Analysis of Faces of Family Members using Image processing Techniques

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Abstract: *The recognition of family members and maintenance of a strict vigil on the strangers in the households of urban area is a very vital and important problem, especially in densely populated metropolitan cities in India like Bangalore, Kolkata, Delhi, Bombay etc., where security is of a great concern as the home alone people are getting killed regularly. The scenario may not be different either in any other business cities of neighboring countries. Through this paper, we would like to throw light on how one can establish a relation between the members of family.*

Keywords: *image processing, entropy , strangers, family, relationships,*

I. INTRODUCTION

Image processing is a form of signal processing in which the input is an image and the output may be either an image or a set of characteristics related to the image. Over the last three decades, most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. In the "real world" image processing is considered to be a function of two real variables, for example, A(x,y) with A as the amplitude (e.g. brightness) of the image at the real coordinate position (x,y).

Recent development in the digital technology has made it possible to manipulate multi-dimensional signals with systems that range from simple digital circuits to advanced parallel computers. The objective of this manipulation is divided into three categories:

    a) Image Processing- where input is image and output is also an image

    b) Image Analysis – where input is image and output is its measurements

    c) Image Understanding- where input is image and the output is high-level description of the image

Image analysis is the extraction of meaningful information from images by means of digital image processing techniques. Image analysis tasks can be as simple as reading bar coded tags or as sophisticated as identifying a person from their face.

Security is the degree of protection from harmful elements. It applies to any vulnerable and valuable asset, such as a person, dwelling, community, nation, or organization. Perception of security can increase objective security when it deters malicious behavior with visual signs of security protections, such as video surveillance, alarm systems in a home, or an anti-theft system in a car such as a vehicle tracking system or warning sign. Since some intruders will decide not to attempt to break into such areas or vehicles, there can actually be less damage to windows in addition to protection of valuable objects inside. Without such advertisement, an intruder might, for example, approach a car, break the window, and then flee in response to an alarm being triggered. Either way, perhaps the car itself and the objects inside aren't stolen, but with perceived security even the windows of the car have a lower chance of being damaged

Machine vision (MV) is the technology and methods used to provide imaging-based automatic inspection and analysis for such applications as automatic inspection, process control, and robot guidance in industry [1],[2]. The scope of MV is broad[2], [3], [4]. MV is related to, though distinct from, computer vision. Pattern recognition includes template matching. finding, matching, and/or counting specific patterns. This may include location of an object that may be rotated, partially hidden by another object, or varying in size [4].

Computers are indispensable for the analysis of large amounts of data, for tasks that require complex computation, or for the extraction of quantitative information. On the other hand, the human visual cortex is an excellent image analysis apparatus, especially for extracting higher-level information, and for many applications, including medicine, security, and remote sensing. Human analysts still cannot be replaced by computers. For this reason, many important image analysis tools such as edge detectors and neural networks are inspired by human visual perception models. There are many different techniques used in automatically analyzing images. Each technique may be useful for a small range of tasks, however there still aren't any known methods of image analysis that are generic enough for wide ranges of tasks, compared to the abilities of a human's image analyzing capabilities. Examples of image analysis techniques in different fields include:

i)2D and 3D object recognition ii) image segmentation iii) single particle tracking iv) video tracking the

v) medical image scan analysis vi) optical flow vii) automatic number plate detection viii)medicine
 ix) Robotics x) astronomy xi) material science and xii) optical character recognition etc.,

Digital Image Analysis is a process in which an electrical device automatically studies an image to obtain useful information from it. The device is often a computer but may also be an electrical circuit, a digital camera or a mobile phone. The applications of digital image analysis are continuously expanding through all areas of science and industry.

Geographic Object-Based Image Analysis was studied by [5]. Also, Front-End Vision and Multi-Scale Image Analysis is implemented by [6]. Quantitative Image Analysis of Microstructures in an image is studied in detail by [7].   The authors in [8], [9],[10] analyzed facial expressions with respect to Japanese female faces and Indian faces. Later the same theory is extended to navarasa expressions exhibited in a south Indian dance style[10]. But none of these papers concentrated on establishing any relation to faces of members of a family. Especially in a multi cultured families in Indian society, we notice members of a family posses inherently the physical characteristics of their parents. This is noticed very well even through naked eye. Establishing the relation between the faces of members of the family is a tricky task. It will serve two purposes. One to avoid disowning a family member after the crime and the other is to recognize a family member and to allow him to access the house to avoid the crime. So far a thorough survey of the literature confirms that no work pertaining to the present topic of research is available. Therefore, the present investigation is carried out to throw light on the subject of research.

Figure 1. Sample Face images of different family members of different parts of Karnataka

II. FORMULATION OF THE PROBLEM

The case study is strictly limited to the state of Karnataka in India. Database used in the analysis of faces of a family are obtained from 30 different families from different parts of Karnataka, India. The data set contains 120 grey scale face images with four members of the family like father, mother, first child and second child. The size of each image is 256x256. Data set is created by us using Sony cyber shot camera with 12.1 mega pixels resolution. Sample of the images are shown below in figure 1. All the faces are facing the camera.

III. METHODOLOGY

Large number of methods is available to analyze the images for extracting different features of images. After collecting the database in jpeg file form, we have preprocessed the images to have the same resolution and then resized all the images in to256 x 256 size and converted all of them to a grey scale image to reduce the memory requirement. Though the edge detection method and the histogram comparison method can help us understanding the similarities in the pattern of the face and the distribution of the pixels, quantification of the difference in image or similarity in image became difficult. Hence we have used the method of extracting total

information on each of the image in terms of entropy. Also, we had extracted the asymmetric distribution of pixels in terms of skewness and kurtosis. This has really given us a fruitful information to establish and correlate the members of a family. For every ten families, six families are found to have similar variations on these parameters

IV. EXPERIMENTS AND RESULTS

Experiment is conducted family wise and each time entropy, skewness and the kurtosis are calculated using the VC++ software programmes. After getting the results for all the data set, the results are plotted using origin. 6.1 software to understand the variations. The resulting graphs are as shown below :
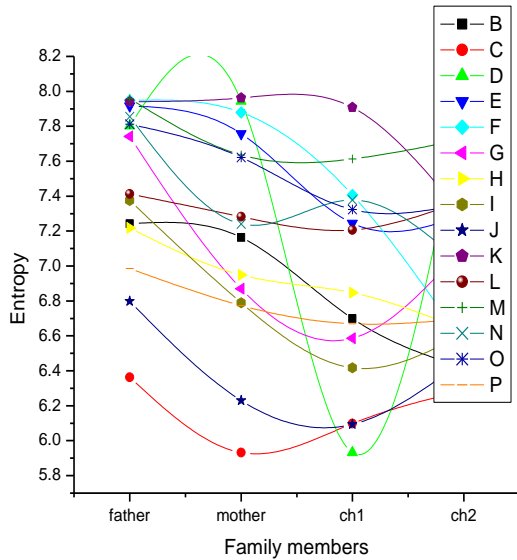
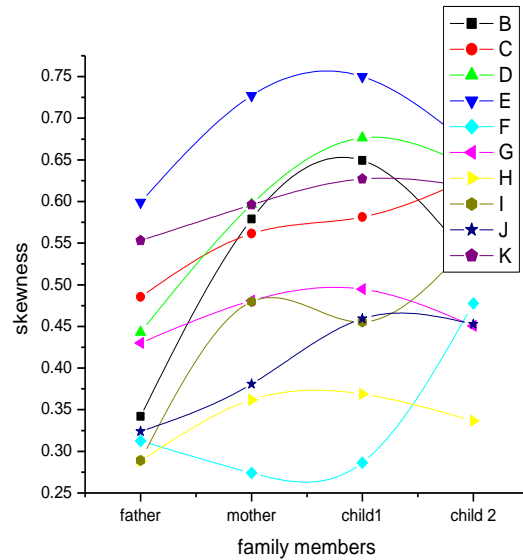**Figure 2. Graph of Entropy vs Face images of family.**

Figure 3. Graph of Skewness vs face images of family

From figures 2. and 3, it is clear that entropy and skewness are inversely proportional to each other.
The figure 4. Represents variation of kurtosis vs face images of the family members in order. It is clear from the figure that the variation in kurtosis of face images from father to the second child is increases in constant magnitude in six out of ten families. This is really an interesting result for establishing the relation between the members of a family. Difference in the level of kurtosis is due to the skin color complexions and the total pixels in the face aperture.
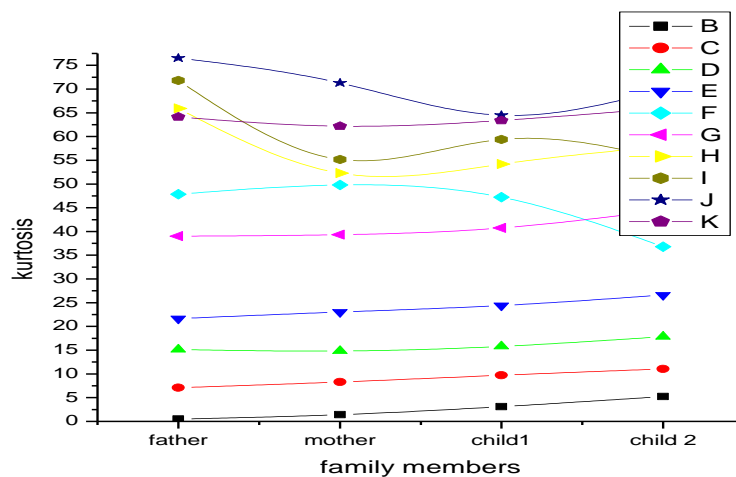
Figure 4. Graph of kurtosis Vs faces of a family

V. CONCLUSIONS

Of late in the city like Bangalore in Karnataka, India, the crime related to killing of old couples or home alone women have increased. The question is, whether we, as a society failed to educate elder people to overcome this kind of situations or the security system itself is not in place to help them on a regular base. The second one may not be possible as the horizontal growth of the city has increased enormously for the last decade and giving security to every lane is beyond ones imagination, and the type of threat cannot be predetermined either. We thought it is important for people in the city to take care of themselves and arrange for a security system on their own. But it is difficult to trust any external agency to do it for them every day. It is not possible also for them to open the door and access the person standing next to the door and then have a dialogue with them as the crime may happen during that time itself. Therefore it is vital to search for a method which acts as an alternative system to identify the family member and other members and give access to the house and do the needful. The above method is yet to implement. But, we find the result provides an excellent platform for future investigation. We will take forward our work to recognize and implement in practice so that the society can take the best use of it.

VI. REFERENCES

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