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A Review on Osteoarthritis Detection From Thermal Images

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***Abstract*— Arthritis is viewed as a disease caused as a result of inflamed joints. Arthritis is the most familiar element of disability in the world. Now a days in India there are six common Arthritis. Those are Rheumatoid Arthritis, Osteoarthritis, Gout Arthritis, Juvenile Arthritis, Ankylosing, Spondylitis, Psoriatic Arthritis. Though X-ray scans alone are insufficient to detect the type of arthritis easily, Image processing can improve the diagnosis. Therefore, there is a need for effective model development to identify knee arthritis. The previous study neglects identify both Osteoarthritis, Rheumatoid Arthritis and Gout Arthritis together. In this paper we develop image processing models for identification of arthritis types like Osteoarthritis. Because those are frequently occurred arthritis types. In this study, we have done image preprocessing(image size normalization 224x224,image denoising and RGB to Gray scale conversion), image segmentation (fuzzy c means Segmentation),image feature extraction GLCM classification of arthritis(SVM) techniques were conducted..**

KEYWORDS-Arthritis, Rheumatoid Arthritis (RA),Osteoarthritis(0A),GoutArthritis(GA),Image processing, SVM

I. INTRODUCTION

"Arthritis" is the sum of two words which is originated by Latin and Greek. In Greek, "Arthron "describe joint and in Latin "It is" describe inflammation. Thus we state that arthritis is a disease caused as a result of inflamed joints. by nature, it is a collection of medical problems collectively termed as "Arthritis". Arthritis is an usual, old, and frequently occurred inflammatory disorder affecting one or more joints of the body with different causal factors but, these factors are not only due to Arthritis including injury, genetics, obesity disability, trauma, infections, autoimmune disorders, and idiopathic(unknown) causes in the world today Impairment due to Arthritis disorders has increased by 45% from 1990 to 2010 and osteoarthritis is listed as the fastest increasing major health condition and ranked second as cause of impairment by World Health Organization (WHO) Arthritis and rheumatic conditions are a major economic and health burden to society

Arthritis are difficult to identify because their symptoms are mostly similar. Therefore, there is a need apply Arthritis identification model using image processing methods and svm on machine learning approach. Image Processing now days is among rapidly growing technologies. It comes core research area within engineering and computer technology disciplines. It can apply in different problem domain such as health sector industries for the purpose of quality, classification and identification. It is a process in different ways, in order to reduce distortion, noise, and enhance an image and extract information from the image Therefore, image processing is used for improving the visual appearance of images to a human viewer and preparing images for extraction of the features and representations for future analysis.

We use this technology to help health sectors. Image processing techniques are used to perform image understanding, image preprocessing, image segmentation and feature extraction to identify the shape, size, texture of the Arthritis. Image processing techniques help to handle digital images using computer algorithms to provide accurate and effective analysis of images This thesis focus on identifying common Arthritis using image processing techniques. Among common Arthritis like: -

Osteoarthritis (OA), Rheumatoid Arthritis (RA) and Gout Arthritis (GA).So this study focus on

identification of three common Arthritis.

Osteoarthritis (OA) is one of the most common forms of Arthritis disease that is seen mostly in females, overweight and elderly people and also a joint disease that mostly affects the cartilage The main symptoms of OA are pain and difficulty in joint motion, reduced function and participation restriction, joint stiffness in the morning. And commonly affects joints like knee, hips, and feets. According to World Health Organization (WHO) osteoarthritis is a serious disabling disease, statistically 1 in 10 developed countries are under its influence. Worldwide estimates of 9.6% men and 18.0% women over 60 years of age have symptomatic OA.

II. LITERATURE SURVEY

Many different thermal imaging systems have been tested over the years since dedicated medical thermographs have been available Many studies have been performed which show the anticipated normal pattern of temperature shown in a thermal image.

Mikhail S. Tarkov et al. have proposed Evaluation of a Thermogram Heterogeneity Based on the Wavelet Haar Transform [7]. This method approach is based on a statistical processing of the thermal image histograms. It is shown that the histogram transform analysis gives much new information about change of the human organism state. At the same time, it is stated that both a sharply heterogeneous and a sufficiently smooth for visual perception (diffusive) thermal pictures can give the same histograms. For this reason, the image heterogeneity degree, being independent informative characteristic of the thermal pattern, necessitates a development of special methods for its quantitative description. The mentioned method devote efforts to search the quantitative criteria of the image heterogeneity and adequate algorithms for evaluating the heterogeneity degree.

Maria del C. Valdes et al. have proposed Multidimensional filtering approaches for pre-processing thermal images [8]. The method proposed by them effectively corrects some blurring effects typically found in thermal infrared images. For the case of a single frame image determines the direction and width of the blur slope and re-assigns the max and min values to the correspondent pixels in the gradient direction. Then, the area is shifted and the same process is done again, up to cover the full image. Image evaluation methods demonstrate the accuracy and quality of the results

Christophe L Herry et al. [9] used quantitative assessment of pain-related thermal dysfunction through clinical digital thermal imaging. This methods presents methods for automated computerised evaluation of thermal images of pain, in order to facilitate the physician'sto make proper decision. Firstly, the thermal images are pre-processed to reduce the noise introduced during the initial acquisition process and to extract the digressive background. Then, potential regions of interest are obtained using fixed dermatomal subdivisions of the body, isothermal analysis and segmentation techniques. Finally, they assess the degree of asymmetry between contra lateral ROI using statistical computations.

Mariusz Marzec et al. [10] described automatic method for detection of characteristic areas in thermal face images. This paper presents an algorithm for image analysis which enables localization of characteristic areas of the face in thermograms. The algorithm is resistant to subjects' variability and also to changes in the position and orientation of the head. In addition, an attempt was made to eliminate the impact of background and interference caused by hair and hairline. The algorithm automatically adjusts its operation parameters to suit the prevailing room conditions.

L.A. Bezerra et al. [11] proposed Estimation of breast tumor thermal properties using infrared images. Firstly is the development of a standardized protocol for the acquisition of breast thermal images which includes the design, construction and installation of mechanical apparatus. The second part is related to the challenge for the numerical computation of breast temperature profiles that is caused by the uncertainty of the real values of the thermo physical parameters of some tissues. Then, a methodology for estimating thermal properties based on these infrared images is presented in the paper.

Carsten Siewert et al. [12] Difference method for analyzing infrared images in pigs with elevated body temperatures. The only prerequisite is that there are at least 2 anatomical regions which can be recognized as reproducible in the IR image. Noise suppression is guaranteed by averaging the temperature value within both of these ROI. The subsequent difference imaging extensively reduces the offset error which varies in every thermal IR-image The aim of this study was to evaluate and analyse the RA based on skin temperature differences measurements, and bto automatically segment the abnormal regions of thermogram using EM algorithm and fuzzy c-means**.**

III. METHODOLOGY

This research follows experimental research**.** Because experimental research includes first we identify the research problem, second plan how to do the experimental study, third conduct the experiment, then Analysis the data and write the paper and describe the result. So the study full fill this criteria. And also the experimental method is a systematic and scientific approach research in which we can manipulates one or more variables, and controls and measures any change in other variables. Experimental research is a study that strictly compatible to a scientific research design. To do this research work, extensive experimentation we follow the step by step procedure in image acquisition, image pre-processing, segmentation, feature extraction and classification and object detection. The methods used in this research work are described in the following sections

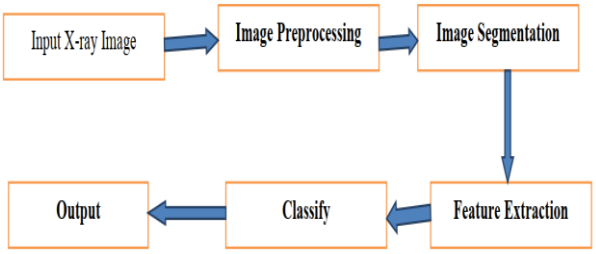

Figure 1. Research Process

This research process shows the steps from image collection to the classification of outputs since our research follows experimental research design . Then each experiment is doing in chapter four.

We use the following Image processing techniques:

- Image Accusation
- Image preprocessing
- Segmentation
- Feature Extraction
- Classification

Image Accusation:-We collect Arthritis thrmal images

Image pre-processing: preprocessing image commonly used removing low frequency background noise images which is taken from the image device. The most commonly used preprocessing steps are as follows to reduce the preprocessing time, images are resized to lower resolution pixel and cropped for removing extra areas

Segmentation:-segmentation is one of the most important since it affects the accuracy of the subsequent steps. However, segmentation is difficult because of the great variety of injury shapes sizes and along with different Arthritis and textures. Image segmentation is one of the most important steps leading to the analysis of processed image data. It is the most important area of research in computer vision.

Feature Extraction: In feature extraction, the features of Arthritis lesion are extracted to feed into the classifiers. The feature would be measurable, highly sensitive, high specificity.

Classification: To extract the feature and classify Arthritis we use support vector machine (SVM)

IV. CONCLUSION

This One of the great virtues of this technique is that it is objective and non-invasive. This means that when the examination of a patient is difficult, e.g. dealing with young children or psychosomatic illness, thermal imaging is particularly useful. In many cases, the technique is not essential for diagnosis. However, in rheumatology, monitoring of disease progress is a major concern. In a disease with no known cure, drug treatment has to be rigorously assessed. In rheumatic diseases this is not a simple process. This is borne out by the extensive literature on the subject and the large number of available tests. No one single test adequately reflects the complex changes which occur in the whole patient with an inflammatory arthritis.. In this paper, we used two segmentation algorithms like fuzzy-c-means algorithm extracting the abnormality of osteoarthritis patients. The fuzzy clustering algorithm compares the colors in a relative sense and groups them in clusters. EM algorithm is an iterative algorithm of first order so it is slower in convergence which is applied for the thermal image processing of hand region did not provide the accurate and good results. Rather fuzzy c-means algorithm produced better results

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