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Review on Emotion Detection in Image

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Abstract—

With the development of society and the increase of living standard tourism industry has become one of the strongest growth momentum. Tourism has turned out to be a very important industry in the modern age. An increase in demand met by a general growth in business activities has seen many regions develop the tourism economy. Travelers suffer from information overload when they use the Internet to look for information about potential destinations, events and related services. Unfamiliar geography makes them difficult to navigate streets and identify landmarks. They are unable to judge which place they visit first. The objective is to providing the relevant information to tourists about destinations with different personal interests and according to different mood of the tourist. In this paper a facial expression recognition system is developed using MATLAB(Neural Network Tool) and a survey is conducted for rating the destination places of Chandigarh tourist like to visit when they are in different emotional moods.

Keywords— Tourism, Chandigarh, Emotion

I. INTRODUCTION

Tourism has reached almost all regions of the world. Tourism today is one of the fastest growing industries throughout the world.A tourist economy has expanded consistently over the last few decades with global international arrivals. An increase in demand met by a general growth in business activities has seen many regions develop the tourism economy. Tourism in India has grown in leaps and bounds over years. According to World Tourism Organization survey report 2014, India was ranked 10th position in the Asia pacific region with around 6.8 million international tourists arrival and 62nd overall on the list of world's attractive destinations. People travel for leisure and recreational purposes. Due to people's inclination to seek out novelty, including that of traditional cultures, tourism has become a major "new" area of demand. A tourist faces many challenges in unfamiliar territory. In unfamiliar territory tourists are unable to take decision in which place they go or which place is best suitable to visit. Navigation system is useful in guiding them to a destination using graphics, text and voice information. They help them to finding a way to get to a place they are travelling. Modern tourists have huge possibilities to search information about interesting places through the Internet, but then decision-making becomes difficult for them from that huge list of places. They are unable to judge which place they visit first. Navigation System becomes an essential requirement for the tourists visiting unfamiliar territory. Sometimes, people come with preset mood because of certain circumstances like travelling fatigue, climate effect etc. in such cases travel experience get affected. They should visit the places where there should no further fatigue. There is an impact of effective states such as emotions and mood generated by leisure consumption services (Sirakaya et al. 2004, Zins 2002). So, to solve this problem an effort is done in developing facial expression recognition system and to provide the tourist visiting Chandigarh a priority wise list of destination places people generally like to visit when they are in different emotional state. Chandigarh is the best planned city in India, with architecture which is world renowned, and a quality of life, which is unparalleled. According to Chandigarh administration in year 2014, 885597 domestic tourists and 22998 international tourists visited city.

Emotions play critical role in rational and intelligent behavior. It is a mental state that does not arise through free will and is often accompanied by physiological changes. These changes need to be monitored as they contain information about different types of emotions which will assist in understanding behaviors. Emotion is a strong feeling deriving from one's circumstances, mood, or relationships with others. Emotions seem to rule our daily lives. We make decisions based on whether we are happy, sad, angry, or surprised. We choose activities and hobbies based on the emotions they incite. Emotion plays a vital role. Emotions play a central role in decision making, problem solving, communicating, negotiating and adopting to unpredictable environments. It consists of external physical expression as well as internal feelings, thoughts and internal processes which the person experiencing the emotion may not be aware of. Of all the nonverbal behaviors- body movements, postures, gaze, voice, etc- the face is probably the most accessible window into the mechanisms which govern our emotional and social lives. Realistic animation of faces would serve a major role in bridging the gap between man and machine. Machines that can recognize emotions will be able to relate to the emotion of the user. Facial expression is one of the most powerful, natural and immediate means for human beings to communicate emotions and intentions. Often emotions are expressed through the face before they are verbalized.

Two procedures are necessary for an automatic expression analysis system: facial feature extraction and facial expression recognition. In facial feature extraction, there are mainly two types of approaches: geometric feature-based methods and appearancebased methods. In geometric feature-based methods, the facial components or facial feature points are extracted to form a feature vector that represents the face geometry. In appearance based methods, image filters are

applied to either whole-face or specific regions in a face image to extract a feature vector.Geometric feature extraction can be more computationally expensive, but is more robust to variation in face position, scale, size, and head orientation. In facial expression recognition, most automatic expression analysis systems attempt to recognize a small set of prototypic expressions.

The neural network performs the very important role for recognizing the facial expression. The artificial neural network is an information processing paradigm that is inspired by the way of biological nervous system. An ANN is configured for a specific application such as pattern recognition or data classification through a learning process. Learning system involves adjustments to synaptic connections that exist between the neurons. For analyzing any type of information, trained neural network treated as an "expert"system. The neural network has an ability to do task based on data given for training and it also creates its own organization during learning time. Artificial neurons are a device with many inputs and one output. After getting the inputs from the pre-processing block the neural network trains the network by using different modeling techniques and provides the recognized output. For implementation of face detection and neural network involve the image processing toolbox and neural network toolbox of MATLAB.

The main objective of this paper is to develop a real time monitoring system that will recognize four human emotions i.e. happy, sad, angry and surprised through face recognition and then show the priority wise list of places tourist like to visit when they are in a particular mood.

II. LITERATURE REVIEW

Face is a complex multidimensional visual model and for developing a model for face recognition is difficult task. Facial Expression Recognition plays a vital role when it comes to developing multi-cultural visual communication systems for emotion translation. Various researches has been done in this field. The below are the some literature review of previous papers related to facial expression recognition.

Ekman(1969) studies emotions using facial expressions in different cultures. He uses six basic emotions i.e. happy, sad, anger, surprise, disgust and fear. These six basic emotions have been accepted widely and till date they are used. Ekman later expanded various emotions in his list.

Lyons et al. (1998) Method for extracting information about facial expressions from images is presented. Facial expression images are coded using a multi-orientation, multi-resolution set of Gabor filters which are topographically ordered and aligned approximately with the face. The similarity space derived from this representation is compared with one derived from semantic ratings of the images by human observers. The results show that it is possible to construct a facial expression classifier with Gabor coding of the facial images as the input stage. The Gabor representation shows a significant degree of psychological plausibility, a design feature which may be important for human-computer interfaces.

Yang et al. (1999) they created and emotion avatar image (EAI) as a single representation for video or image sequences for emotion recognition. They used scale invariant feature transform (SIFT) flow algorithm to align the face images which is able to compensate for large global motion while maintaining facial feature emotion detail.

Zhang et al. (2005) developed a semi- automatic acquisition technique to obtain emotion information using a sentence or text. They constructed a Chinese language emotion thesaurus in which words has its own classification (such as commendatory, derogatory) and the corresponding emotion information. Their emotion recognition system was able to analyze the textual input, using sentence and paragraph to obtain the emotion such as the emotion value and category of emotion.

Cowie et al. (2005) developed an intelligent emotion recognition system, interweaving psychological findings about emotion representation with analysis and evaluation of facial expressions. They created a system which is based on fuzzy rule for classification of facial expressions.

Valstar et al. (2006) designed a fully automatic system for fast and robust facial expression recognition from face video. They analysed subtle changes in facial expression and their temporal behaviour by recognizing facial muscle action units. These action units helped in the detection of facial expressions of emotions, attitudes and moods from facial signals in a face video. A fully automatic facial localization method is used to detect 20 point of interests in the first frame of an input face video. Support, vector machine trained on a subset of most informative spatio-temporal features, is used for recognition of temporal segments and muscle action units.

Chakraborty et al. (2009) presented a fuzzy relationship approach to human recognition from facial expressions and its control. Their proposed scheme used external stimulus to excite specific emotions in human subjects whose facial expressions were analysed by segmenting and localizing the individual frames into regions of interest.

Li et al. (2009) designed an emotional chatting system incorporating personality factor. The participants were asked to chat with the emotional chatting machine. The recorded results from the chat were then read by another machine which followed basic emotion reasoning rules.

Ryan et al. (2009) Focuses on real-time system which will detect the seven universal expressions of emotion disgust, Fear, Anger, Contempt, Sadness, Surprise and Happiness providing investigators with indicators of the presence of deception during the interview process. In addition, the system will include features such as full video support, snapshot generation, and case management utilities, enabling users to re-evaluate interviews in detail at a later date. Heightened concerns about the treatment of individuals during interviews and interrogations have stimulated efforts to develop "non-intrusive" technologies for rapidly assessing the credibility of statements by individuals in a variety of sensitive environments.

AlMejrad (2010) studied emotions of human using wave signals of wave and classified emotions of human in three types i.e. social, motivational or social. These types represent different human emotions i.e. basic type includes emotions like

disgust, anger, fear, sad, happy and surprise, motivational type includes emotions like hunger, thirst, pain and mood and social type includes emotions like pride, embarrassment, shame and guild.

Calix et al. (2010) focused on automatic emotion detection in descriptive sentences and used it to tune facial expression parameters for 3-D character generation. They compared manual and automatic word feature selection approaches to determine the influence of word features on classification accuracy using support vector machines (SVM).

Dailey et al. (2010) Two studies explored the effect of culture and learning on facial expression understanding. Japanese and U.S. participants interpreted facial expressions of emotion. Each group was better than the other at classifying facial expressions posed by members of the same culture. The reciprocal in-group advantage was reproduced by a neuro computational model trained in either a Japanese cultural context or an American cultural context. The model demonstrates how each of us, interacting with others in a particular cultural context, learns to recognize a culture-specific facial expression dialect.

J.L.Rehaja et al.(2010) A system is developed that recognize the different human gesture in color image. Depending on threshold value the researchers system can recognize the facial expression. The approach of this system can be adapted to real time and describes the schemes of capturing the image and to recognize the gestures.

M. Agrawal et al.(2010) In this paper the method of eigenfaces are discussed which are calculated by using Principal Component Analysis(PCA). Two type of methodology was introduce- feature extraction using principal component and feed forward back propagation neural network method.

Hamdi et al.(2012) they aimed to recognize the six, basic, primary emotions proposed by Ekman, using a widely-available and low-cost brain-computer interface (BCI) and a biofeedback sensor that measures heart rate. It exposed participants to sets of 10 IAPS images that had been partially validated through a subjective rating protocol. Results showed that the collected signals allowed us identifying user's emotional state. In addition, a partial correlation between objective and subjective data can be observed.

Saudagare et al.(2012) they reviews various techniques of facial expression recognition systems using MATLAB (neural network) toolbox. The task of detecting face is complex due to its variability present across human faces including colour, pose, expression, position and orientation. So using various modelling techniques it is convenient to recognize various facial expressions. In the field of image processing it is very interesting to recognize the human gesture by observing the different movement of eyes, mouth, nose, etc. Classification of face detection and token matching can be carried out any neural network for recognizing the facial expression.

Valstar et al. (2012) presents a a meta-analysis in automatic recognition of facial expressions, It details the challenge data, evaluation protocol, and the results attained in two sub challenges: AU detection and classification of facial expression imagery in terms of a number of discrete emotion categories. It also summarise the lessons learned and reflect on the future of the field of facial expression recognition in general and on possible future challenges in particular.

Quazi et al. (2012) an algorithm is being developed for automatic recognition of emotions using various clustering techniques. The partial developed system has shown good results in monitoring the physiological parameters. A smart sensing system, which would help in detecting human emotions based on information from physiological parameters obtained from sensors, has been designed and developed. Sensors continuously monitor the heart rate, skin conductance and skin temperature. The amplified and filtered signals from the sensors are then processed by a microcontroller and transmitted wirelessly using Zigbee technology. The received signals from the system are displayed and stored on the computer where they are analysed visually for obvious patterns.

Pushpaja et al.(2012) This paper reviews various techniques of facial expression recognition system using MATLAB(Neural Network Toolbox).Classification of face detection and token matching can be carried out any neural network for recognizing the facial expression.It presents coding and decoding methodology for face recognition.

Shivhare et al. (2012) here emotion recognition based on textual data and the techniques used in emotion detection are discussed. Emotion can be expressed in many ways that can be seen such as facial expression and gestures, speech and by written text. Emotion Detection in text documents is essentially a content – based classification problem involving concepts from the domains of Natural Language Processing as well as Machine Learning.

Savran et al. (2013) here the first practical 3D expression recognition using cheap consumer depth cameras was done. Despite the low fidelity facial depth data, and show that with appropriate pre-processing and feature extraction recognition is possible. Their method for emotion detection uses novel surface approximation and curvature estimation based descriptors on point cloud data, is robust to noise and computationally efficient. Experiments show that using only low fidelity 3D data of consumer cameras, we get 77.4% accuracy in emotion valence detection. Fusing mean curvature features with luminance data, boosts the accuracy to 89.4%.

Lin et al. (2014) Studies static 2D face images through reconstructing 3D model by a specific algorithm. Geometric features are collected and obtain the three-dimensional space of false geodesic distance. There are two emotional changes. Then remove the relative feature extraction. Finally, compares the test sample and the training samples about the Mahalanobis distance. The experimental results show the recognition rate reaching to ninety percent. Results illustrate the validity of the algorithm.

V. CONCLUSION

In this paper an emotion recognition system was developed which is based on data provided and also provided a priority wise list the people generally like to visit places in the city beautiful(Chandigarh)when they are in various different moods.The neural network approach is based on face recognition and feature extraction.

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