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Video Processing Algorithm to Detect Air Gesture to Assist Wheelchair Bound People

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Abstract: Depending on the disease or disability, for multiple reasons wheelchairs are used either transitory or permanent. Some Wheel chair bound people may not have upper body strength to control the wheelchair while others might have lost their complete body strength and they find difficult in controlling the wheelchair and also they find difficulties in controlling the home appliances without the external assistance. To help such wheel chair bound people this Air gesture based wheelchair is a way to help them in controlling their wheel chair without the assistance of others. To detect the air gesture made in air against a camera an efficient algorithm is implemented. Depending on the gestures made in air, wheelchair movement takes place. The objective of this project is to compare between the existing algorithm and developed algorithms for better speed and accuracy.

Keywords: air gesture; developed algorithm; wheelchair.

I. INTRODUCTION

Human – robot integration interface is used to detect the gestures made in air using finger. This air gesture based wheelchair can be used by the physically handicapped and elderly people who have lost their limbs due to paralysis or by other reasons. These wheelchair bound people find it difficult in their day to day activities inside the home without the external help. This intelligent wheelchair makes it easy for these activities without the external help. And the other side these people find difficult in moving the wheelchair without the help from others. This automated wheelchair helps them to control the movement of wheelchair and day to day activities inside the home on their own. In many approaches were followed in the existing system to automate the control of the wheelchair. Due to some inconvience and improper implementation this techniques are eradicated. So in this proposed system controlling the wheelchair using air gesture mechanism system using the finger. These gestures are captured and this will control the movement of the wheelchair and day to day activities. When the user show the gesture in front of the camera, Camera is placed such that it can capture air gestures. it is send to the processor and it will process it and change the movement of the swheelchair. Wheel movement can be controlled in forward, reverse, left, right and stop directions according to the gestures along with home appliances control.

AES is solitary of the algorithms with the purpose of being used intended for security, which is proposed under the NIST. AES perform the encryption of the data as an ECB cipher type. AES perform encryption of 128 bit data, which is symmetric (that is same key is used for encryption as well as the decryption process). It has four modules, at the end of every round a secret message text is obtained as product.

II. LITERATURE SURVEY

For drawing or writing no physical means is required. Symbols can be drawn from bare hand in air. Non time wrapping approach is adopted to detect bare hand motion symbols drawn in air. Finger is detected from the Start and end points of symbols drawn in air from the bare hand. From this approach 96% accuracy is achieved. [1]

Air controller recognizes the hand gesture drawn by the user and air controller has leap motion in it. Users can interact with the system through hand via VR device. In this paper they have introduced new hand gesture system with the normal palm which has synchronization of leap motion and oculus rift. There is a new technique i.e, the users are allowed to adjust the hand motion speed to get a smooth moving acceleration. [2]

Depending on the hand gestures shapes ten hand gestures can be recognized. In This paper they have introduced a new algorithm in which three shape based features are introduced to detect the gesture made by the hand. There are three steps involved in this algorithm they are: Segmentation, feature calculation and classification. This algorithm has 200 images of database. This algorithm became successful in identifying 182 images. This new technique has got a accuracy of 91%. [3]

III. IMPLEMENTATION

The figure shows the flow diagram of proposed algorithm. To detect the gestures made against camera the step by step procedure is carried out.

Input the gestures made from the finger: the images are collected from the webcamera. The figure 2 shows the gesture images made from the finger that are collected from the database. Once images are collected, suitable color model is selected in order to preprocess it.

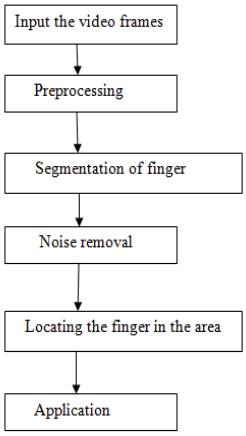

Fig 1. Flow chart of the proposed algorithm

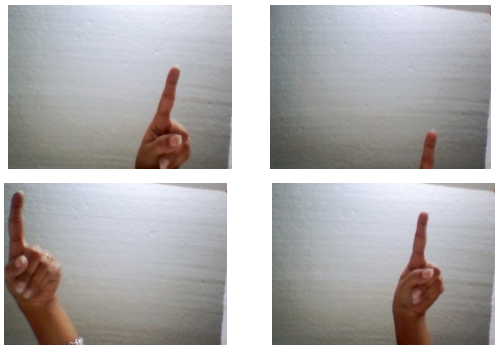

Fig 2. Images of finger from database

Preprocessing: Once the images are collected from the database images are preprocessed to select suitable color model using different color model. Different color models such as RGB, YCbCr and HSV color model.

Preprocessing using RGB color model: images that are processed using RGB color model will be brightness dependent. Hence, this color model is not suitable. Figure 3 shows the images after performing the RGB color model.

(a) (b) (c)

Fig 3. Images of RGB color model (a) R component (b) G component (c) B component

Preprocessing using YCbCr color model: YCbCr model gives the images with independent brightness. Figure 4 shows the images after performing YCbCr model.

(a) (b) (c)

Fig 4. Images obtained after performing YCbCr color model (a) Y component (b) Cb component (c) Cr component

Preprocessing using HSV color model: this color model provides the amount of color and luminance and brightness added to image and at which layer images are varying. Figure 5 shows the images after performing HSV color model.

(a) (b) (c)

Fig 5. Images obtained after performing HSV color model (a) H component (b) S component (c) V component

After performing preprocessing using different color model, the result for saturation color model is selected as the best color model. The minimum and maximum intensity values of images collected from the database, are calculated for S color model. Saturation color model is selected for further process.

Segmentation process: In this segmentation process object of interest is converted as white and rest of the object i.e, background is converted as black. In segmentation process threshold values are considered, i.e, minimum intensity of the object. Different algorithms are tested such as single level thresholding, otsu's algorithm and two level thresholding algorithm. The two level algorithm is selected as the best algorithm for the images collected from the database. Figure 6 shows the flowchart for the two level thresholding.

In two level thresholding algorithm minimum and maximum intensity values are calculated and it considers one pixel at a time. Segmentation is carried out using the calculated intensity values. As a result, images of the two level thresholding will be obtained as the white finger and black background. Figure6 shows the images obtained after performing two level thresholding algorithm.

Noise removal: Noise removal is carried out remove unnecessary pixels from the image. There are two process in noise removal such as erosion and dilation. Figure 7 shows the images obtained after performing noise removal.

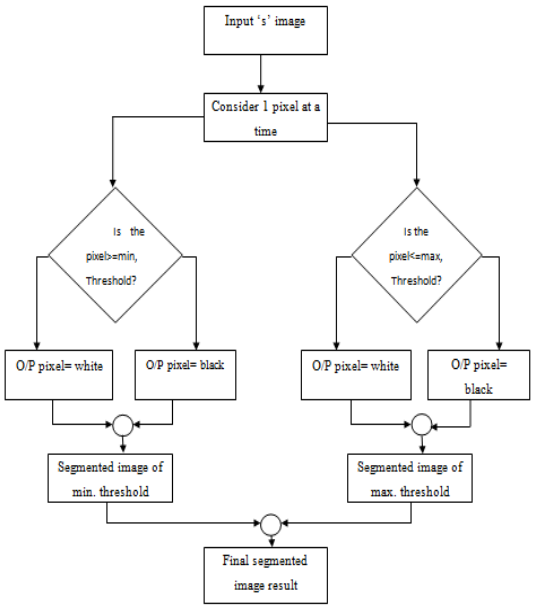

Fig 6. Flow chart of two level thresholding

Fig 7. Resulted image for two level thresholding

Fig 8. Image obtained after noise removal

Air gesture: After removing the unwanted noise the gestures are done according to the gestures made wheelchair starts moving.

Comparison: The proposed two level thresholding algorithm is compared with the existing algorithm to get a better speed and accuracy.

The whole process is done using matlab and hardware implementation is done. Depending on the gestures are made wheelchair starts moving and home appliances can be controlled. The block diagram of the proposed system is as shown in the above figure 9.

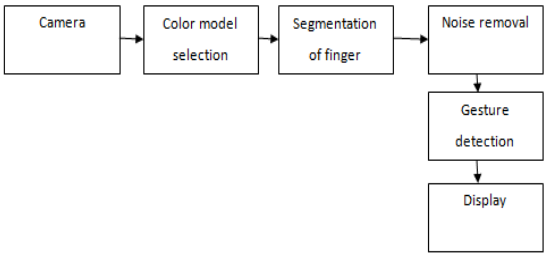

Fig 9. Block diagram of the proposed system

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