

A Systematic Review of Human Biofield Image analysis using Image Processing Techniques

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Abstract

Human Biofield is considered as an important factor in different energy healing techniques. It reveals the information about ones physical as well as mental health. Early diagnosing of diseases can be performed using Human biofield information, because diseases first affects our subtle body and then it reflects on the physical body. In last few decades significant research has been carried out in the field of Biofield Science. This review provides the light on the meaning of biofield, evolution of various techniques used for capturing and interpreting human biofield. In addition to this it also focuses on the advantages, applications of biofield, challenges, various energy healing techniques and the type of diseases which can be detected by the human biofield.

1. Introduction

Information about auras and chakras have been found in Ancient Indian History Literature- Vedas, Patanjali Yoga sutras, Upanishdas etc. According to this literature, our body contains seven chakras namely root chakra, sacral chakra, solar plexus, heart, throat, third eye and crown chakra. These also referred as energy fields or energy centers[14][15][25] and are explained in Table-1. These chakras are the result of the intersection of various nerves or nadi's connecting different parts of the body. Energy is transferred continuously from every chakras to different organs connected and other chakras as a result of which energy field is created in and around our body i.e. Human Energy field or Biofield.

Each of our chakras have a particular sound, colour and frequency on which they should vibrate to be in balance. Illness in the body imbalances the chakras[13][18][28]. For example imbalance of solar chakra shows illness such as digestive disorders, problems with stomach, liver, colon and intestine. It also shows behavioural problems such as poor self esteem, arrogant, stubborn etc. Our rishis at ancient times had spiritual power to observe this imbalance in chakras and human biofield. Today we have different techniques to capture the human biofield. Information revealed by this human biofield is being used in different therapies or energy healing techniques[3] like reiki, pranic healing, yoga etc.

Scientific research on capturing biofield was started by Semyon Kirlian.[4][5][21] He discovered the methodology for capturing an energy field based on the phenomenon of electrical coronal discharge also known as "Gas Discharge Visualization (GDV)". Fig. 1 shows the setup required for kirlian photography for capturing energy field. To capture energy field the object is placed on photographic film which is placed on top of metal plate separated by sheet made up of glass. High voltage frequency is supplied to metal plate which causes ionization of air around the object and the moisture present in air results in glow around the object which is called as "corona plasma discharge". This glow depicts the energy level around the object.

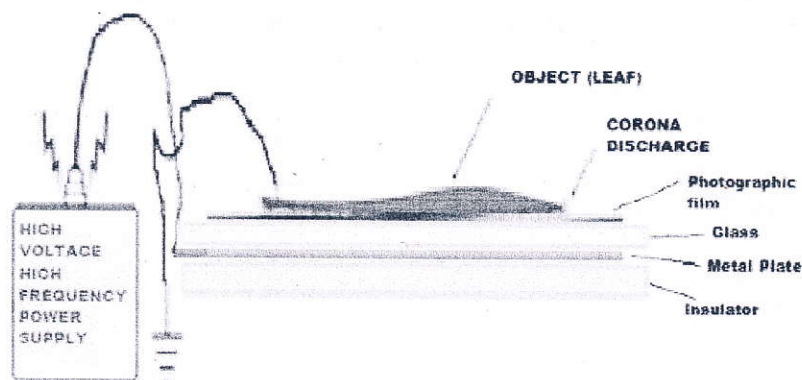


Fig. 1- Kirlian photography setup for non-living objects [5]

Based on Gas Discharge Visualization Dr. Konstantin Korotkov developed an advanced Kirlian photography technique[4][5][28] in which specially designed camera as shown in Fig. 2 is used to capture the energy field around the finger. Fig. 3 shows energy field around left thumb and index finger representing energy level of different organs which is used in medical diagnosis.



Fig. 2 – Kirlian Camera

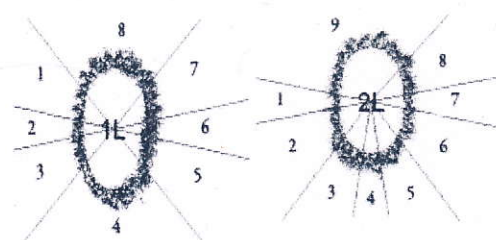
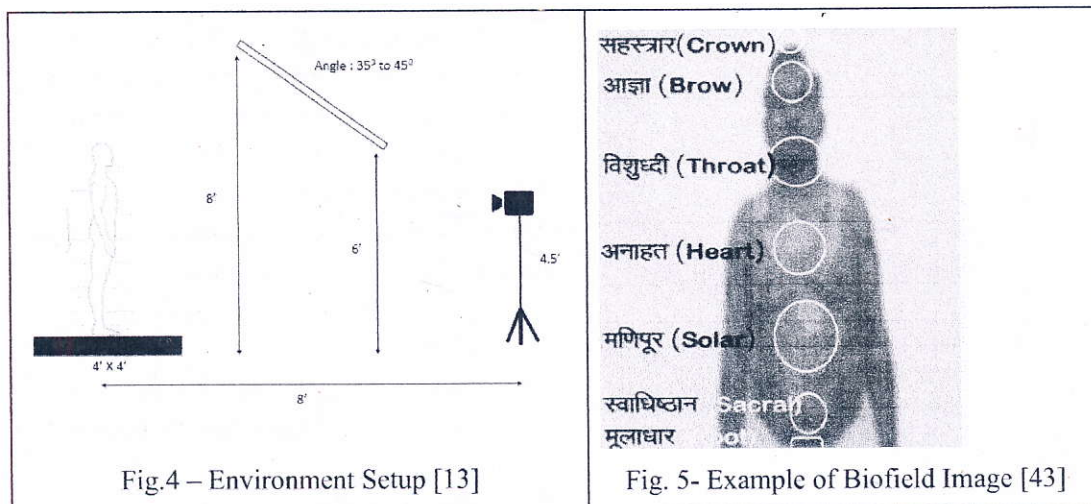


Fig. 3 – Energy levels around left thumb and index finger

Another non invasive, radiation free method introduced by Harry Oldfield to capture human biofield is **Poly-contrast Interference Photography (PIP)** [16][28][33]. A customized scanner camera takes photographs in specialized designed room as shown in Fig.4. PIP examines photon (light) interference and its changes in and around the body. This interference is generated when wide spectrum radiation falls on the energy field. The PIP software program allocates a number to each specific grade or frequency of radiation and then recodes every number into the visible light range so that we can see it. This color information in the photographs helps in health diagnosing.



2. Human biofield and its relation with health and diagnosis

As mentioned by different researchers human biofield is the magnetic field formed in and around our body as the result of continuous energy transfer within our body. This energy (qi, prana) is transferred through meridians and chakras which connects organs present in our body. Blockages in circulation of this energy shows mental and physical health of the person. Following table shows 7 chakras, their position and disease due to imbalance of chakra.

Table 1: Chakras, their location in human body and effects of imbalance at chakra [13]

Chakra	Position	Imbalance causes
Root	At the base of the spine	<p>Physical problems Sluggishness, tiredness, weight problems, skin, bone, teeth and back problems</p> <p>Behavioral problems Shows signs of greed, fears of lack of material things and support, fear and worry, fear of change, anxiousness, addiction to security, restlessness and lack of discipline.</p>
Sacral/ Naval	Located 3 finger widths below the belly button	<p>Physical problems Sexual problems, back problems, problems with reproductive organs, spleen and urinary system. problems.</p> <p>Behavioral problems Dramatic mood swings, addiction to or fear of sex, emotional dependence, obsession, poor social skills, lack of desire or passion, loss of appetite for food, sex or life.</p>
Solar Plexus Chakra	Located 3 fingers above the belly button	<p>Physical problems</p>

		<p>Arthritis, diabetes, digestive disorders, ulcers, problems with stomach, liver, colon and intestine, anorexia or bulimia, pancreatitis, gallstones and allergies.</p> <p>Behavioral problems Poor self esteem, overly aggressive, arrogant, stubborn, hyper active, competitive, passive, sluggish, blaming and being unreliable.</p>
Heart Chakra	Located at the centre of the breasts	<p>Physical problems Problems of the heart, lungs, breast, thymus and arms, asthma, allergy and immune system problems.</p> <p>Behavioral problems Jealous, critical, lonely, depressed, demanding, narcissism, fear of intimacy and intolerant.</p>
Throat Chakra	Located in the throat area	<p>Physical problems Stammering, weak voice, laryngitis, swollen glands, thyroid and ear problems such as earaches and infections.</p> <p>Behavioral problems Talking too much or too little and poor listening skills.</p>
Third Eye Chakra	Located in central to the eyes but up into the centre of the forehead	<p>Physical problems Poor vision, sinus and nose problems, headaches, seizures, learning disability and neurological problems.</p> <p>Behavioral problems Lack of imagination, visualization and foresight, poor memory, obsession, nightmares and hallucinations.</p>
Crown Chakra	Located on top of the head	<p>Physical problems Symptoms of being out of balance, migraine, brain tumor, amnesia, coma, and sensitivity to Light and Sound.</p> <p>Behavioral problems Confusion, cynicism, rigidity, greed, and domination.</p>

Our body is the network of thousands of meridians from which 12 principle meridians are used by Acupuncture therapy of Traditional Chinese Medicine. Acupuncture therapy is recommended as an effective alternative therapy by WHO in 1980 [35]. Meridians are the pathways of energy flow (prana, qi) within our body. Disturbances in this energy flow along the path of the meridian affects health of the person. Certain areas on these meridians are defined as acupuncture points or acupoints. More details of these acupoints is beyond the scope of this paper. Applying treatment on these points helps in various physical and mental disorders[36].

Biofield images captured using advanced digital scanning system [13] can show the energy blockage along the path of meridians and chakras. This technique represents energy information on and around body in the form of various colors [11][12][13][33][34] which reveals information about physical and mental health of the person as shown in Table-2. These images will be used by the reviewers in proposed study.

Table 2 – Colors appear in human biofield

Color	Interpretation
Red	Life force passion, anger, survival sense, ill health, depression, blocked energy
Green	Growth, health, healing, balance, friendly, abundance, in the flow, nurturing
Blue	Calm, caring, sensitive, intuitive, harmonious, tranquil, emotional, loving, nurturing
Gold	Enlightenment, divine guidance and protection, higher consciousness
Gray	Ill health, depression, blocked energy, struggle, past life karmic issues,
Indigo	Strong psychic, ability, honest, independent, good soul
White	Purity and truth, higher dimensions, evolved, divinity
Pink	Healing, unconditional love, gentleness, willingness to serve
Yellow	Intellect, optimism, motivated, analytical, happy, non attachment, spiritual teacher
Orange	Creativity, energy, outgoing nature, vitality, adventurous, lacking in self discipline, dominance
Black	Health problems, un-forgiveness, trauma, issues relating to death

3. Related Work

Researchers have investigated various methods on the detection and analysis of Biofield energy. Image representation and description are one of the important and basic steps of image processing. Some

admirable work has been done in the related field by various researchers as described in the reviews given below:

Dr. Beverly Rubik et.al.[1] explain evolution of Biofield science and its use in complementary and alternative medicine (CAM). The use of Biofield to detect the human health condition is widely practiced since antiquity. These practices are now referred as biofield therapies which are gaining more importance. These include acupuncture, energy healing, magnet therapy, bioelectromagnetic therapies. Biofield concept is a useful construct to guide new research on such CAM modalities, It is also a requisite for a better understanding of contemporary developments in biophysics and biology. Moreover, information connected with the biofield may serve as a bridge between mind and body, which is fundamental to understanding mind-body interactions.

Evgeniy Bryndin et.al.[2] have mentioned that the biofield is tied with the functioning of body. It is formed as the result of energy at power centers and it reveals present as well as past information about an individual. Any violation in the physical structure shows imbalance in the energy at power centers and vitiates the biofield. Normalizing the energy at these centers helps in recovering the health. Qualities and behaviour of person can be accurately determined by observing shades and patterns of colors which appear in biofield. They have also cited what every color represents.

Jeo Joy A et al.[3] have listed various energy healing techniques such as Reiki, Distance Healing Intention(DHI), Healing Touch(HT), Reconnective Healing(RH), Polarity Therapy(PT), Pranic Healing, Quantum Touch, Johrei, Qigong, Intuitive Healing(IH). These can be applied to balance the abnormal energy levels found in the human biofield. They also encouraged for new research where the Artificial Intelligent tools can be used to reveal the significant information about the human biofield and can predict changes in a person's condition much earlier than a physician will.

B.Shanmuga Priya et.al[4] conducted experiment on twenty five subjects. In their experiment they captured kirlian images of finger tips of all the subjects using kirlian camera. These images are observed as two regions, inner aura which is in the form of flames surrounding the objects and outer aura appears like intensity rings surrounds objects and an inner aura. For image enhancement they used morphological filters. Features like size, area, number of pixels, number of connected components, curvature, zero crossing of ROI helps to diagnose the health condition. Kirlian image of each finger represents the state of corresponding organs. High energy level at some region indicates illness at the corresponding organ. Thus abnormal energy levels in aura images can be used as a diagnostic tool in medical science.

ShreyaPrakash et.al[5] described various techniques used for capturing human biofield such as Kirlian Photography, Resonance Field Imaging, Polycontrast Interference Photography[6] which use different phenomenon i.e fluorescence, interference, and resonance for recording human biofield. Human biofield is the result of physiological and mental activity of human body. It is directly connected to physical, spiritual, and mental health of an individual. Biofield or aura of healthy person will be more intense compared to unhealthy person which may extend about 4 to 5 feet around the human body. Health of an unhealthy person can be restored by two methods. First is the conventional method to apply the treatment on physical body, as it recovers aura also is restored to the healthy state. Second method is to applying the treatment directly to the human biofield itself i.e the energy body. Once the energy body is restored, automatically the physical body is restored to healthy state.

Denitsa Grozdeva et.al[21] have shown how the research in GDV (Gas Discharge Visualization) technique has been progressed in last few decades. GDV is capable of measuring the impact of central, automatic nervous system and various types of stress on human health status. So it can be applied in

various fields such as conventional and alternative medicine, sports, psychology for prevention, early diagnosis and effectiveness of treatments.

Thenappan S et.al[6] have mentioned that the Human aura is made up of electromagnetic waves and influence the other human beings around him/her. They stated that various mantras, shlokas, duas present in our scriptures have the ability to reduce the deficiency, disease exist in human body. This can be done by converting sound related to mantras into electromagnetic waves by antenna and are passed through human skin which can absorb these waves through its pores.

Hwa Chiang LEE et.al [7] captured images of all ten fingers of 24 healthy volunteers and 6 cerebrovascular stroke patients through the BEO GDV system. Fingers are connected to different organs through meridians. To predict overall health condition of the person they used fundamentals of Traditional Chinese Medicine (TCM) in meridian channels. They analyzed these images by selecting some bioenergy parameters such as *Uniformity, Mean dullness, average dullness, Fractality dimensions, Fragments*. It was observed that these parameters differ for healthy volunteers and stroke patients. Images of healthy volunteers had continuity in the flow of bioenergy, high intensity level and high contrast. Whereas bioenergy fields of stroke patients showed breaks and disruptions in the regions of illness. According to authors measuring and analyzing bioenergy helps in predicting health condition of an individual. It is easy to operate, less costly and harmless compare to health screening methods such as X-Ray, MRI, city scan etc. Thus, it can be used as medical diagnosing tool.

Rai Sachindra Prasad et.al[8] have nicely depicted the nature and importance of biofield. As it is mentioned in Indian philosophy and Ayurveda, there exists an invisible physical body which shows the mental state of an individual in different color shades and patterns. Thoughts originated in an individual's mind get reflected in the biofield. This can be used for identifying people with undesirable or harmful thoughts like murderers and terrorists and if we are able to transform such minds with desirable thoughts may result in healthy and peaceful society. Authors have mentioned about the Gas Discharge Visualization and Electronic Photo Imaging techniques used to capture human biofield which helps health practitioners in diagnosing health of a person quickly and accurately. Ministry of Health of Russian Federation has certified GDV system as medical technical device. More research is required in this area as there are no mathematical analyses or instruments present for interpreting human biofield.

Rai Sachindra Prasad et.al[9] conducted experiment on biofield images published in theosophical literature. In their study they used a single attribute of Hue (h) in the HSV space as an analytical tool to divide the image patterns in two classes, good or bad. As a result they found that nearly 85% of the images were correctly classified in the 'Bad' or 'Good' patterns.

Rai Sachindra Prasad has described in his paper [10] novel conceptual method which identifies human nature and behavior using spectral analyses of biofield images from Theosophical literature. In his analysis the average value of all wavelengths was used to identify dominant color, which was used to determine behavior. It was found that Red color dominated in the images show anger, depression, murderous rage, which were classified as bad patterns. Whereas the images dominated by green or blue were classified as good patterns.

Dr. Anup Deo [13] has represented advanced digital scanning system which is based on Polycontrast Interference Photography. He reveals that this technique is Non invasive, radiation free, preventive, live imaging system which is capable of detecting energy disturbances before they become full blown physical problems. It identifies blockages in energy flow in the meridians, extent of the disease in the physical body and also the positive results of the different treatment therapies.

Gunjan Chhabra et.al [11] have presented a detail process of capturing the Biofield energy in the form a photograph in a specific environment. These images help to analyze people's mentality, future health issues, compatibility with others, reaction to the situations. Researchers implemented Aura color space visualizer to detect human aura. They observed human aura of the subject, interpreted it and found the accuracy in interpretation by interviewing the subject. Human aura was also observed after the treatment to see the effect of the treatment.

Gunjan Chhabra et.al [12] have focused on the use of Artificial Intelligence techniques to study and interpret human biofield. According to them, human biofield is very complex but gives plenty of information about mental, physical health of a person, which can be used in various applications like clinical, IOT and wearable device applications, Social applications, Human Computer Interaction applications, security applications and so on. Using AI and image processing tools models can be developed which captures biofield and generate reports stating stress level, social wellbeing, physical diagnosis, emotional status of a person which will help him/her for self-analysis.

Centre for Biofield Sciences[17] conducted experiment on 20 participants of age between 16-25 years to see the effect of Student's Memory Enhancer Mat on human biofield. Scans were captured before and after using Memory Enhancer Mat for 20 minutes. They considered only the crown chakra and brow chakra as they are related with brain activities. Scans captured using Biofield viewer and Electronic Photo Imaging were observed and they found significant change in the human biofield. There was reduction in red color pixels which shows reduction of low energy and increase in green color pixels which shows positive energy which helps students in increasing concentration and balance their biofield.

Hegde et.al[20] with the objective of finding the effect of Yoga and Yagna on stress level conducted study on 18 participants. They used Activation coefficient which is one of the parameter derived from the images which are captured using Electronic Photo Imaging which is also known as Gas Discharge Visualization technique. This parameter shows the stress level of an individual. In this study the group of participants attended Yoga and Yagna on 2 consecutive days. EPI parameters were read before and after sessions on both days. It was found that there was significant reduction in stress level after participating in Yagna compared to Yoga.

C. Rajan Narayanan et.al [22] say that tremendous research in the field of bioenergy has been conducted in Russia and Germany as a result of which there are various GDV devices introduced. These devices measure the communication of energy in bio meridians which is used in traditional system of medicine. They proposed Unified System of Medicine(USM) where EPI readings were recorded using Biowell device. The three parameters which are considered are energy of communication (C), total level of available energy referred as Integral Area(IA), Entropy (E) which indicates the amount of coherence of energy communication. Entropy and coherence are related inversely. More entropy results in less coherence. Subjects with abnormal values for C,E and IA were suggested to practice appropriate yoga practices for some duration based on traditional and researched information on yoga practices. EPI readings were recorded immediately after the said duration and in most of the cases normal values for these parameters were found. The proposed model also considers other factors for good health such as power of the mind, healing through acupuncture points, non contact healing etc.

E.G. Yakovleva et.al [23] conducted pilot study using the data obtained by Electrophotonic Imaging (EPI) technique to identify the patients with tumors of colon. Aim of their study not to only detect but also the differential diagnosis of colon tumor. The study was conducted on a group of 137 people of age between 16 to 86 which involved 55 healthy individuals and 82 patients with tumor. EPI camera

and Biowell camera with special Biowell software was used for recording and analysis of EPI images. Different 69 parameters associated with coccyx, sacrum, descending colon, lumbar regions were used for analysis. Classification using binary logistic regression was obtained with sensitivity and specificity values 76.4% and 85.0% respectively. Results obtained were compared with other screening methods used for diagnosing colon tumor such as FOBT, FIT, colonoscopy and virtual colonoscopy. The techniques FOBT, FIT are time consuming, conventional colonoscopy is expensive and also unpleasant for patients, virtual colonoscopy is noninvasive but may not detect polyps of less size and not suitable for pregnant women. On the other hand screening using EPI technology is noninvasive, cheaper and takes less time for diagnosis.

Gaillard, C., Allain et.al [25] conducted randomized controlled trial with the aim of effectiveness of biofield therapy on warts of the hands and feet. The trial was randomized into 2 groups of 31 each. One group was treated using biofield therapy and another used sham therapy. Treatment scheduled twice with the duration gap of 3 weeks. According to authors Biofield therapy produces various noteworthy effects, including wound repair, regeneration, growth enhancement and reduction of pain. They have noticed lack of scientific studies undertaken on biofield therapy but even then these therapies are widely preferred by patients because of its advantages such as non-invasive, cost-effective than conventional treatments.

Chhabra, G et.al [34] proved in their experiment that the sound therapy is effective for healing negative emotions. For this they used an integrated approach wherein image processing and machine learning techniques were used to extract the emotional status of people from biofield image and facial expressions. Based on emotions sound therapy was applied in which based on emotion of the person, the appropriate recorder songs were played for positive results in emotional state of the person. Experiment revealed the accuracy of around 84%.

Aleksandrova EV et.al [37] conducted study on 138 individuals from which 32 were healthy and 106 patients with arterial hypertension. In this study images captured using Electrophotonic Imaging (GDV) were examined. Significant difference was found in various EPI parameters related to state of central nervous system in patients with arterial hypertension and healthy people. According to authors such diagnosing methods can be used for timely detection of latent forms of hypertension.

Drozdovski A et.al [38] in their pilot study they evaluated Stress level (SL), energy potential (EP), and psycho-emotional tension (PET) of athlete using galvanic skin response (GSR) and gas discharge visualization (GDV). This evaluation helps in assessment of level of readiness of athletes during training and at the time of competition. This study was conducted from November 16 to December 18, 2011 on 18 athletes from Russia's Skiing and Biathlon Paralympic during their training period for the upcoming World Cup competition. According to authors higher value of EP observed during training period lowers SL at the time of competition. Whereas higher values of SL and PET during training period results in lower probability of success in competition. Thus helps in preparing athletes for the competition. Authors also emphasized on need of further research in order to get a more concrete picture about psycho-physiological landscape of an athlete's for higher level athletic competitions.

Nataliya Kostyuk et.al [39] consider medical biometrics as one of the branches of biometrics which helps in identification of diseases at the early stage of development. On the basis of pilot studies conducted [40-42] they believe GDV can be used in medical biometrics as they are capable of assessing the functional state of human organs. Further computer modelling tools can be used for automatic identification of diseases.

Based on all the above studies it is observed that human biofield is very complex and dynamic. Various techniques have been introduced to capture this biofield in form of images. These techniques can pick up energy disturbances before they become full-blown physical problems. But there is no standard mathematical analysis or technique available for its interpretation. Introducing automated tools for detecting this energy disturbance will provide strong scientific evidence to recommend preventive, complementary, and natural healing methods before symptoms become serious and require medication and/or surgery.

4. Search Strategy

A systematic search was conducted by using relevant databases available such as PubMed/MEDLINE, SPRINGER, IEEEXplore, Elsevier etc. To apply searching various keywords related to human biofield were used such as "biofield therapy", "detection of human biofield", "human biofield for health diagnosis", "measurement of human biofield", "application of biofield in energy medicine". In addition to these databases other literature published in offline books, publicly available ebooks and websites were also navigated to extract the required information.

5. Selection Criteria

Navigated literature was filtered and articles which focused on following criteria was considered for the review 1) Concept of biofield was described 2) Experiments conducted on human population 3) Human biofield was used in energy healing techniques 4) Biofield used for health diagnosis 5) Image processing used in detection and measurement of energies in human biofield.

Various papers have been selected based on PRISMA Flow diagram as shown in Fig-4. The PRISMA flow diagram is the graphical presentation of the stages involved in review process such as identification of articles published, method used for screening and for assessing eligibility of articles for inclusion in the review.

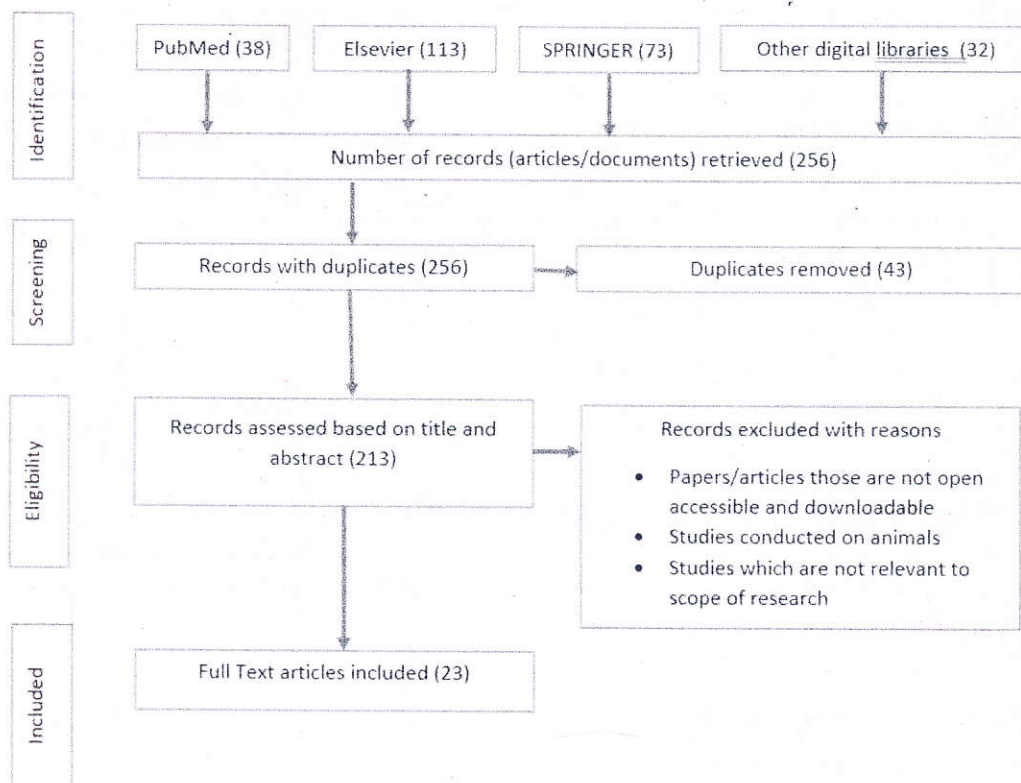


Fig 6: PRISMA flow diagram showing the summarized systematic literature review process

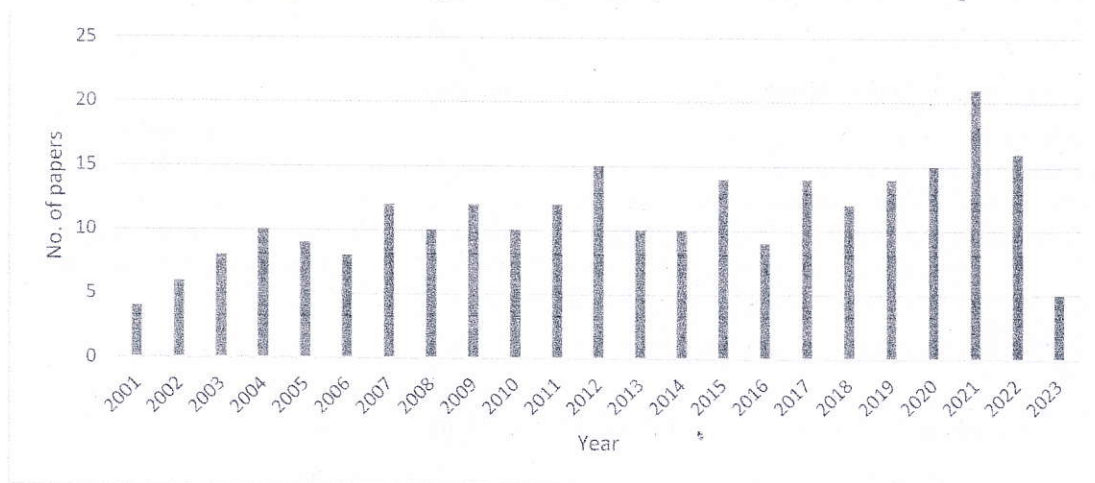


Fig 7: Publication distribution over the last two decades (2001-2023)

Table 3. Inclusion and exclusion measures of the study

Inclusion Measures for the study	Exclusion Measures for the study
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<ol style="list-style-type: none">1. Articles/ papers those are open accessible and downloadable2. Articles published in English and Marathi languages.3. Articles published in last two decades4. Studies which involve use of energy healing techniques5. Studies related to analyzing biofield images obtained using GDV and modern scanning techniques based on PIP	<ol style="list-style-type: none">1. Articles/papers those are not open accessible and downloadable.2. Articles published in other languages3. Studies conducted on animals4. Studies which are not relevant to scope of research
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6. Data Extraction

This study has scrutinized around 40 to 50 articles/book chapters/google links etc and important data is extracted to understand the concept of human biofield for health diagnosis. Following are some key points extracted during review.

- Author(s)
- Source of the research data
- Techniques used for capturing biofield
- Information revealed by human biofield
- Energy healing techniques for balancing biofield
- Application area

7. Energy healing techniques/ Balancing human biofield

Many articles reviewed during this study have listed various techniques [3][13][22][25] which are used for treating disturbance in energy detected in biofield due to mental or physical disorders within our body. Some of these techniques are Reiki, Distance Healing Intention(DHI), Healing Touch(HT), Reconnective Healing(RH), Polarity Therapy(PT), Pranic Healing, Quantum Touch, Johrei, Qigong, Intuitive Healing(IH). In addition to these, some studies [6][20][34] have also noticed positive effects of sound therapy, shlokas and mantras, yoga and yagna on biofield.

8. Some salient features, applications of human biofield

- Human biofield is the result of physiological and mental activity of human body and is directly connected to physical, spiritual and mental health of an individual.
- Qualities and behaviour of person can be accurately determined.
- Can predict changes in a person's condition much earlier than a physical will.
- As thoughts reflect human biofield can be used for identifying people with undesirable or harmful thoughts. Transforming such minds may result in healthy and peaceful society.
- Used for validating devices designed for energy healing.
- Used for studying effectiveness of different therapies used for energy healing.

9. Advantages of biofield capturing techniques over other health screening methods such as X-Ray, MRI

- It is easy to operate, cost effective
- It is non invasive, radiation free
- It can predict past, present and future physical ailments
- Suitable for small children, pregnant ladies and patient with pacemaker and artificial valve replacement
- Harmless, no side effects.

10. Research gap/ Challenges

- Human biofield is very complex and dynamic.
- No mathematical analyses or instruments present for interpreting human biofield.
- Many research studies are conducted on images present in literature and not on real time images.
- Most of the research studies are conducted on images captured using GDV technique. No much research is conducted on images captured using PIP.

11. Proposed Automated model for Analysis of Human Biofield scan images for Physical, Mental, Emotional health issues using Image Processing Techniques

Biofield image consists of various color spectrums. Evaluation of the biofield image requires extracting colors, their patterns and the position which helps to predict past, present, future health related issues. Process of biofield evaluation using image processing techniques involves following steps.

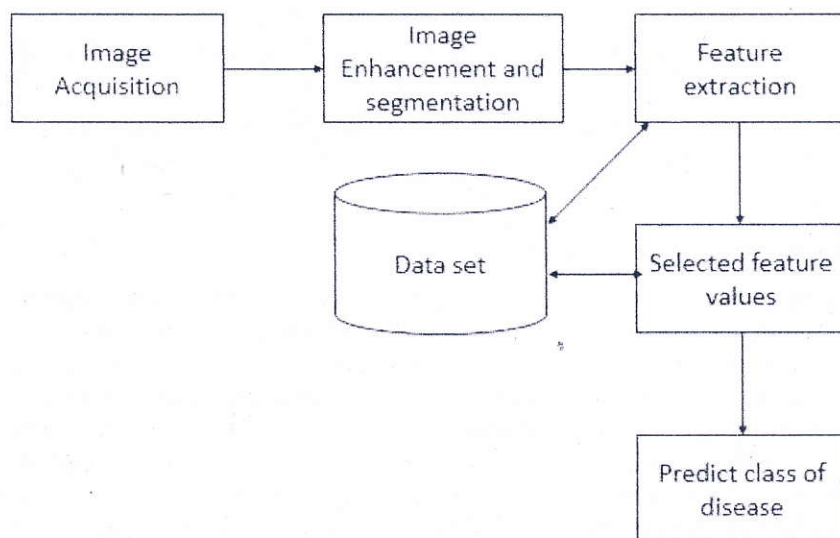


Image acquisition– It is the first step in any image processing system. Image acquisition is done with the help of suitable camera. Biofield images of individuals are captured using a customized scanner in a specially designed room.

Image Enhancement – It is the process of manipulating an image so that the result is more suitable than the original for a specific application. The idea behind this is to bring out details that are obscured or simply to highlight certain features of interest in image.

Image segmentation – It is the process where the image is partitioned into its constituent parts or objects that can be identified individually. It is also concerned with segregating the foreground pixels from the background or clustering certain pixels groups based on color or shape of object in an image. Segmentation allows to extract objects in images. Some of the segmentation techniques are as follows.

- Region Based Methods
- Mean shift algorithm
- Discrete step algorithm
- Otsu's Segmentation method
- Watershed Segmentation
- Texture based Segmentation methods

Image representation - Representation and description follow the output of a segmentation stage, which usually is raw pixel data, constituting either the boundary of a region or all the points in the region itself. Choosing a representation is only part of the solution for transforming raw data into a form suitable for subsequent computer processing.

Description deals with extracting attributes that result in some quantitative information of interest or are basic for differentiating one class of objects from another. For example extracting the regions with specific colors for the interpretation.

Image interpretation -It interprets the image to predict the medical condition of the individual.

Validation and testing

1. Subjective Testing – This can be done by comparing interpretation with the interpretation done by experts in IBERC, Thane from where the images used in the proposed study are collected.
2. Objective Testing – This can be done by various statistical tests available such as ANOVA, t-test and Chi-square test etc.

12. Conclusion and future direction

Review concludes that human biofield can be used as an effective health diagnosing tool. Today's modern investigations like Sonography, X-ray, MRI, Pet scan can diagnose diseases which are present in the physical body. Whereas human biofield provides not only physical status but also mental and emotional status of an individual. It also accurately predicts the diseases which may occur in future. It is widely used as an input by various energy healing techniques known as biofield therapies to detect imbalance in the energy field. As it is mentioned by various researchers, information revealed by human biofield can be used in medical, social and security applications. This review observes lack of automated techniques for evaluation of live biofield images. Hence the proposed study is an attempt to design an automated technique to perform the biofield evaluation using digital image processing and machine learning tools.

Following are some of the works which will be done during proposed study.

1. Detail study of structure of the biofield image and process of deciphering the same
2. Deriving image processing algorithms to detect various color spectrum and their boundaries in a biofield image
3. Match the pattern of the color spectrum of specific area of interest in an image to detect disharmony or disease associated with area of interest.
4. Analyze effectiveness of the treatment on human biofield
5. Create a database of Biofield images which can be used for further references and testing the image processing algorithms

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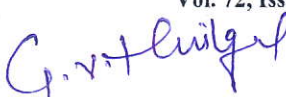
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Vol. 72, Issuc. 01, No. 5 Jan - June-2023


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