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Detecting Human from Environment: Using AI for embellishing preprocessing step of Human Accedence

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***Abstract-* In order to enhance the surveillance system, detecting human and acceding their behavior is a must requirement. This research paper is presenting a methodology towards improvement of human detection approaches. Human dataset is created through 2D images by developing feature vector of humans using various image processing techniques in order to extract the human contours from the environment. As per the studies head is a most distinct part of human, head features are extracted to train the neural network and make it able to perform classification between human and a non-human entity.**

***Keywords*- human detection, feature extraction, classification.**

I. Introduction

Enhancing Surveillance System is an active topic in research, and Human Detection and Behavior accedence is the most significant domain for improving the surveillance system. Human Detection and Behavior Accedence is a process to employ expertise to thwart and retort to misdemeanor, doubtful activities, violence, and sabotage. Human detection and behavior accedence contrivances can be used by experts for avoidance of calamity or act in response to investigate. An intelligent system needs to develop to fill the gap between the human and computer vision [2], whereas edge detection methods are effective to extract to extract features from a 3D dataset as stated in [1], [3], [5]. Detection method includes differentiating human from the environment i.e. human versus non-human (while environments e.g. airports, railways, buses, traffic signals etc.) whereas accedence methods includes single person (e.g., lurking), multiple person interfaces.

Presently, 2D images can be captured easily due to popularity of digital cameras in mobile phones; images are captured conveniently and in a much lower cost, which is presently considered as the most important information carrier for the human recording and understanding. In the past decades, distinguishing between objects from the environment has become a research hotspot. The aim is to efficiently and robustly extract more information from the digital data which are present in form of 2D images and videos on the cloud. Extracting human from the environment to understand their behavior and securing civic areas are areas to deploy this model. Extracting Human features not limited to civic area security but also have significant role in garment industry, creating virtual environment.

This research paper focuses on automatic classification of human using neural network and image processing methodologies. The main aim of image processing is to extract the head features of the human from a 2D image as head is the only body part which is different from other objects, the set of multiple human heads as a unique feature vector is used to perform training of the machine and on the basis of learning the classification is performed between human and non-human

II. Proposed System Structure

We are surrounded with various detection system we frequently see them in our day-to-day life like metro stations, inside metro, bus stands, inside bus, offices, airports etc; basically we are surrounded with these detection system in all over the civic areas. But presently we need a system which can differentiate between a human and non-human from the environment.

The Proposed System is to extract the feature from the input using the feature extraction algorithm. Afterwards training is initiated and classified. The major step is to extract the input to generate an input data set for the neural network to perform training which is termed as feature extraction.

This proposed system consists of various sub-parts to form the complete system like extracting the feature, training the system and classifying the data. In below diagram the algorithm structure is shown:

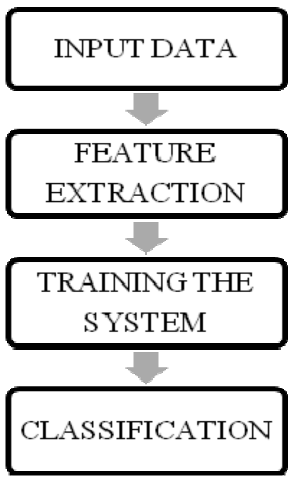


Fig.1. Algorithm steps for the proposed system.

III. Extraction Of Features

Feature Extraction is not a one step task, several processes are applied to extract the features from the input to get an input data set from which preprocessing of input, extracting the contour, applying edge detection , applying mask to extract the feature and generating the feature vector are major tasks respectively.

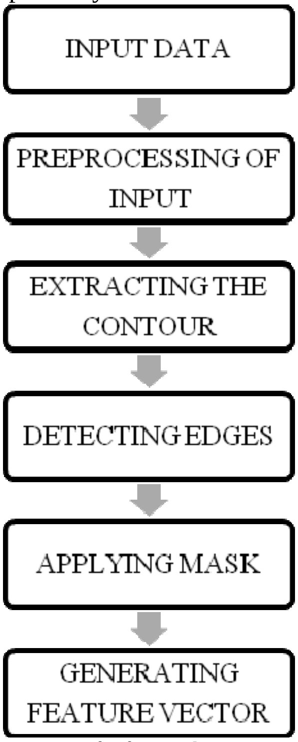
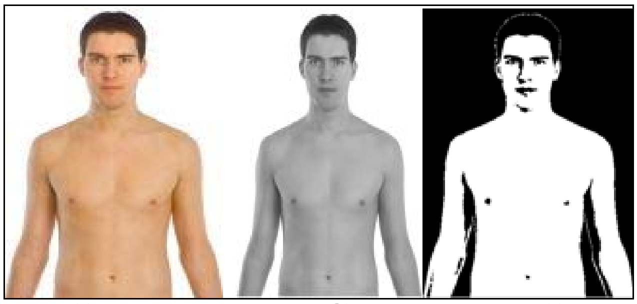


Fig.2. Steps for feature detection.

A. **Preprocessing** of an input is performed to get the more relative processed input to human. Here, we have chooses the green plane of an input human image as green plane is more intense to human details. The result is shown in figure below:

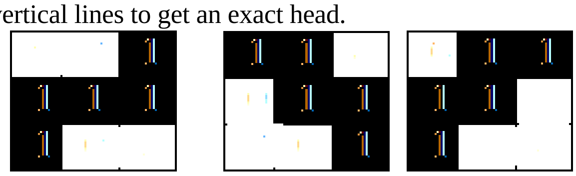


(a) (b) (c)

Fig.3. (a) Original Image, (b) Preprocessing results, (c) Extracted contour of human.

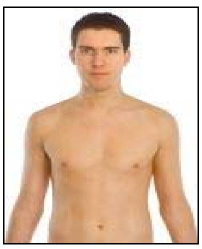
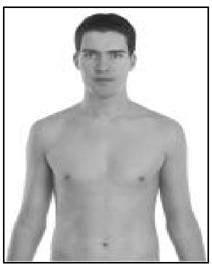
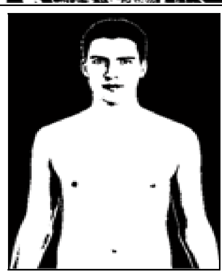
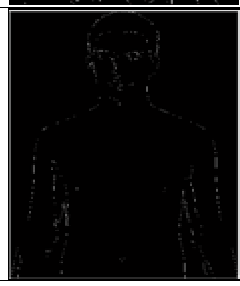
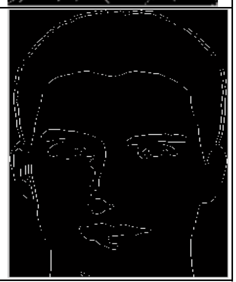
B. **EXTRACTION of CONTOUR** is performed to get the human from the background, the various dataset is optimized and a threshold value of 128 is evaluated to differentiating between the human and background. The result is displayed above in figure 3(c) after preprocessing (b) of original image (a).

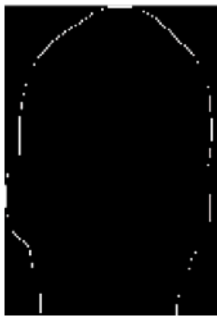
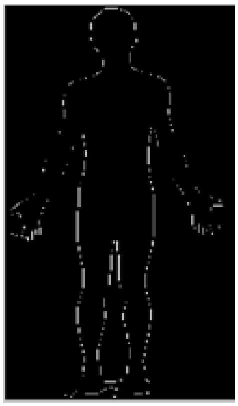
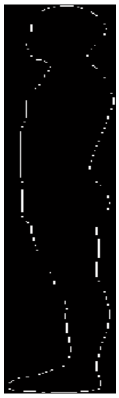
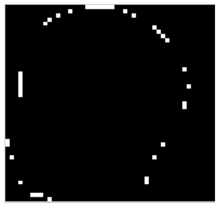
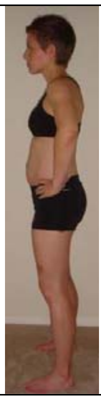
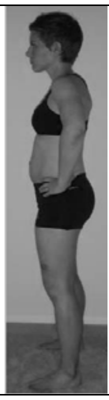
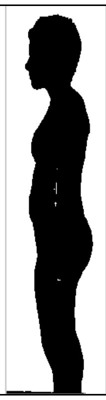
The next step in this process is applying edge detection in order to minimize and get optimal features from the contour. CANNY edge detection is applied and various masks are used to extract the features from the edge detection result. The result of canny edge detector on the extracted contour is shown in figure 5(a). As per the results of contour canny edge detector reflects all the edges in white while rest items are in black. The masks used for the feature detection are shown in the figure 4 from mask (a) to (f). There are a total of six masks are used to do extract the feature. The masks detects left arc, right arc, horizontal and vertical lines to get an exact head.

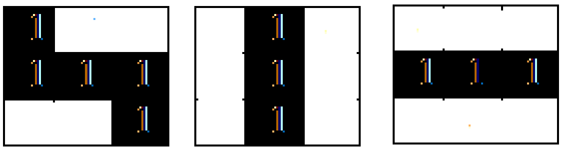


(a) (b) (c)

Table 1: Training Dataset Samples (Showing all major processes to get the final training dataset)

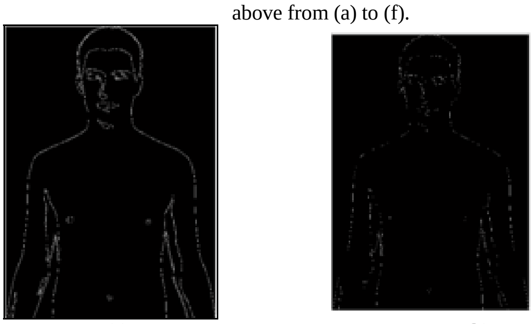
Dataset Details	**Actual Input**	**Initial Processing Result**	**Contour**	**Mask Result**	**Final Result**
1: Head region & shoulder only.					
2: Head to waist region only (semi-clothed).					

DATASET DETAILS	ACTUAL INPUT	INITIAL PROCESSING RESULT	CONTOUR	MASK RESULT	FINAL RESULT
3: Fully clothed Human with half body region.					
4: Full body human posture.					
5: Full body in side pose (1).					
6: Full body in side pose (2).					



(d) (e) (f)

Fig.4. Six different masks are used to extract features which are shown above from (a) to (f).



(a) (b)

Fig.5. Extracted boundary of human (a), extracted feature of human (b).

These masks will results in an extracted featured boundary of human body which is shown in the figure 5(b). As we need some significant attributes to train the network for specific features of human for classification, we created the mask set.

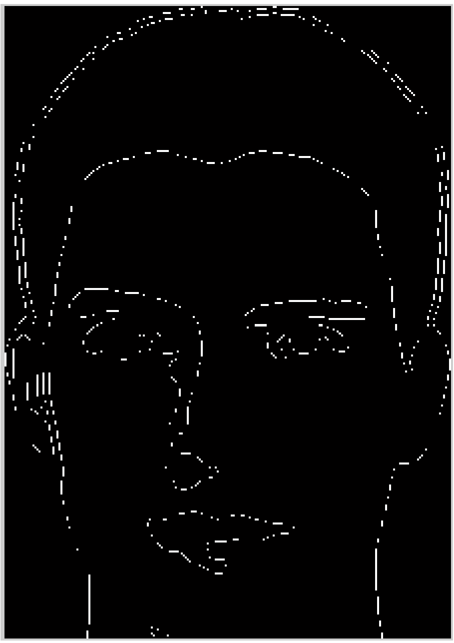


Fig.6. Extracted head

After extracting the major features from the input dataset, the next action is to extract the head features and to generate the input vector set for training. As, per our studies head is the most significant part to identify an object as human or not. Feature extraction for various body part is performed by segmenting them in the defined golden ratio proportion but it will differ by image type and size e.g., if only image has head portion or half portion of a human body than the ratio will be more where as if input image is having full length then this golden ratio portion can be applied there. The final resultant dataset to train the network is shown in figure 6 as the human head.

IV. TRAINING & CLASSIFICATION

Dataset has a significant role in training the system; the Table 1 presents a few set of dataset used in training process, from the table dataset 1 to 6 we have shown several dataset from a human head only parts to getting the full body part as well as side pose and at the end applying all the methodologies for extraction of features as mentioned in section III to get the final result as head of a human. We can observe from the table that each training sample is pre-processed to perform the major tasks as contour development, masking the contour to get the major attributes and then by applying golden ratio we had extracted our final training set as human head; all methods are needed to execute simultaneously. The final result is then sampled to make a vector of image metrics to train the network for classification as stated below.

In order to develop the proposed model, we trained this set of extracted datasets through neural network tool. This phase is performed in order to define the classification of human and non-human by machine itself.Training is performed in neural network in pattern recognition tool, whereas the INPUT data set and TARGET data set is generated in MATLAB to initialize the network. After the initialization it is proceed to train and after completing the training we can check the performance measures to understand its feasibility aspects.

Neural Network toolbox also provides inbuilt tools to re-train or test the system. 'nnprtool' can be used on command line to open the prompt of pattern recognition network tool wizard. Once the initialization is completed, we click on next button to set the data set for training, validation, and testing. By default the system uses 70% of the data for training and a 15-15 % data for validation and testing respectively.

Although the programmer can change this value as per their choice. After following the complete steps and completing the training we can observe the time taken to train the network, it depends on the number of dataset and complexity. Training performance, its state and confusion results can be viewed directly through the plot options or by command using plotperform, plottrainstate and plotconfusion respectively on the command line.

After training a neural network using processed data set, the next phase in continuation is to perform classification. We have train a network using the training setup procedures which will helps to classify a result on the new input on the network. The classification criteria is a human or non-human on the extracted feature set computed on a new input on the network, The network is trained to distinguish as human or non-human mathematically.

V. CONCLUSION

The need of future is an "Intelligent Surveillance System" which is highly sophisticated i.e. not only detecting human from environment detecting the behavior and can inform the authorities to take immediate actions to prevent the immense loss by the inauspicious behavior in public space.

The paper submitted a simplest method to compute a human from the environment using image processing techniques and classifying the result through neural network to increase the efficiency of security models by detecting and classifying a human and its behavior with other objects.

The proposed methodology has some limitations like not able to handle occlusions and bad light environment which can be although improved using: standard input device for processing, low penetration fluoroscopy based camera is used to extract more human features easily. Although the method is able to perform the desired task parallel reducing human efforts but more techniques needs to embed for a robust model.

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