual guilt	Creative, friendly, concerns for others	Aggressive, self-serving, manipulative,	Eating disorders, Drug use, Allergies, Uterine problem, Impotence, Depression
Root	Base of Spine	Red	Passions, self-preservations	Low sex drive, feel insecure, lack of self-esteemed	Master of oneself, limitless energy, grounded	Egoistic, selfish, dominating.	Anaemia, Fatigue, Bladder infection, numbness, obesity, body temperature, rebuilds blood cells, and haemoglobin.

Step 5: Final report generation and analysis

This is the final step of the whole procedure, represents the generation of final report based on the human energy color field obtained after the processing of above mentioned steps by the algorithm. This step involves the color identification of aura image and evaluate their presence at each chakra. Next, as these chakras are associated with different organs and emotions, the algorithm is able to generate the final analysis report. The aura analysis not only reveals about the human health condition but also present the emotional and mental status.

Input : Camera captured image of an object and its Aura representation   **Output : Aura interpretation report**

Begin
 	
    1. Import the captured image for further processing.
 	
       $img\ =\ cv2.imread('DSCN1646.JPG')$
 	
       $im\ =\ cv2.imread('AuraImage.png')$
 	
       $img\ =\ np.array(img)$
 	
       $pix\ =\ np.array(im)$
 	
    2. Compute height, img_width and channels of an image.
 	
    3. Import Haar_Cascade frontal face and upper body classifier.
 	
    4. Convert colored image into a grayscale image
 	
    5. Identify the chakras and pixel value of chakras
 	
    6. Identify the colors from the pixels values of Aura image
 	
    7. Generate report
 	
       chakra_list = ["Crown Chakra", "Throat Chakra", "Heart Chakra", "Third Eye Chakra", "Sacral Chakra", "Solar Chakra", "Root Chakra"]
 	
       organs_list = ["Spinal cord and brain stem", "Bronchial tubes, vocal cords, respiratory system, all areas of the mouth, including tongue and oesophagus.", "Heart, lungs", "Eyes, pituitary and pineal glands, brain", "Bladder, prostate, ovaries, kidneys, gall bladder, bowel, spleen", "Intestines, pancreas, liver, bladder, stomach, upper spine", "Testes, kidneys, spine"]
 	
       color_list =[ ]
 	
 End

Figure 4.7 Final output image (right)

with interpretations (left)

Interpretations:

1. Unconditional love for humanity, feeling supported by other people.

2. Motivational speaker, speaks about love

3. Love for humans and animals

4. Eyes and ears are working well. You are a good listener

5. The immune system is weak.

These interpretations are made based on the colors obtained around the human body. After the analysis of human aura colors, a person is suggested dos and don'ts.

As this individual is having a problem with immunity, he is advised to work on it. Rest, everything is working fine.

The image shown above, figure 4.7, in the outcome of the final step, hence generating a report as required. Further, the elaboration on these outcomes is done in the result section that will help in detailed understanding of these outcomes.

CHAPTER 5

COMPARATIVE ANALYSIS

This chapter is to presents the comparative study between the proposed technique and some of the existing techniques. There are number techniques available in the market for the analysis for human biofields, shows the evidence of its presence and their applications in various domains. Due to certain limitations and challenges, these methods are not considered as much reliable, hence there is a need for new advanced methods to overcome those issues. This section focuses on the comparative analysis between the proposed method and the pre-existing methods, i.e., standard energy-sensing method, Quantum Resonance Magnetic Analyser, and Bio-pulsar Reflexograph. The performance of this comparison has been evaluated in terms of the average accuracy of the overall results.

5.1 Standard energy-sensing method

The first method used for the comparative study is an ancient technique popularly known as energy-sensing. This method is being used by a healing practitioner for *Pranic Healing,* a natural healing process, used to treat illness by using universal energy. This method required no external machine or device to detect or analyze the human energy field, but one can sense the energy field of another person via learning special skills. Hence, to use this method or to sense the energy field, a person requires to undergo special training to gain the skills. The more interesting thing is, if anyone learns how to work with energy, it can help in transforming all the false (or negative) results into a positive one. The aura is a special trait of the human body that reflects the health, emotions, psychic, and spiritual information. The origin of the energy field is already elaborated in the previous chapters. In this process, the skilled person can analyze aura as two-region, namely *Inner aura* (expands 6 to 12 inches) *& Outer aura* (expand to several feet). Inner aura region and outer aura region reflects the health status and emotions of the person respectively, based on their strengths. The whole formation of the human energy field is associated with the seven energy centers (the chakras), reflects the psychophysical status of the human being [94].

While analyzing the subject using this technique, a trained person can feel the strength of the energy field of the other person. This is the reason they are known as energy-sensitive people. Based on the strength, they can make certain interpretations and conclude about the energy abnormalities, if any. Along with that, a trained person is also capable of removing these abnormalities and transfer fresh universal energy. For this comparative analysis, a supervisor from "**Alternative Medicine Center (Shree Vedmata Shyama Trust)**", who performed the analysis on a certain group of people. The table illustrated below shows a sample of the interpretations made by the manual method.

Table 5.1. Manual method interpretations

Chakras	Strength of Energy field	Interpretations
Crown Chakra	High	Organs related to this chakra are working fine
Third Eye Chakra	High	Organs related to this chakra are working fine
Throat Chakra	Weak	Need some medication for improvement
Heart Chakra	Weak	Meditation, yoga for improvement
Solar Plexus Chakra	Imbalanced	Need some medication for improvement
Sexual Chakra	Average	Recommendations for Meditation
Root Chakra	High	Organs related to this chakra are working fine

5.2 Biopulsar Reflexograph

The second technique used for the comparative study is Biopulsar Reflexograph, another device to analyze the human energy field. It represents the energy field of the whole body, including chakra activities and the status of various organs. The representation of the complete report by threshold graphs and visual pictures. The complete working and characteristics of this device are explained in the previous section (Refer chapter 2). The working of this device is quite fast and therefore, it can detect and analyze the whole body within a minute. The dedicated software generates a pictorial representation of the scanned energy field based on the strength of the signal at different reflex-zones. It not only presents the current status but also suggests the upcoming disorders based on the strength of the energy field. It helps in detecting the physical disorders as well as psychic status about the subject. It also reflects the spirituality and emotion status of the human [62].

For the current comparative study, using Biopulsar Reflexogrph, a group of people was analyzed at "**Dev Sanskriti Vishwavidyalaya, Haridwar**", under the supervision of n expert. The overall results obtained are highly accurate, the sample result is shown in the figure 5.1 below.
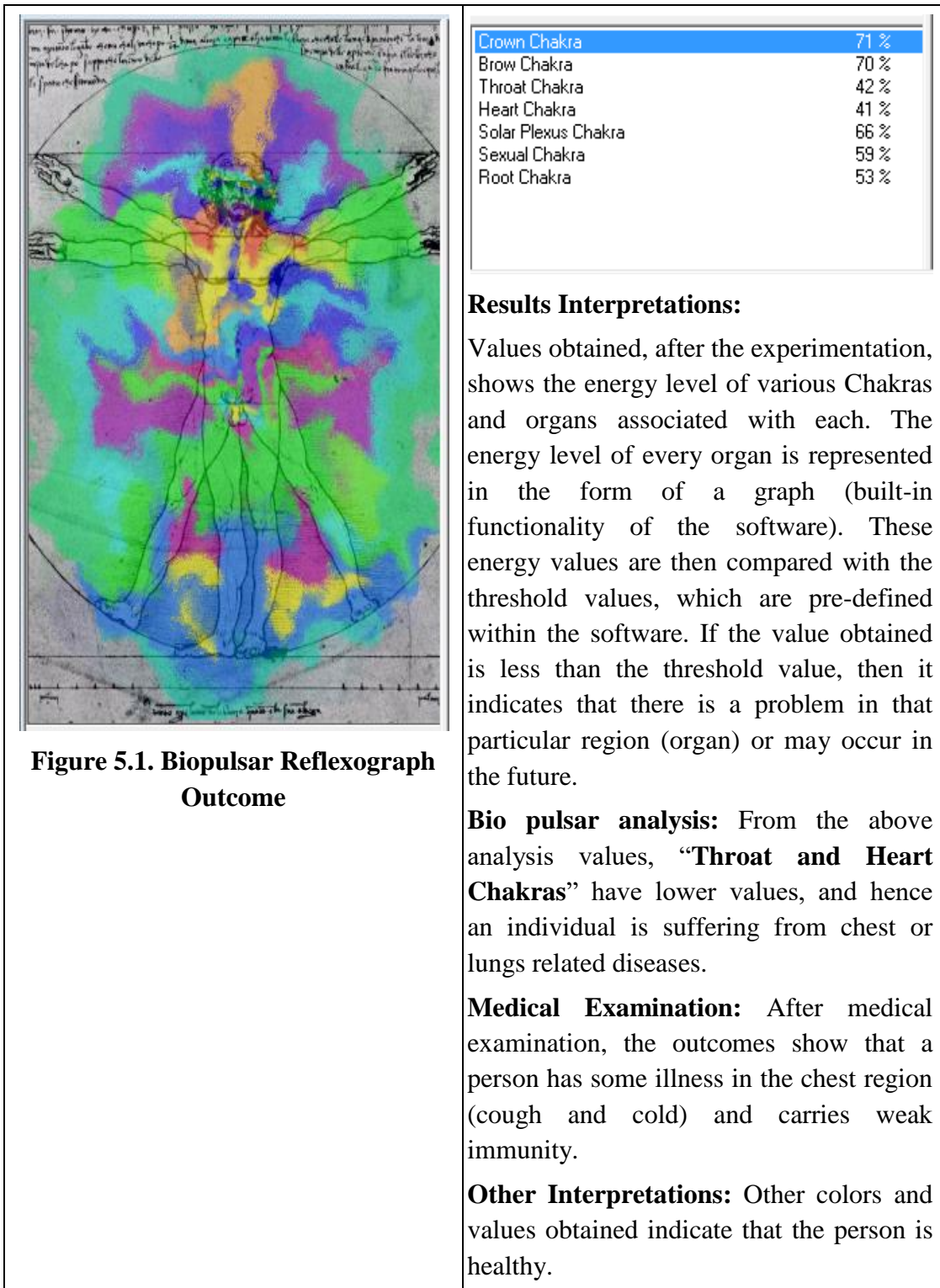
Figure 5.1. Biopulsar Reflexograph Outcome

Crown Chakra	71 %
Brow Chakra	70 %
Throat Chakra	42 %
Heart Chakra	41 %
Solar Plexus Chakra	66 %
Sexual Chakra	59 %
Root Chakra	53 %

Results Interpretations:

Values obtained, after the experimentation, shows the energy level of various Chakras and organs associated with each. The energy level of every organ is represented in the form of a graph (built-in functionality of the software). These energy values are then compared with the threshold values, which are pre-defined within the software. If the value obtained is less than the threshold value, then it indicates that there is a problem in that particular region (organ) or may occur in the future.

Bio pulsar analysis: From the above analysis values, "**Throat and Heart Chakras**" have lower values, and hence an individual is suffering from chest or lungs related diseases.

Medical Examination: After medical examination, the outcomes show that a person has some illness in the chest region (cough and cold) and carries weak immunity.

Other Interpretations: Other colors and values obtained indicate that the person is healthy.

5.3 Quantum Magnetic Resonance Analyser

The third device used for the comparative analysis is Quantum Magnetic Resonance (QMR) analyzer. This instrument is capable of analyzing more than 30 parameters in just one minute. The detailed working of this device is also explained in the previous chapter (Refer to chapter 2). It captures the electromagnetic waves emitted by the human body. This device uses dedicated software for the analysis of these waves and generates the final report by comparing the obtained signals with the built-in quantum spectrum. The weak EM waves are collected using a sensing electrode that further uses the Fourier method to analyze the input signals [66].

The image shown below, figure 5.2, represents the scaling meter to reflect the conditions of various organs and others. Based on the reading on this scale interpretations are made by the expert. The color values on the scale represent the status of the working of any organ. The color value Red color specifies very low, the yellow color specified low, blue color point toward average, and green color shows the wellbeing of the organ [66].
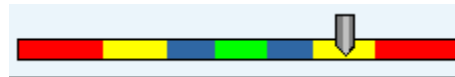
Figure 5.2. QMR color-scale

Under the presence of an expert, QMR analysis was performed on the same group of people. The analytical reports were generated and share with everyone for verification. The sample outcome of this system is shown in the below illustration, figure 5.3 [66].

Figure 5.3. QMR outcome

Results Interpretations:

The Analysis shows that a person has minor thyroid-related issues, as the magnetic field of thyroid organ is mostly on the **Yellow or Blue** mark.

After medical examination, results obtained states that a person has less thyroid value as compare to the normal range, which is possible due to chest infection.
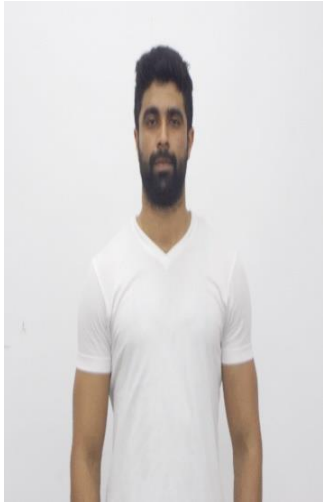
5.4 Proposed Method: Aura Colorspace Visualizer Algorithm

The detailed working of the present research has been elaborated in previous chapters (Refer to chapter 3 & 4). The present technique is based on image processing and artificial intelligence to visualize the human energy field. The present research focuses on visualizing the energy field via a digital image captured by the standard digital camera. To capture the image few pre-requisites have to be followed, that is explained priory. The brief overview of the systematic functioning of the planned process is illustrated in the figure 5.4 below:
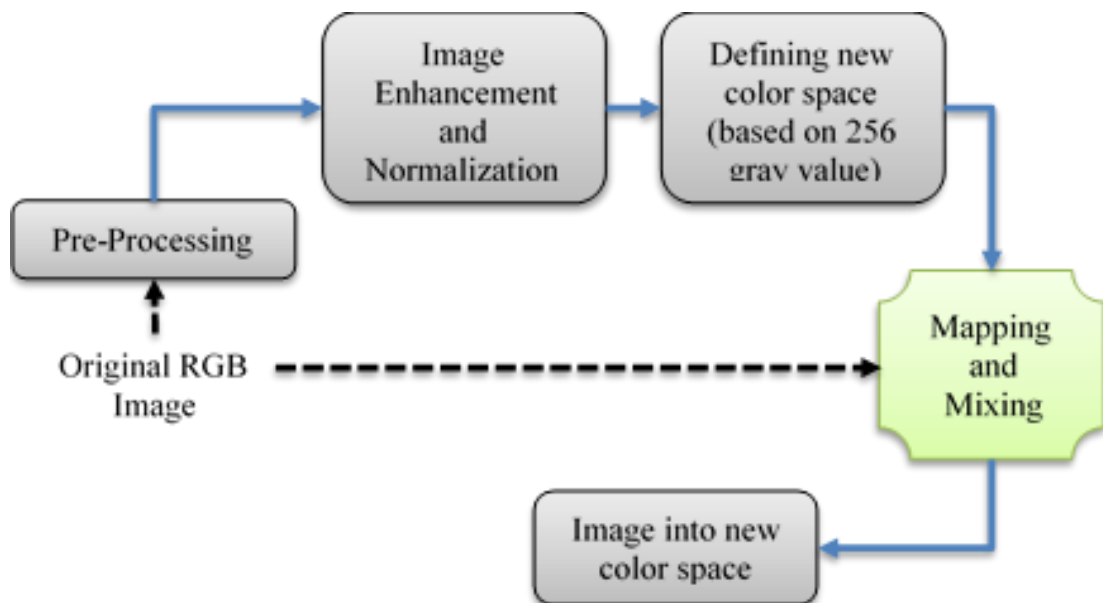
Figure 5.4. Block diagram for proposed method

The present approach is applied to the various group of individuals to test, verify, and validate the results. The sample results are shown in the figure 5.5 below. These results were also verified by the energy reading experts as well as the medical examination of the same group of people to validate the outcomes.

		Interpretations:
		As per the color codes, RED color indicates the area where problems are perceivable, due to the lack of energy in a particular region. One can interpret that RED color is spread all over the region of HEAD, CHEST, THROAT, ARMPITS, and lower body parts. This states that a person's organs in these regions may have some issues like infection, allergy, and others.
		After the medical examination, it was clear that a person is suffering from high fever and bad chest infections, the further analysis states that he is having body ache due to some reason.

Figure 5.5. Original image (left), obtained results (middle) and color interpretations (right)

5.5 Comparative Analysis: Proposed method Vs Others

After experimenting and collecting the outcomes from all the above-mentioned techniques, a comparative analysis was performed based on the accuracy of each device. The accuracy of these devices is calculated by various means, i.e., firstly, by verifying the outcomes from the domain experts and secondly by medical cross-examination of the people. The table shown below compares these techniques on various parameters other than the results. The accuracy of the present work in moderate, which can be enhanced to high on further research.

Table 5.2. Comparison with existing techniques based on parameters

Parameters	Trained eye method	Bio-pulsar Reflexograph	QRM	Proposed method
Reliability	Less reliable	Highly Reliable	Reliable	Reliable
Cost	Variable cost	Expensive	Moderate cost	Low cost
Hardware and Software Requirement	No machine or device is required	Hardware instrument and dedicated software	Hardware instruments and dedicated software	Digital camera and software
Ease of use	Difficult to learn and required long and continuous training	Difficult to understand and learn	Required good analytical training	It is simple and easy to learn and use
Accuracy	High to moderate	Accuracy is high	Accuracy is moderate to high	Accuracy is moderate (need more research to enhance)

In the previous findings, it is mentioned that every organ is associated with their respective energy centers (chakras), therefore the comparative study is done based on how accurately the techniques have examined each of them. The table shown below is the sample records of the examination performed on more than 50 peoples.

The functionality of each organ is detected and classified into three categories as Normal, represents that organs are working fine as expected; Average specifies that the organs are not performing well; whereas Weak represents the poor performance and person need some medical consultations for that region or that may cause some anomaly in future. Some of the rows are marked with "unable to detect" to demonstrate that the functionality of those organs is not detected by the technique.

Besides that, the specific values mentioned under the category of other techniques are evaluated by the internal programming of the respective software. On the other hand,

the proposed algorithm has this limitation, therefore precise values are not mentioned at this particular moment. This needs further experiments to design a standard scale.

Table 5.3. Comparison with existing techniques based on outcomes

Name of Chakras	Organs associated with each Chakra	Bio-pulsar	QMR	Proposed method
Crown Chakra	Pineal Gland	normal (0.72)	weak (0.48)	normal
	pituitary gland	normal (0.75)	normal (0.79)	Normal
	spinal cord	normal (0.72)	unable to detect	normal
	brain stem	average (0.65)	normal (0.77)	Weak
Third Eye	Eye	weak (0.48)	weak (0.45)	Weak
	pituitary gland	normal (0.75)	normal (0.79)	Normal
	Pineal	normal (0.72)	weak (0.48)	Normal
	Ear	normal (0.75)	unable to detect	Average
Throat Chakra	Thyroid	normal (0.73)	average (0.48)	Normal
	Mouth	average (0.56)	average (0.45)	Normal
	Shoulder	weak (0.30)	unable to detect	Normal
	Arm	weak (0.35)	unable to detect	Average
	Neck	weak (0.38)	unable to detect	Weak
Heart Chakra	Heart	normal (0.73)	normal (0.70)	Normal
	Lungs	weak (0.30)	weak (0.37)	Weak
	Thymus gland	weak (0.20)	average (0.61)	Weak
Solar Plexus Chakra	Pancreas	Normal (0.81)	Average (0.60)	Normal
	Liver	average (0.69)	average (0.45)	Average
	Human digestive system	normal (0.78)	average (0.63)	Weak
	Large intestine	weak (0.46)	normal (0.78)	Average
	Stomach	normal (0.81)	normal (0.86)	Normal
	Lung	weak (0.30)	weak (0.37)	Average
	Adrenal gland	normal (0.76)	average (0.52)	Average
Sexual Chakra	Kidney	normal (0.76)	average (0.44)	Normal
	Urinary bladder	average (0.68)	average (0.62)	Normal
	Reproductive system	average (0.62)	normal (0.73)	Normal
	Genitals	average (0.57)	normal (0.72)	Average
	Pelvis	average (0.56)	average (0.62)	Average
	Buttock	average (0.54)	unable to detect	Weak
Root Chakra	Reproductive glands	normal (0.71)	average (0.55)	Normal
	Controls sexual development and secretes sex hormones	average (0.69)	average (0.65)	Normal
	Hip	average (0.48)	unable to detect	Weak
	Feet	average (0.53)	average (0.66)	Normal
	Knee	average (0.47)	weak (0.32)	Normal
	Spine	average (0.42)	unable to detect	Normal
	Lower Abdomen	average (0.45)	weak (0.22)	Average

The outcomes of the experiments came nearly similar by all the methods, and some of the dysfunctions are highlighted by "weak" values. The observations, for example, in the case of Throat, Neck, and Eyes are marked as weak in all three techniques. Hence, this indicates that the subject is or may have a **throat infection, issues near the neck, and weak sight.** For verification of these results, the subject is asked to undergo a minor medical examination, and the outcome of those examinations proves and verifies these results as well. Similarly, to verify the other results, the person is asked for the other medical tests and consult the domain experts. All the outcomes obtained during this comparative study were verified and plotted on a line graph, as shown in the below figure 5.6. One axis of the graph represents the average score of correct identifications and the other axis represents the different chakras (as each organ is associated with these chakras).
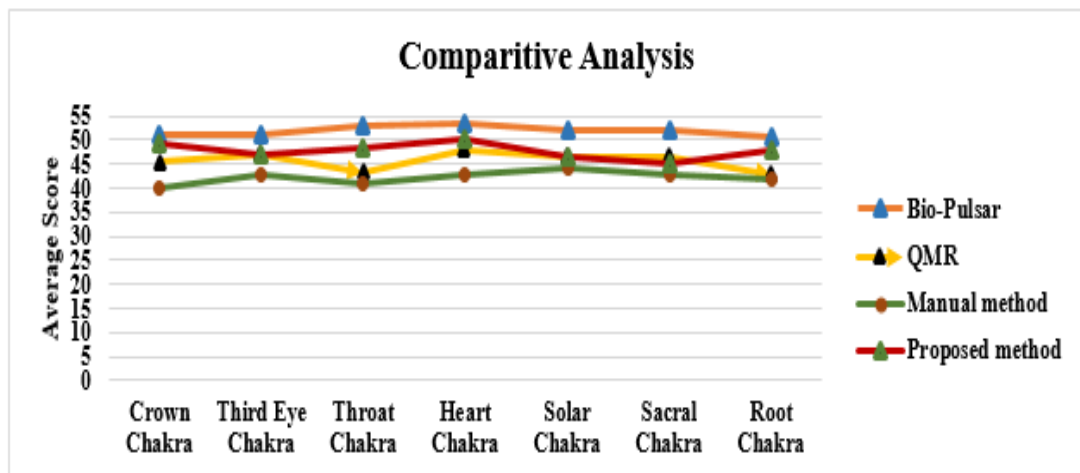
Figure 5.6. Chakra-wise comparative analysis of results obtained

To conduct this comparative study, more than 55 individuals are asked to go through these processes and to validate the outcomes. All the results were shared with each one of them. The accuracy of each of these techniques is plotted on a comparative graph, as shown in the figure 5.7 below, by calculating the chakra-wise accuracies. One axis of the graph signifies the accuracy percentage, i.e., the percentage of correctly identified values among the whole population, and the other axis represents the name of chakras.

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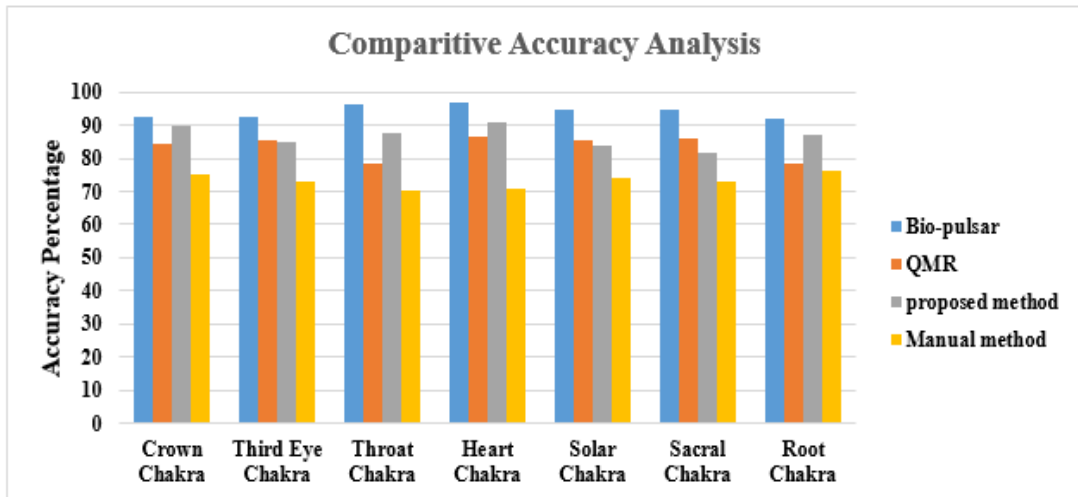
Figure 5.7. Chakra-wise accuracy analysis

Based on the final analysis and by evaluating the overall average accuracy of each technique, it is observed that the Biopulsar Reflexograph gives the most accurate results with approx. 95%. On the other hand, the accuracy of the prosed algorithm is 89% and the accuracies of QMR and manual methods are 82% and 73% respectively. Although the accuracy of the proposed method is not at the highest end this analysis validates that the proposed method is working in the right direction; hence, the further enhancement will improve the overall results and accuracy of the proposed technique. Further, this approach will open up a new path for researchers in this domain. This will not only support in the medical domain but also give rise to various other applications (Refer to chapter 6) in the domains of human health analysis, human emotions and relationships, and healthcare informatics.

CHAPTER 6

RESULTS AND DISCUSSION

After the completion of implementation, comparative analysis, and other studies, this chapter highlights the results and other outcomes of the present research. In this chapter, section 7.1 elaborates about the out-coming of the proposed method, the accuracy, and the brief description for each. In the next section 7.2, highlights a few key points and other discussions about the research conducted.

6.1 Results

A life that gets birth in this universe originates from energy. As life goes higher, it can emanate patterns of lights, which is directly associated with their experience, personalities, level of awareness, and moods. The color and lights describe a human aura contain all known as the color spectrum. These colors specify dominant characteristics of an individual's such as emotional and mental state, personal power, and spiritual wellbeing. Some people emanate low energy or biofield level this is due to genetic and environmental factors. Every creature emanates different patterns of aura color. Each color spectrums in aura have their meaning, which has been rigorously analyzed understands and delineates the life path of a person.

The beginning of the research states about the complex and dynamic nature of the biofield, therefore as pre-requisite, experiments are conducted in the static environment. Also, as mentioned, the human biofield is made up of combinations of multiple energy fields, reflected by the human body, and to visualize the same pictorial representation method was chosen. Proceeding with the pre-defined objectives, colored visualization was achieved by implementing the computing procedure (Refer to chapter 4). Each color in the image defines a specific meaning and states about the psychophysiological status of the human. The images shown in this section are limited, due to confidentiality, and present with the owner's consent.

Figure 6.1 shown below, display the aura colors around the body of the subject. Later own the interpretations were made based on the colors obtained. Figure 6.2 shows brief details about the interpretations made by the proposed method. The

interpretations observed were shared with the person. After interviewing and medical examination (for verification), the results obtained were approximately equivalent as per aura interpretation. The person was advised to go for some medical treatment or some other therapy like acupressure, yoga, etc., and come back for re-examination after a week.

Figure 6.1. Results obtained from the proposed methodology

Interpretation:

Sahasrara Chakra: the color at Sahasrara Chakra is green, this indicates that the person has a perfect balance between mental security and relationship.

Ajna Chakra: the color at Ajna Chakra is pink, yellow, and green that indicates that the person having fear, intelligence, having high analytical skills and brain and eye health is perfect.

Vishudha Chakra: the color at Vishudha Chakra is pink, this indicates that the person is weak. This is not a good sign; the person may suffer from throat related diseases.

Anahata and Manipura Chakra: the color at Anahata Chakra is yellow this indicates that the person is self-lover, never feels loneliness, and have good analytical and logical thinking.

Figure 6.2. Color Interpretations based on the results obtained

After the prescribed duration, the subject undergoes the same procedure, and figure 6.3 displays the new results. The new outcomes clearly show the difference in the pattern of the auric field. Further, figure 6.4 shows the new interpretations after medication, elaborates on the many more improvements in a person's health. Every person exhibits aura color based on its emotion, stress, trouble, etc., it not possible that a person only exhibits one aura color. It cannot be possible to categorize aura color distinctly in negative and positive aspects. Understanding and interpreting stress reactions, emotions, mental fixations, and physical sensation is important for personal awareness. The results indicate the improvements in human aura after performing the acupressure therapy on the individual.
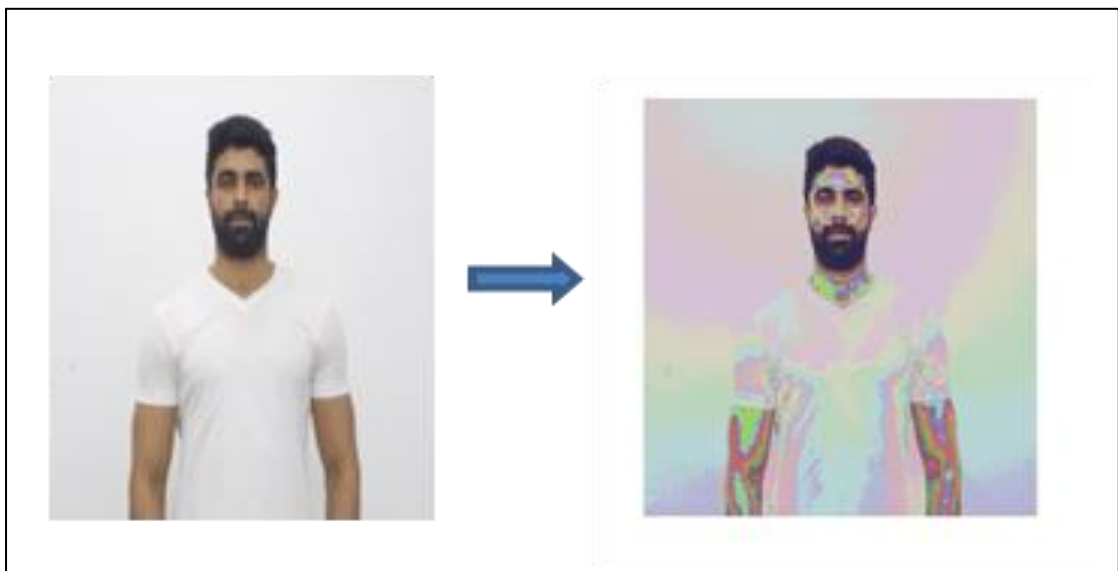
Figure 6.3. New results after aura healing process

| | **Interpretations**

Sahasara Chakra: the color at Sahasara Chakra is green, this indicates that the person has a perfect balance between mental security and relationship.

Ajna Chakra: the color at Ajna Chakra is blue, purple, red, and yellow, this indicates that the person is strong, intuitive, strong, involves in spiritual and meditation. This is a good sign.

Vishudha Chakra: the color at Vishudha Chakra is blue, purple, green, and yellow, this indicates that the person's throat is healthy because green and purple color specifies healthiness.

Anahata and Manipura Chakra: the color at Anahata Chakra is yellow and green this indicates that the person is self-lover, never feels loneliness, and has good analytical and logical thinking.

After performing the same procedure, the person was examined and the interpretation obtained in this phase was quite different as compared to the previous experiment. This time, after medication and therapy, the person's aura was quite healthy and shows positive energy around the body. |

Figure 6.4. New color interpretations after healing process

Before interpreting the aura patterns, one must know about chakras. Chakra is the center of energy that moves inside a human being. This energy has seven focal points responsible for providing an exact amount of energy to every part of the human body. These chakras are responsible for a balanced life and aura generation, their imbalance causes issues (physical & spiritual). Therefore all must understand their aura and keep

it balanced, whenever required. The outcomes shown in figure 6.5, represents the original image, chakra representation, and biofield pattern representation (left to right), whereas figure 6.6 shows the overall analysis report.
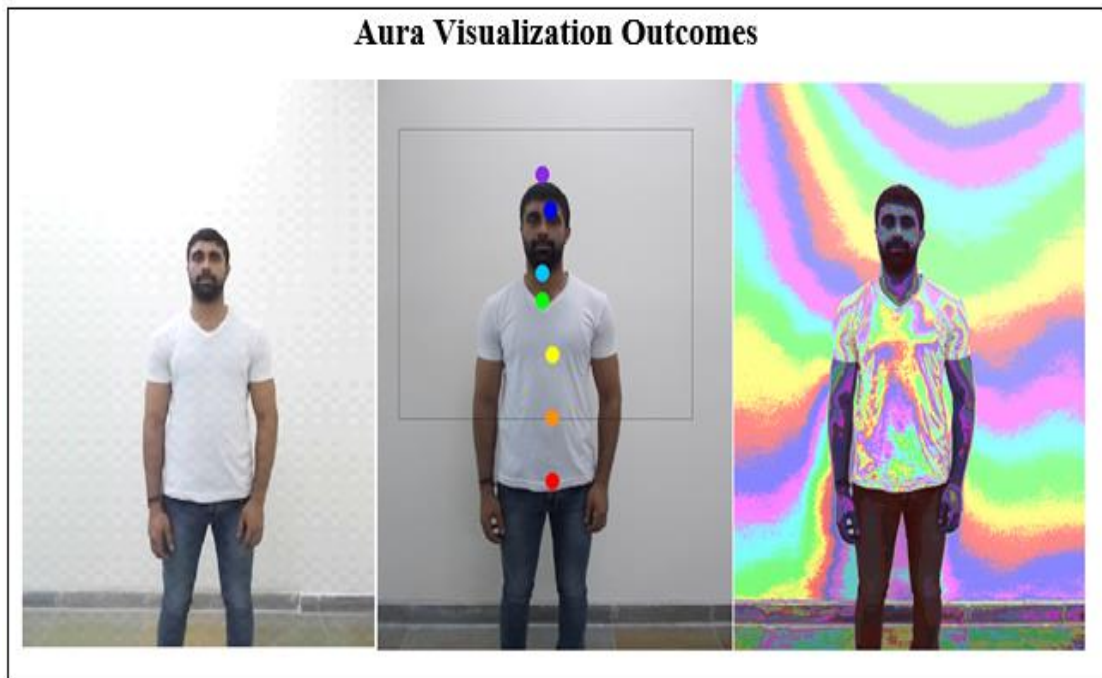
Figure 6.5. Chakra representation and Aura visualization

```
1 Crown Chakra
Spinal cord and brain stem
[255 255 201]
lemonchiffon
Overly analytical, over thinking, can't seem to shut mind off, would find it hard to meditate due to too many thoughts.  Likes to learn and take classes.. Feeling rigid in life.
2 Throat Chakra
Bronchial tubes, vocal cords, respiratory system, all areas of the mouth, including tongue and esophagus.
(255, 255, 201)
lemonchiffon
You would speak more about yourself and your interests.  Might have a hard time listening to what other people are talking about as you are thinking about your response.
3 Heart Chakra
Heart, lungs
(199, 255, 193)
gainsboro
Heart is shut down.  In heart and lung area  - grief.
4 Third Eye Chakra
Eyes, pituitary and pineal glands, brain
(212, 255, 237)
lightcyan
You see things through balanced eyes meaning that not too many people can pull the wood over your eyes.  You can usually see people for who they are.  Also your eyesight is good.
5 Sacral Chakra
Bladder, prostate, ovaries, kidneys, gall bladder, bowel, spleen
(191, 255, 255)
paleturquoise
Harmony, Balance.  Probably has a good relationship with their family.  Feels safe in the world.
6 Solar Chakra
Intestines, pancreas, liver, bladder, stomach, upper spine
(194, 255, 194)
lightgrey
Possible illness. Possible Dehydration. Basically tis person has shut down and does not want to deal with anything.
7 Root Chakra
Testes, kidneys, spine
(189, 255, 255)
paleturquoise
Hips and Pelvis are in alignment right now.
Selected
```

Figure 6.6. Final Report outcome

6.2 Discussion

Likewise, the same experiment was executed on 55 participants to verify the results of the proposed technique. For cross-validation and verifications of results, medical examination and feedback process was performed. In terms of accuracy, the comparative analysis reveals that the biopulsar reflexograph is highly accurate with a 95% accuracy rate, whereas the accuracy of the proposed technique obtained is approximately 89%. The other techniques, used for the experiment, the QMR device, and the manual energy-sensing methods achieved 82% and 73% accuracy as compared to the others. The accuracy is evaluated based on correct outcomes, after the validations via medical analysis and one to one interactions (for feedback). Though the accuracy of the proposed method is lesser in comparison with the biopulsar reflexograph technique but the present research was conducted to propose a new technique that will overcome the limitations of existing methods. Hence, the presented new method will give new directions to the researchers working in this domain.

These results were further validated by using the confusion matrix method. A confusion matrix is a table that is often used to describe and visualize the performance of an algorithm. Before proceeding, the polarities of biopulsar reflexograph, QMR technique, the proposed method, and manual techniques are stated in the below equations.

$$Polarities_{biopulsar} = \begin{cases} Prediction_{biopulsar} \geq above\ 35\ \%\ \text{Noticeable Impact} \\ Prediction_{biopulsar} \leq 35\ \%\ UnNoticeable\ Impact \end{cases}$$

$$(1)$$

$$Polarities_{QMR} = \begin{cases} Prediction_{QMR} \geq above\ 35\ \%\ \text{Noticeable Impact} \\ Prediction_{QMR} \leq 35\ \%\ UnNoticeable\ Impact \end{cases}$$

$$(2)$$

$$Polarities_{proposed} = \begin{cases} Prediction_{proposed} \geq above\ 35\ \%\ \text{Noticeable Impact} \\ Prediction_{proposed} \leq 35\ \%\ UnNoticeable\ Impact \end{cases}$$

$$(3)$$

$$Polarities_{manual} = \begin{cases} Prediction_{manual} \geq above\ 35\ \%\ \text{Noticeable Impact} \\ Prediction_{manual} \leq 35\ \%\ UnNoticeable\ Impact \end{cases}$$

$$(4)$$

The table 6.1 shown below represents the 2x2 confusion matrix, whereas the equations from 5 to 7 describe the formulae used to calculate precision, recall, and accuracy whose values will be evaluated using the given matrix.

The recall is calculated as the ratio of true positive predictions to the sum of true positives and false negative predictions, whereas precision, also called positive predicted values, calculated by the ratio of true positive predictions to the summation predicted positive

Table 6.1. 2×2 confusion matrix

True Positive Criteria: Noticeable Impact if accurately predicted	False Positive Criteria: Noticeable Impact if accurately predicted
False Negative Criteria: Un-Noticeable Impact if not-accurately predicted	True Negative Criteria: Un-Noticeable Impact if not-accurately predicted

$$Precision_{predict} = {True_{Positive}}/{True_{Positive} + False_{Positive}} \qquad (5)$$

$$Recall_{predict} = {True_{Positive}}/{True_{Positive} + False_{Negative}} \qquad (6)$$

$$Accuracy_{predict} = \frac{True_{Positive}+True_{Negative}}{True_{Positive}+False_{Positive}+True_{Negative}+False_{Negative}} \qquad (7)$$

For quantifying the model, the feedback taken from the participants is deliberated as control parameters and a total of 55 participants are examined via all four techniques mentioned above. Table 6.2 shown below describes the confusion matrix for biopulsar reflexograph. By using the above states equations 5, 6, & 7, values for accuracy, recall, and precision are evaluated as below:

Table 6.2. Confusion matrix for biopulsar reflexograph

$True_{Positive}$ 40	$False_{Positive}$ 0
$False_{Negative}$ 03	$True_{Negative}$ 12

$$\boldsymbol{Precision_{biopulsar} = \frac{40}{40+0}} \quad =\gg \; \boldsymbol{1} \qquad (8)$$

$$Recall_{biopulsar} = \frac{40}{40+3} \quad =\!\!\gg \quad \mathbf{0.930} \tag{9}$$

$$Accuracy_{biopulsar} = \frac{40+12}{40+3+0+12} \quad =\!\!\gg \mathbf{0.945} \tag{10}$$

Hence the accuracy of the biopulsar reflexograph is 95% approximately and recall is 93%. Similarly, the predictive accuracy of the remaining methodologies was calculated as below. The confusion matrix for QMR is shown in table 6.3. The equations 11, 12 & 13 evaluates all three parameters for QMR.

Table 6.3. Confusion matrix for QMR

$True_{Positive}$ 35	$False_{Positive}$ 4
$False_{Negative}$ 6	$True_{Negative}$ 10

$$Precision_{QMR} = \frac{35}{35+4} \quad =\!\!\gg \quad \mathbf{0.897} \tag{11}$$

$$Recall_{QMR} = \frac{35}{35+6} \quad =\!\!\gg \quad \mathbf{0.854} \tag{12}$$

$$Accuracy_{QMR} = \frac{35+10}{35+6+4+10} \quad =\!\!\gg \mathbf{0.818} \tag{13}$$

Hence the accuracy of the QMR is 82% approximately and recall is 85%. Table 6.4 shows the confusion matrix of the manual technique to analyze human biofield. The equations 14, 15 & 16 evaluates all three parameters for manual method.

Table 6.4. Confusion matrix for the Manual method

$True_{Positive}$ 25	$False_{Positive}$ 7
$False_{Negative}$ 8	$True_{Negative}$ 15

$$Precision_{manual} = \frac{25}{25+7} \quad =\!\!\gg \quad \mathbf{0.781} \tag{14}$$

$$Recall_{manual} = \frac{25}{25+8} \quad =\!\!\gg \quad \mathbf{0.758} \tag{15}$$

$$Accuracy_{manual} = \frac{25+15}{25+7+8+15} \quad =\!\!\gg \mathbf{0.727} \tag{16}$$

Hence the accuracy of the manual method is 73% approximately and recall is 75%. The confusion matrix for the proposed algorithm is shown in table 6.5. The equations 17, 18 & 19 evaluates all three parameters for the proposed algorithm.

Table 6.5. Confusion matrix for the proposed method

$True_{Positive}$ 40	$False_{Positive}$ 3
$False_{Negative}$ 4	$True_{Negative}$ 9

$$Precision_{proposed} = \frac{40}{40+3} \quad =\gg \quad \mathbf{0.930} \qquad (17)$$

$$Recall_{proposed} = \frac{40}{40+3} \quad =\gg \quad \mathbf{0.930} \qquad (18)$$

$$Accuracy_{proposed} = \frac{40+9}{40+3+3+8} \quad =\gg \mathbf{0.891} \qquad (19)$$

Hence the accuracy of the proposed method is 89% approximately and recall is 93%. The comparison between all the predictive modules is shown in figure 6.7 below. The feedbacks are used for further analysis based on the satisfaction level of each person. For this, one to one interaction was performed and feedback was taken from everyone. The overall evaluation shows that 85% of the total participants were satisfied by the results shared with them.
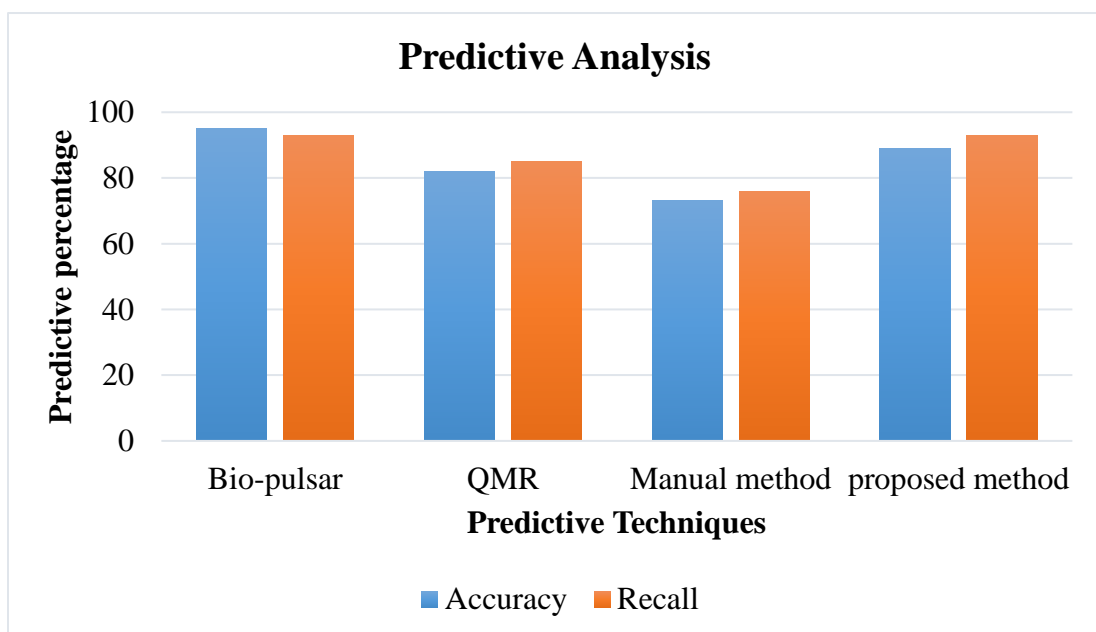
Figure 6.7. Predictive analysis chart

Thus, the results reveal the success of the proposed method, and therefore the present technique further be used for more experimentation. The medical diagnosis devices are capable of analyzing the present health status only, but unable to reveal psychic outcomes and also cannot do early predictions. Therefore, by embedding the analysis of biofields will overcome these present issues. Hence, biofield study can be utilized to predict health and thought status, emotion management, and others.

The present research highlights the issues in analyzing the human biofield and comes up with a novel approach to solve these issues. The research also enlightens about the historical background, the past success, recent advancement, and the available techniques to measure the human energy field. Next, this study also elaborates on the new areas and opportunities for research and development in numerous domains. Now it is believed that the novel proposed technique will uncover the hidden and unknown information about humans and life that will be utilized in various means, which will be beyond imagination. The unfolding facts related to human biofield will bring a new revolution in medical science.

The human energy field is categorized as one of the complex and dynamic fields in this universe. But one cannot deny the fact that it is highly rich in biological information. This raises the technological challenges for its interpretations and understanding [101]. These mysteries can be solved with the help of advanced techniques like artificial intelligence and its sub-domains. As mentions in chapter 6, biofield can be used to develop outstanding applications in the future. Hence, this area of research has a very bright future and has a lot many opportunities, along with numerous challenges. Therefore, intense study and a high level of deep research are required to solve these challenges that require high funding and good teamwork.

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

This section elaborates on the concluding remarks about the present research, followed by the future possible enhancement and opportunities in this domain.

7.1 Conclusion

The concept of analysis of human biofield was stated by Alternative and Complementary Medicine (CAM) practitioners as Pranic healing. Their studies disclose that biofield carries very crucial information about human health and life. These theories came up with new challenges and slowly after gaining pace, it disclosed unbelievable mysteries of life. Now, on collaboration with technology, CAM practitioners will be capable of unfolding more details about the human body and life. As per the previous studies, balanced human life is controlled by the seven energy centers known as chakras. These are responsible for the generation of aura patterns and to have a balanced life, there is a need for balancing these energy centers. Sometimes the unbalancing may cause some serious illnesses or dysfunctions, which might be difficult to cure only by medicines. Therefore, understanding the aura patterns is quite important and beneficial for each human. Thus, the present research methodology highlights those imbalances in the form of an image using false color distribution.

Energy is life and life is energy! Considering these words the present research was carried to decode the mysteries of one of the most complex energy waves in the cosmos, popularly termed as *Human Biofield or Human Aura or Human Energy Field.* Many previous research and studies reveal about this energy and its connection with life, but due to its complexity and dynamic nature, this topic always remained in debate. So, to add something fruitful as a solution this research was conducted by using a novel approach of image-based computation. As this energy field is invisible, therefore as a new beginning, a novel algorithm is designed for its visualization and analysis. To achieve the pre-defined objective, a new colorspace was implemented

along with other features as explained in previous chapters (Refer chapters 3 & 4). A colored pictorial representation of aura energy patterns is obtained that is visible and interpretable by the human eye. Further, this algorithm is capable of generating color interpretations for the understanding of the user. Though aura analysis and its interpretation need a detailed study, the present research outcomes made it easy for the layman to understand the basics. The methodology adopted in the research is easy and simple to use and also can be used as a piece of support information in medical diagnosis and clinical research. Moreover, for the verification of these results, a competitive study, with some of the existing techniques (Refer chapter 5), was carried out. In addition to that, for cross-validation, a medical examination of the participants, and feedback from the participants was performed. At present, the success of the present research is approx. 89% and can be improved by applying advanced techniques and hybrid approaches. The present research can be considered as the beginning of the new phase in this domain and can bring a lot of changes in the field of research and development and can be used in many technologies (Refer to chapter 6).

A further lot much knowledge is available inside the human energy field but not so easy to understand. There are various challenges associated with the study of human biofield that will guide in developing many new outstanding projects for the society. With the development of smart computing devices and intelligent computers, deep insights about human energy are possible in the future. Also, for better research and development in this domain needs some more detailed literature, which is scattered at present. Hence for more advancements, a central repository of strong and valid literature is required. Moreover, an online forum of the domain experts in this area of specialization will help to take the research on the next level. Along with all these requirements, a fully dedicated and enthusiastic group of researchers with a sufficient amount of funding will be required for experimentation.

7.2 Future Scope

This section highlights the future enhancements and opportunities associated with this research. The study of the human biofield and its decoding will help in resolving and unfolding various hidden dimensions between health and life. The present research was conducted using various constraints and with certain limitations, hopefully, the

future enhancements will remove these issues and will present better outcomes. The expected future enhancements are highlighted below, thus, opening up the new challenges and opportunities for emerging researchers and scientists in this domain.

1. The present research is conducted under the static and controlled environment. In the future, this can be carried forward for the dynamic environment.

2. Current work is performed for 2D images, which can be further upgraded for 3D images for much better results and analysis.

3. In the future, new fields of dynamics like emotion dynamics, biometric dynamics, and so on will come up with various research and development opportunities.

4. Decoding human biofield with advanced techniques of Artificial Intelligence will help in resolving various aspects of medical research and provide additional support for diagnosis.

5. Various applications of the biofield, explained in chapter 6, will provide a high level of opportunities for research and new emerging technologies.

6. Current research is limited to image processing; this can further be extended to video processing for real-time results.

7. Present work is performed on image-based computations, i.e. in Spatial Domain. This research can be further extended to Frequency Domain, which may probably help in decoding more details about the biofield. Frequency domain computations may enhance the results of its visualization and analysis.

8. Present research is unable to revel the percentage of healing after any therapy like medication, acupuncture and others but limited to visualize the changes occurred in the biofield. Thus, this research work can be upgraded to quantify the amount of healing.

There are many more opportunities under this umbrella that needs to be grasped but not so easy due to the presence of unseen challenges. Some challenges are already highlighted in this research under different sections but many are still to be disclosed, which is possible only after more detailed studies. Hence, looking forward to more out-comings in this domain in the future.

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Source :

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Table 4.2: https://my4ms.wordpress.com/2014/04/07/reiki-and-the-chakras/

Appendix A: The Effect of Mannequin on Biofield

An experiment has been conducted to showcase the existence of the biofield by using a mannequin. A mannequin is a non-living object; hence does not perform dynamic changes at the atomic level similar to human beings. A similar kind to the static environment is prescribed for this experimentation and results of the same are shown here. Initially, the image has been captured of the environment, without any presence of human of a mannequin. In the given figure, figure A.1 & A.2, shows the original image of the environment and the biofield of the environment. These effects, as observed, are due to the presence of surrounding electromagnetism from electric wiring, mobile signal, Wi-Fi signals, and many others.


Figure A.1 Initial image of the environment
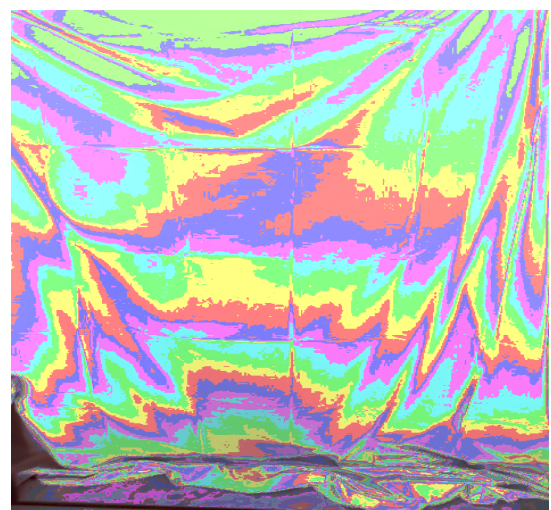
Figure A.2 Biofield of the environment

In the next step, the mannequin is placed in this environment to study the effect of its presence on the biofield. Below illustrated images, figure A.3 & A.4, shows a mannequin effect indicating no major changes in the surrounding energy field. The same experiment has been conducted several times to check the surrounding effects but no major observations are seen. This helps in the conclusion that non-living objects have a negligible energy field. The energy field effects observed on the mannequin and its surroundings are just because of the presence of the fall of full-spectrum light and shadow effects that occurs due to the presence of surrounding objects.

Figure A.3 Original image of Mannequin

Figure A.4 Biofield of Mannequin
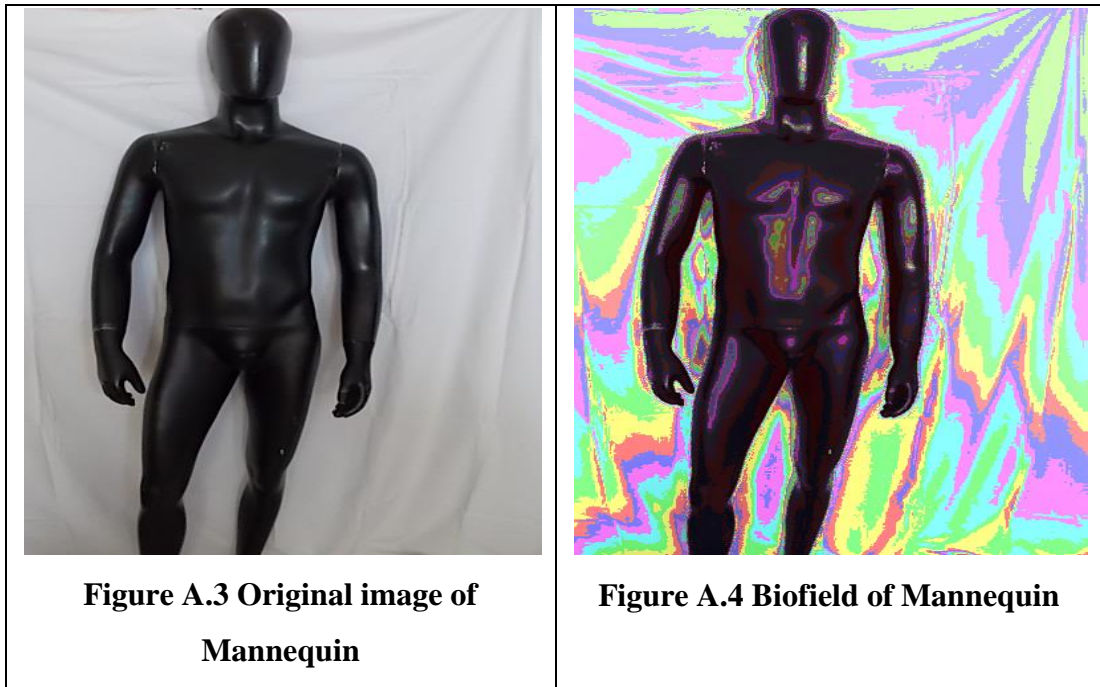
On proceeding further, the effect on the environment biofield is studied on human beings and mannequin. The outcome shows the major change of the energy field with the presence of humans along with mannequin. Hence, this shows that humans carry their won energy field, which reflects their internal changes. As stated, figure A.5 & figure A.6, indicates the effect of the presence of human being, with a mannequin, on biofield.

Figure A.5 Original image of a human with a mannequin

Figure A.6 Biofield image of a human with a mannequin
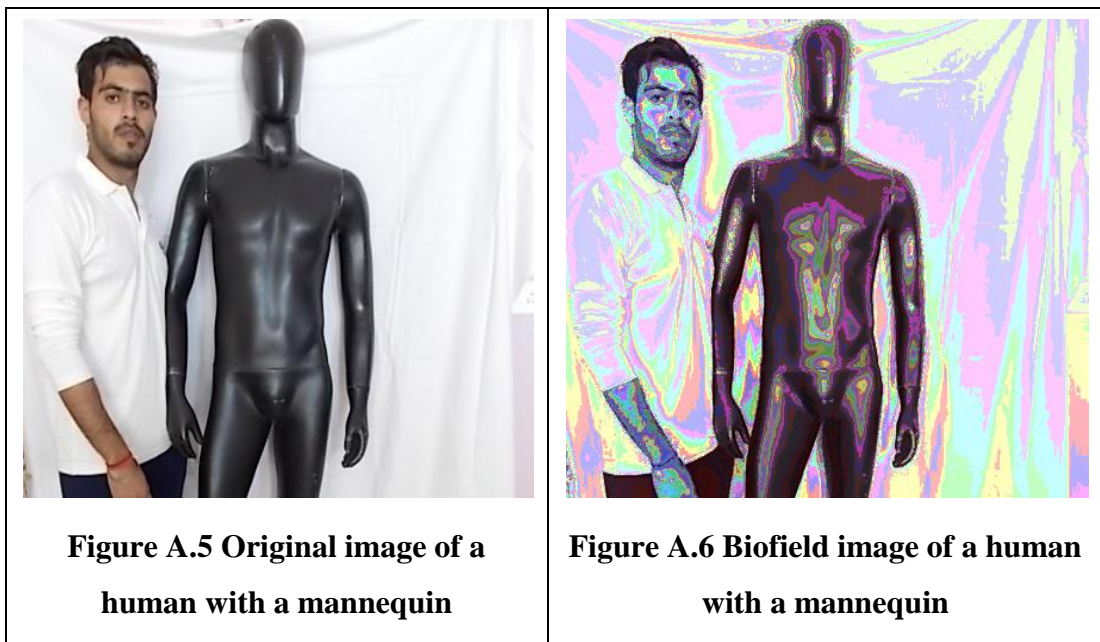
Hence on the performing, this experiment indicates the presence of human biofield, which reflects the internal energy changes of an individual.

Appendix B: The decoding of Human Aura

The biofield is very complex and dynamic, hence to decode the meaning of the same is a very critical task. To carry forward this research and to conclude the results following data, shown in the table, was used to indicate psychological and physical effects on the human body. These effects are due to the energy level changes take place due to various factors in living beings. Further for the color interpretations of the human aura, in the current research, the table exemplified below is used to understand the complex pattern of biofield obtained around the human. This table helps in decoding the meaning of each color and in identifying the positive and negative effects of energy pattern changes.

Table B.1 Biofield color interpretations.

S. No.	Region	Name of the Color	Interpretation/Meaning
1	Head	White	Direct Connection with God or whoever you believe in.
		Violet, Muddy/Dirty Violet	Very spiritual, great speaker, writer, or leader. Living in the future, not in the present, learning disabilities, sleep problems
		Blue/Turquoise Blue/ Muddy Blue/ Dirty Blue	They may not know what it is yet, but they have always known that they will do a lot in this lifetime/Growing more in their spirituality/ Opening up to new Spiritual beliefs/Self-critical/ Distrustful, over-ambitious, domineering
		Indigo/Dirty Indigo	Very intuitive, has a higher vision of life and how the Soul evolves/ Conflicted thoughts, addictive personality, food sensitivities causing scattered thoughts
		Muddy Brown	Negative Thoughts
		Green	Lives in balance and harmony with their Spirituality and with all things. Feels their beliefs are right for them about God and the Universe. Peaceful.

S. No.	Region	Name of the Color	Interpretation/Meaning
		Yellow	Overly analytical, overthinking, can't seem to shut the mind off, would find it hard to meditate due to too many thoughts. He/She Likes to learn and take classes.
		Light Orange/ Orange/ Muddy Orange/ Dirty Orange	Depression/ Creative, Out-going, Social, Enthusiastic/ Lacks creativity, anti-social, withdrawn, living in the past, possible headaches/ Negative thoughts, moody, manipulative
		Red	Passionate
		Gray	Lower consciousness probably does not believe in God. Possible dehydration, possible stroke, may have the illness, lack of oxygen to the brain, maybe Alzheimer's. Ask if the person has had seizures.
2	Arms and Upper Legs	White/Pink	They want to escape from life. They may be contemplating suicide.
		Violet/Muddy Violet/Dirty Violet	Quite Spiritual whether they believe it or not/ Daydreamer, no clarity – not certain what they believe in/ Feels superior to others
		Indigo/Muddy Indigo/Dirty Indigo	Wants to move forward more on an intuitive level. Essential to use their intuition more/Sacrifices for others/Conflicting thoughts about moving forward.
		Blue/Dirty blue/muddy blue	Time to bring knowledge and wisdom forward/ Natural Healer/ May have picked up negative energy from others or are being negative about moving forward
		Yellow/Dirty yellow/Muddy yellow	Thinking about what they want to do in life and how they can move forward/ Lacking clarity/confidence/ Thinking only of themselves when

S. No.	Region	Name of the Color	Interpretation/Meaning
			moving forward
		Orange/Dirty Orange/Muddy Orange	Move forward on a creative level/ Moody/ Lacking clarity
		Red/Muddy Red/Dirty Red	Passion, energy, vitality/ Feeling angry/ Feeling discouraged/frustrated
			If there are multiple colors on the arms except for blue and green, then there is probably a pain in the arms, shoulders, or leg area.
3	General vitality of your organs and glands. Immune System.	White, Pink, Violet or Indigo	The immune system has just started to overwork. Check if they have any health challenges. Ask about immune disorder diseases such as Lupus, Lymes Disease, Cancer, etc.
		Turquoise Blue/ Green	Immune System healthy
		Yellow, Orange, Red or Gray	The immune system has been challenged for some time. May relate to chronic illness.
4	Heart	Yellow, Orange, Red or Grey	Heart, lungs, or both are not functioning correctly. It would probably be a more long-term illness. Here is where I would see lung disease, heart disease, breast cancer.
		Grey	The heart is shut down. In heart and lung area - grief
		Red	Anger in relationships. May have not forgiven yet and are probably not ready to forgive. It is perhaps something that has happened more recently.
		Orange	They have been hurt in a relationship. They have not forgiven the person that hurt them.
		Yellow	Protecting their hearts. They do not want to be hurt again.
		Blue and Green	Organs are functioning well. Colors you would want to see. They are

S. No.	Region	Name of the Color	Interpretation/Meaning
			loving, giving, and caring people. They have a good relationship with themselves and those around them.
		Indigo	Gets to know people on a heart to heat basis, soul to soul basis. Gets to know who they are. Honors their soul.
		Violet	Coming into the heart area, no breaks. Maybe someone is coming into your life that may be addicted. Could be someone you know, could be your addiction or it could be someone that you will meet soon. Be cautious about this person. Meets people heart to heart or soul to soul
		Pink	Love for humanity and animals
		White	Feeling overwhelmed. May be giving more than they are receiving in love.
		White, Pink, Violet, indigo	Heart and Lungs are overworking – not a good sign. Heart – may have heart problems. Check with Dr. Lungs – Ask if they are a smoker or have ever smoked. If no, ask if they have been around a wood bring stove, fireplace or whatever, Also ask if they have mold allergies.
5	Eyes	White	You see the world through God's eyes. You try not to judge others. You might still judge, but you decide not to. Seeing people as they indeed are without judgment.
		Pink	You see the world through a love for humanity
		Violet/ Indigo	You can psychically see. It means that you might see auras or colors; you might get psychic visions or prophetic dreams. You may be able to read people when you first meet them.
		White, Pink,	Eyes are just starting to feel stressed.

S. No.	Region	Name of the Color	Interpretation/Meaning
		Violet, Indigo	Suggest getting an eye test done. Ask if they are sensitive to the sunlight. They may need to wear sunglasses.
		Blue & Green	You see things through balanced eyes, meaning that not too many people can pull the wood over your eyes. You can usually see people for who they are. Also, your eyesight is good.
		Yellow	You question other people's motives. Wondering what they want. Questioning the world around you. Curious about how things work, etc.
		Orange	You see things through creative eyes. You have a creative eye and probably have artistic skills of some sort.
		Red	You see things through angry or frustrated eyes right now. Something recent probably has upset you, and you haven't quite resolved it.
		Gray	You don't want to see anything that's going on in your life. Or the world around you. Probably your eyesight is wholly inadequate as well.
		Yellow, Orange, Red, Gray	Again I would suggest getting the clients' eyes checked. This problem has been going on for more long-term, so they may be vision problems and may need glasses.
6	Mouth	White	You speak God's words. You talk to people on a higher level. You probably talk more about spirituality.
		Pink	You speak about humanitarian issues that are close to your heart.
		Violet	You speak about your spiritual beliefs
		Indigo	You speak more on an intuitive level
		Blue	You speak the truth
		Green	You speak more about environmental issues.

S. No.	Region	Name of the Color	Interpretation/Meaning
		Yellow	You would speak more about knowledge, things that you have learned, the courses that you have taken.
		Orange	You speak more about your emotions
		Red	You would speak with passion about the things that you love. Great Motivational speaker. It could also be an infection.
		Gray	Probably does not speak of anything as afraid they will get into trouble or will not be heard or might hurt someone's feelings.
7	Throat	White	You talk about God's love and what you believe about God.
		Pink	You would speak about Universal Love
		Violet	You would speak about your spirituality
		Indigo	You would speak what you felt intuitively
		Blue/periwinkle blue	You would speak your truth. You would probably do the writing of some form as you would be an excellent writer/You would talk about your knowledge and wisdom. Also, you could write about this knowledge and understanding.
		Green	You would speak more about the environment. You would also think before you speak and choose your words wisely so as not to offend anyone.
		Yellow	You would speak more about yourself and your interests. We might have a hard time listening to what other people are talking about as you are thinking about your response.

S. No.	Region	Name of the Color	Interpretation/Meaning
		Orange	You swallow your feelings and probably don't speak your true feelings. You don't want to hurt other people, therefore consume rather than say what you think
		Red	There are angry words that stuck into your throat. I would suggest that they are just writing down what they would like to say, burn it, ask God or the Universe to deal with it. That way, it is out of their throat and dealt with.
		Gray	Their throat is closed. They do not feel that they are being heard or feel like they can speak their true feelings. They feel like the words stuck into their throat with no outlet. Again, I would suggest writing it down, etc.

Appendix C: Basics of Aura Reading

Everything is Energy

Our Aura shows our emotional response to various situations in the current moment. By finding Chakra (Energy Centers) blocks through the aura photo, we can enhance various aspects of life whether it is health, relationships, personal development or freedom from illness by enhancing our thinking [95].

What is Aura?

Aura is an energy field in and around us. While some of the clairvoyants can see this energy field with their mind's eye, most of us can see a halo of light around certain plants, the moon or the sun. It is often captured by a digital camera. Every living and non-living object has an energy field around called 'auric field'. At a subconscious level, we are all in touch with our own auric fields or energy fields, as well as that of others. Our physical body is soaked in the auric field like a piece of sponge soaked in a container full of water [96] [97] [98].

Where is Aura Located?

Human aura is in and around the physical body. Our physical body is soaked in the auric field like a sponge soaked in a pot full of water [98].

History of Aura and Chakra

The oldest records were found in Indian literature called Patanjali Yogasutra by Maharishi Patanjali; where he has mentioned about the seven energy centers (Chakras) and a field of energy around the body (human aura). At that time it remained a metaphysical concept, until 1939 when a Russian electrician named Simion Kirlian discovered the art of photographing the energy field. Since then, Kirlian photography has become the basis of all aura photography in the art of reading Aura in modern days [96] [98].

What is the need of understanding Aura?

Our auric energy responds to our thought process. Hence through aura reading we can understand our thoughts and their impact on the physical existence and human health. So when our thought process is in sync with our life plan; in general our auric field tends to remain uniform and free flowing, when our thoughts are disturbing and not in

sync with our life plan; our auric field seems to get disturbed. So a diseased body begins with a 'dis-eased' thought process [97] [98].

A disturbed thought gives rise to disturbed emotions which brings about disturbances in the aura and lead to a dis-eased physical state. Study of aura helps us in understanding the onset of disease. However the appropriate changes of thought can reverse the same. When we click a photo with a digital camera, the camera also captures the light field in and around you and the Aura which is not visible to naked eyes [103].

Outer Aura and Inner Aura

There are two aspects in an Aura Photo:

1) <u>Outer Aura</u>: Understanding the meaning of colors in the outer aura represents your predominant to the outer world. We can also analyze Major Chakra blocks from the outer aura.

2) <u>Inner Aura</u>: More emphasis is to be given to Inner Aura reading as the inner aura shows our true nature. If the outer aura shows blue (peaceful), it's possible that we may be pretending to be peaceful when we are not from the inside. The inner aura can show who we really are.

Kindly note that the colors of the aura are ever changing. They change with our thoughts and resulting emotions. But they are like the fruits, flowers and leaves of the tree. Instead of labelling a person based on aura reading, use these colors and indicators as parameters to come to the core issue and work with the core issues [99] [100].

Representation of Outer Chakras

There exist seven major chakras on the human body. The location, name and their individual characteristics is shown in the below figure C.1. These energy chakras are the energy controllers of the human body, the center line shows the oneness i.e. balanced energy state. In the human body, energy is perceived from the front and emitted from the backside, as illustrated in the figure. Also, every energy chakra has its own associativity with different type of characteristics, allow our body to perform accordingly.
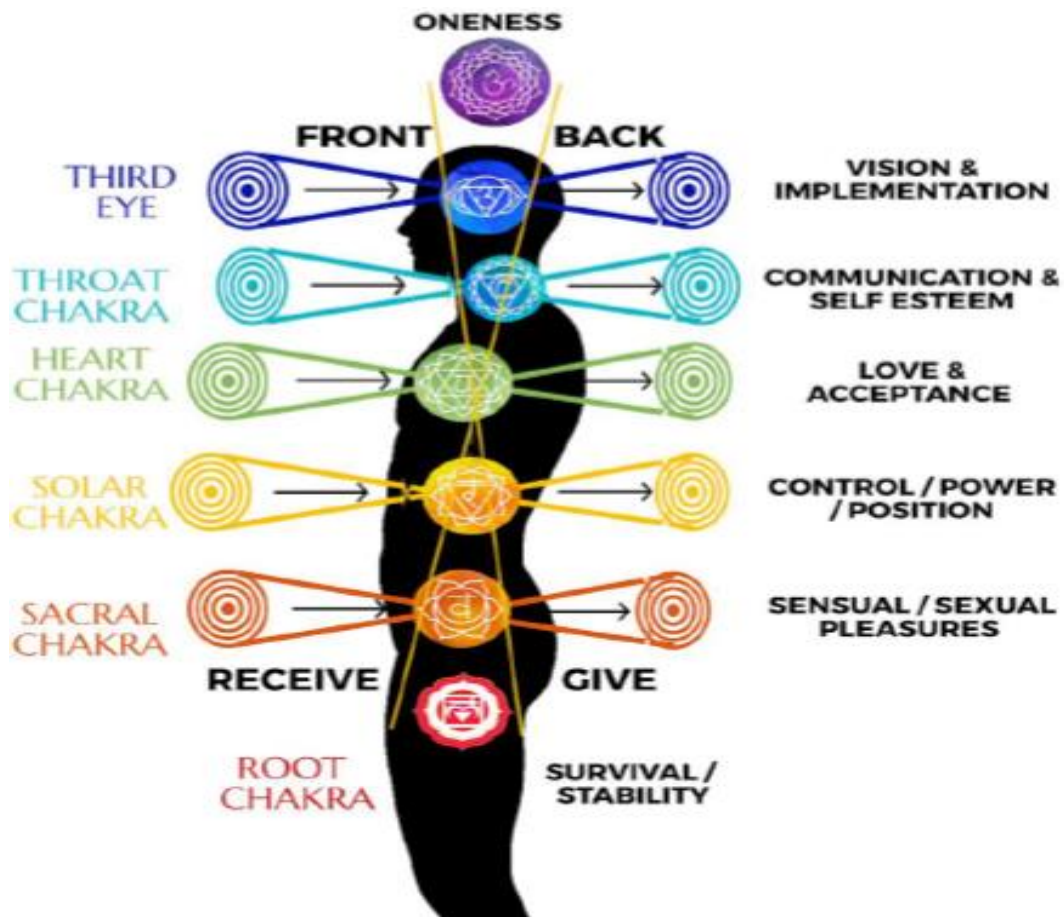
Figure C.1 Major Chakra Representation

Being in the balanced state, every chakra has its own color explained earlier, hence, while a person is not stable in any means, indicates the associated chakra is in imbalanced state [99] [100].

Representation of Inner Chakras

On the other hand, the human body also carries more than 200 minor chakras around the body. These chakras are the represents of ones' true nature. The figure C.2 shows the location of minor chakras on the human face. Every chakra is associated with different meaning. The aura reader photography reveals the internal meaning via colors, to understand the inner-self on an individual. By this information, one can easily interpret the psychophysical status of the subject and deal accordingly.
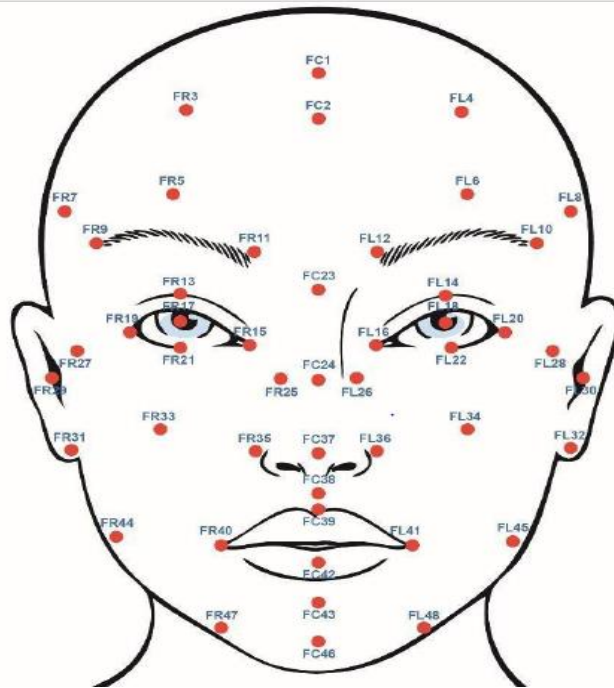
Figure C.2 Minor chakras on human face

The other locations of these minor chakras are: Head, Neck, Chest, Abdomen, Palms & Arms, Backbone, Front thighs & Back thighs and Ankle & Toes. Each and every chakra is very difficult to capture as of now, but every chakra revels detailed information about the subject, which may be used for many applications.

The energy released from these chakras (outer & inner) get overlapped, it is because the energy is flowing freely, in and around the body. The overlapping is natural phenomena but it very difficult to segregate these energies at the boundaries. Moreover, the pixels are closely located on the screen, hence it is a very tough task to separate these overlapped regions. In this scenario, interpretations is made in the manual manner as interpreter check the scale (identification of dominant color value) of the color, for example, if it is more towards red then based on red color interpretations are made, in the similar fashion, other colors interpretations are made. In case of more complex overlapping, where it is tough to get any exact color code understanding, as of now, interpreter ignores that region. But as of now, past research indicates that these is not much effect on the actual interpretations because the energy colors are decoded at the chakra locations, where very less overlapping is observed, but, it is yet under research.

LIST OF PUBLICATIONS ON THIS RESEARCH WORK

1. **Gunjan Chhabra, Dr. Ajay Prasad, Dr. Venkatadri. M.,** "Novice Methodology for Detecting the Presence of Bio-Field", International Journal of Pure and Applied Mathematics, Volume 118 No. 20 2018, 149-154 (SCOPUS).

2. **Gunjan Chhabra, Dr. Ajay Prasad, Dr. Venkatadri M.,** "Implementation of aura colorspace visualizer to detect human biofield using image processing technique", Journal of Engineering Science and Technology, volume 14, issue 2 (SCOPUS, E-SCI) (April, 2019).

3. **Gunjan Chhabra, Dr. Ajay Prasad, Dr. Venkatadri M.,** "Future Trends of Artificial Intelligence in Human Biofield", International Journal of Innovative Technology and Exploring Engineering at Volume-8 Issue-10, August 2019 (SCOPUS).

4. **Gunjan Chhabra, Dr. Ajay Prasad, Dr. Venkatadri M.,** "Comparison and Performance Evaluation of Human Bio-Field Visualization Algorithm", Archives of Physiology and Biochemistry. (SCI).

5. **Gunjan Chhabra, Dr. Ajay Prasad, Dr. Venkatadri M.,** "Computational Approach for Human Bioenergy Field Imaging and Analysis for Human Wellness", International Journal of Psychosocial Rehabilitation at Vol.-24 Issue-6 August 2020. (SCOPUS)

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