Wireless Data Transmission using Hand Gesture

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ABSTRACT:

Hand Detection has a significant role in human computer interaction (HCI) applications, as well as supervision. Inside this work, we design a structure that acquires and classifies users' hand gestures from images and videos. We provide input from the cameras from low resolution, our algorithm identifies the position and shape of the provided hand gesture and describes according to one of a number of predefined gestures. In our structure first we implement image processing techniques on the images to subtract background, noise effects on the image, and then take out appropriate features for categorization and then for appropriate gesture it will transmit wireless signal. The data transmission takes place with the help of arduino connected to system and received data with the help of HC-05 Bluetooth device at the Arduino end. It is appropriate for equally real-time and non real time categorization

KEYWORDS:

Image processing, hand gesture recognition, Pattern recognition, Human computer interaction, Human computer interface (HCI), Wireless Data transmission with arduino, HC-05.

INTRODUCTION:

Digital cameras are now incorporated into personal computers, mobile cellular devices and handheld computers. The primary point of developing hand gesture recognition arrangement is to generate a ordinary interface among human and computer where the predictable gestures can be utilized for passing on significant data. Gestures are of two types- Dynamic and Static Gesture [1]. Static hand gestures are defined as direction and pose of hand in the space during an amount of time without any movement and if a movement is there in the above mentioned time duration it is called dynamic gesture. Dynamic hand gestures include gestures involving body parts like waving of hand while static hand gestures include single formation without movement [2]. In a process, which is generally known and referred to as static hand gesture recognition, a person instructs the machine using his bare hands, whereas images of the persons hand gestures are captured and analyzed in order to determine the meaning of the hand gesture. In general, gesture recognition is considered as a very challenging field since natural environments tend to be rather unsuitable for gesture recognition due to bad illumination, non-uniform backgrounds, and so on.

The method of hand gesture recognition composes generally of four stages:

a) Hand gesture images collection

b) Gesture image preprocessing using some techniques including edge-detection, filtering and normalization

c) Capture the main characteristics of the gesture images using feature extraction algorithms, and

d) The evaluation (or classification) stage where the image is classified to its corresponding gesture class.

Real time gesture recognition is a challenging task. Gestures are extracted from video representing the signs performing static or dynamic gesture. Use of video bases information is increasing more and more. Due to this many research is done in the area of video processing. Key frame is very useful in the area of video abstraction, video summarization, video editing and animation. With the large amounts of video data available, it has become increasingly important to have the ability to quickly search through and browse through these videos. For that Key frame is very useful for the users

METHODOLOGY:

The design strategy of our project depends on the steps which we take during the implementation. There are two basic way of implementation in static gesture recognition, as follow as:

1. The top-down approach, where a old created model of collected information's about hand postures is rendered to some feature in the image coordinates. Comparing the likelihood of the restored image with the real gesture image is then used to decide whether the gesture of the real image is similar to which restored image.

2. The bottom-up approach, which extracts features from an input image and uses them to check images from a database , where the result is based on a similarity measurement of the database image features and the input features which is present in dataset.

The whole process of static gesture recognition can be widely divided into different phases, as shown in Figure 2.1. Each phase performs a particular task which is assigned to them, whose result is passed to the next phase and for the input of one's phase is output of the previous phase. The commonly used techniques for each phase are described in the following manner.

A) Input Camera Image: For the input the image is provided with help of camera. Cameras can webcam or mobile phone camera or depth camera depending on our requirement.

B) Hand Tracking and Segmentation: We have to track hand because there can be some other object in front of camera apart from hand. This can be done with the help of Skin segmentation. Generally, hand is located with the help of rectangular bounding box. Segmentation also consists of various other steps like erosion and dilation for connecting the boundaries.

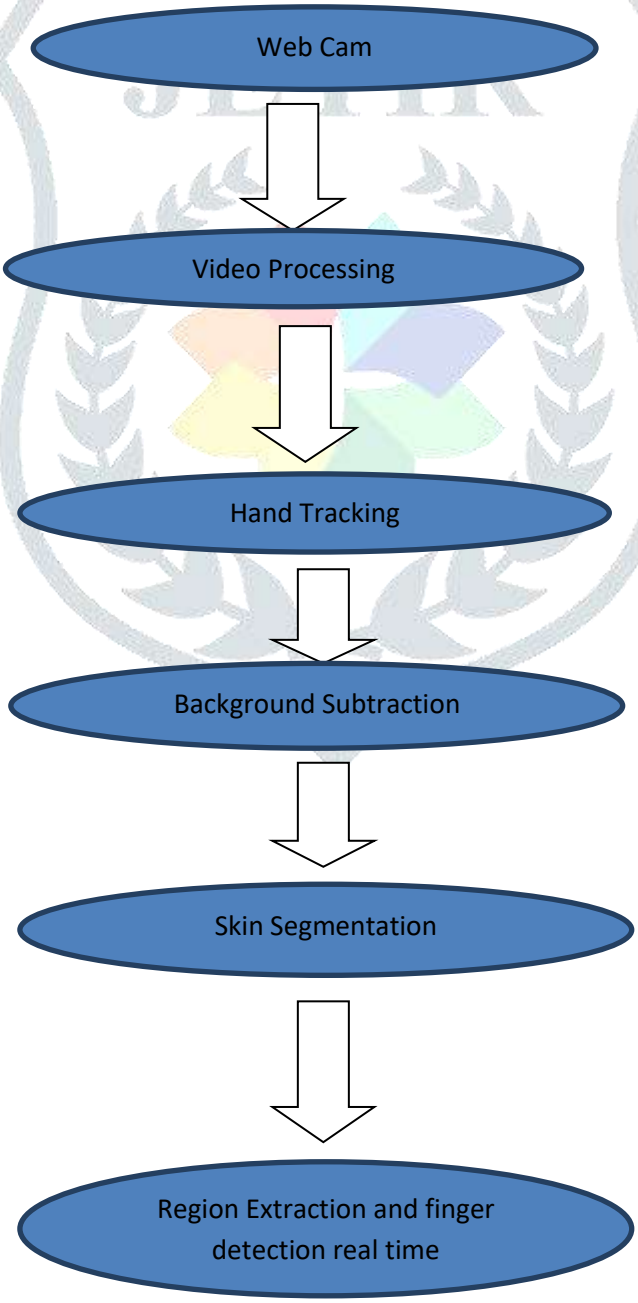
C) Feature Extraction: It consist of extraction of desired features according to our requirement. In hand gestures features related to shape of hand, posture of hand, no. of fingers and direction of fingers etc. are extracted [3] [4].

D) Training Database: Database is trained for a set of postures. There can be many hand postures but system will recognize only the trained posture. There can be different methods of training database like Template Matching, Neural Network.

E) Classification and Recognition: Classification can be done with the help of different classifier such as Support Vector Machine (SVM) [5] [6].Depending upon the extracted features and trained data, image is classified in different categories.

F) Gesture Recognized: When the gesture feature is executed, corresponding action is taken depending on Hand signal give as a input image.

G) Wireless Data transmission: At last when hand gesture is recognized at this moment we have to transfer the data using wireless data transmission to interface with the system. This recognized gesture transmits the data at the particular gesture and it will remain no signal transmitted at the specified hand gesture.



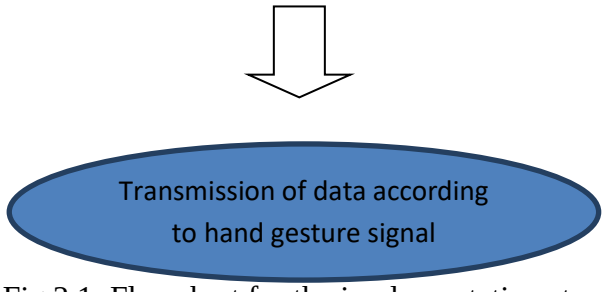


Fig 2.1: Flowchart for the implementation steps

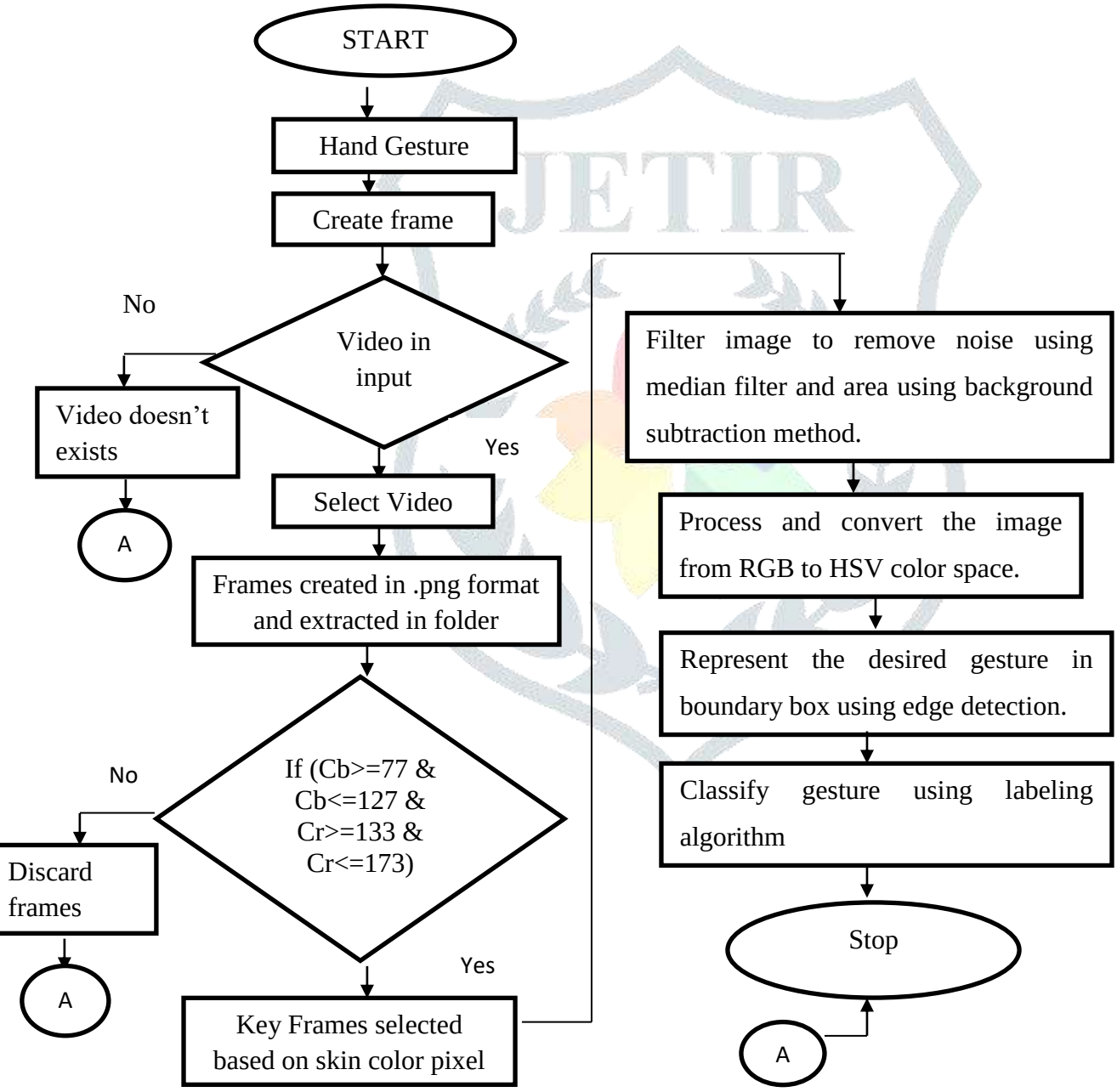


Fig 2.2: Flowchart for the proposed system

In figure 2.2, frames will be created after selecting existing images. The video folder needs to be of the required format .avi only and if some other formats exist then it will display folder doesn't exists. If camera is not initialized or is not able to capture a video the user will be required to restart the program.

Then the extracted frames from the video will be stored in a folder in the extension .png. From the extracted frames, the key frames will be extracted based on the range of skin color pixel as discussed in fig 2.2. Once the key frames are extracted from sequential shots of scenes it becomes easier to process the image and represent the area of the respected static hand gesture.

On the extracted key frames median filter is used to remove noise and background subtraction method to remove the unwanted areas.

In order to detect the skin in the image it needs to be converted to HSV color space. After image is converted to HSV color space explicitly defined skin model for skin detection is applied. This process helps to distinguish skin regions from the non-skin regions. The areas are detected by the edges of the fingers within the boundary box and finally the gesture representing number is classified using labeling algorithm.

RESULT:

After implementation of all technique now we check the results which we need to verify the resultant output and test it whether it is transmitted and detection is done according to input provided through camera .The result analysis divided into two categories:

1. Analysis of static response and real time without wireless transmission.
2. Analysis of real time with wireless data transmission.

There are different steps involved to find out the final output as the data is transmitted from hand gesture. The given table show the function we going to perform and the output which we are expected as given as input.

Description	Expected Outcome	As Expected
Open the application	The software will be loaded as intended. There are no glitches or anomalies.	Yes
Add Gesture Button	A dialog box will appear with an option to select the gesture video or to capture a image through webcam	Yes

Create frames	A dialog box will open to select a video to create frames in a folder	Yes
Recognize Gesture	The code behind logic will be implemented on the input video file. The content of the video will be processed and if is a gesture that corresponds to the gestures from 0-9 it identifies the gesture accordingly.	Yes

Table 5.1: Table for the Startup Screen Display and Recognizing the video

Test	**Description**	**Desired Outcome**	**Actual Outcome**	**Result**
1.	Extract Frames	To extract frames and key frames from a video	Extracted frames from a video in a folder and chosen key frames from those frames based on skin color detection condition	PASS
2.	Initialize Camera	Display user image in new window	Displayed user original image in new window	PASS
3.	Image Conversion	To convert RGB image into HSV and display in a new window	Displayed HSV image in new window	PASS
4.	Filtering	Smooth out image	Smooth out image	PASS
5.	Background Subtraction	To remove unwanted areas in the background other than the fingers	Unwanted areas are subtracted based on simple morphology	PASS
6.	Skin detection	Display skin areas in the image in a new window	Displayed skin regions as white with background removed	PASS
7.	Finger detection	Draw area around the skin region	Red outline drawn along outline of the skin region detected	PASS

8.	Exit	Exists when user clicks 'ESC' button	Exists when ESC button is clicked by user	PASS

Table 5.2: Table for the overall tests that were implemented and results for the tests

5.1 OUTPUT WHEN ARDUINO IS NOT CONNECTED FOR WIRELESS DATA TRANSMISSION:

The below table show the output for different hand gesture when the hardware is not connected for the wireless data transmission. As the different finger input given in real time recognition as the frame is extracted and then converted into HSV color Space. This color space output is input for the finger representation which finds out the number of figures and resultant output is shown and provide the resultant output.

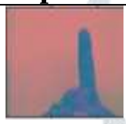
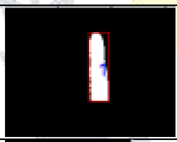
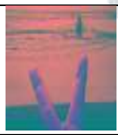
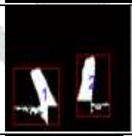
Frame	HSV color space	Finger Representation	Gesture Detected
			
			
			
			
			

Table 5.3: Table representing gestures without interface arduino with single hand

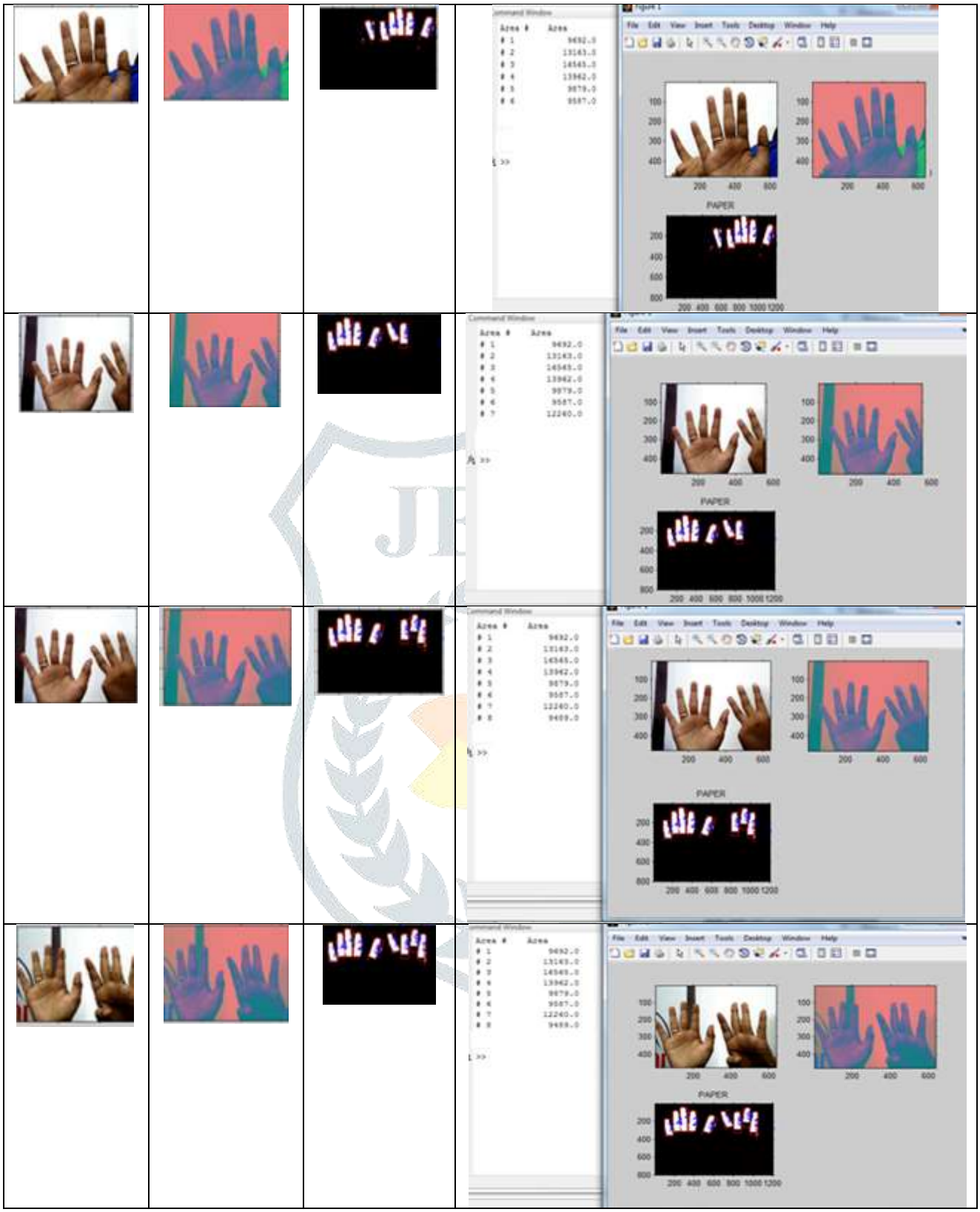


Table 5.4: Table representing gestures without interface Arduino with dual hand

5.2 OUTPUT WHEN CONNECTING ARDUINO FOR WIRELESS DATA TRANSMISSION:

The resultant output which is analyzed when arduino uno is not connected now transmitted with wireless data transmission. This data is now transmitted with the help of Bluetooth device and the Arduino uno. The

interfacing is done with the help of system Bluetooth device and the HC-05 which is connected with arduino uno.

Fig 5.1: Start GUI window

When we click on the start button the data resultant screen displayed. The input provided is 0 which provide the finger output0 and same result is given in the command window

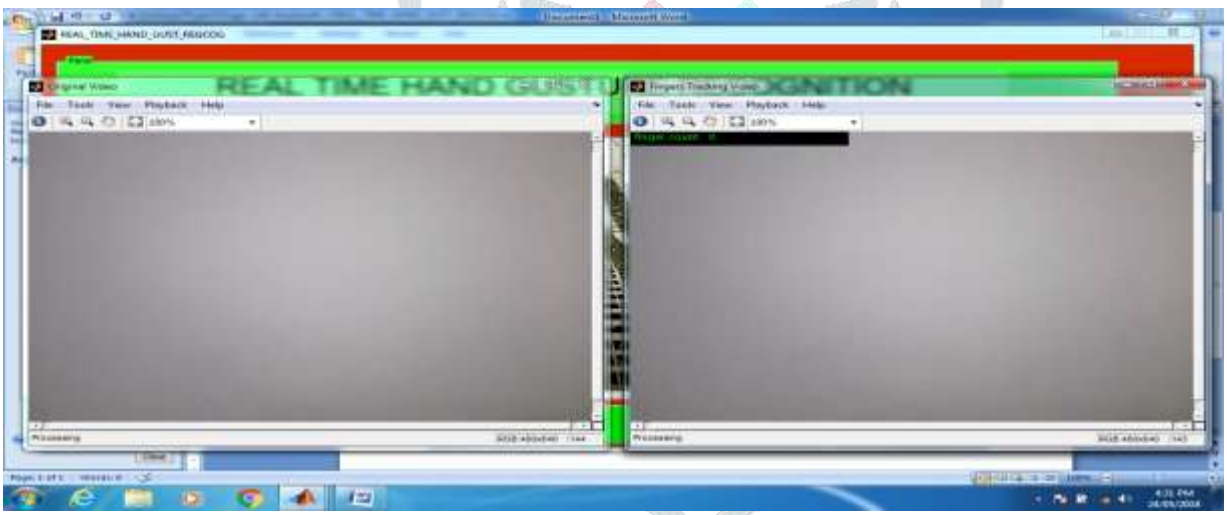


Fig 5.2: When finger count is zero

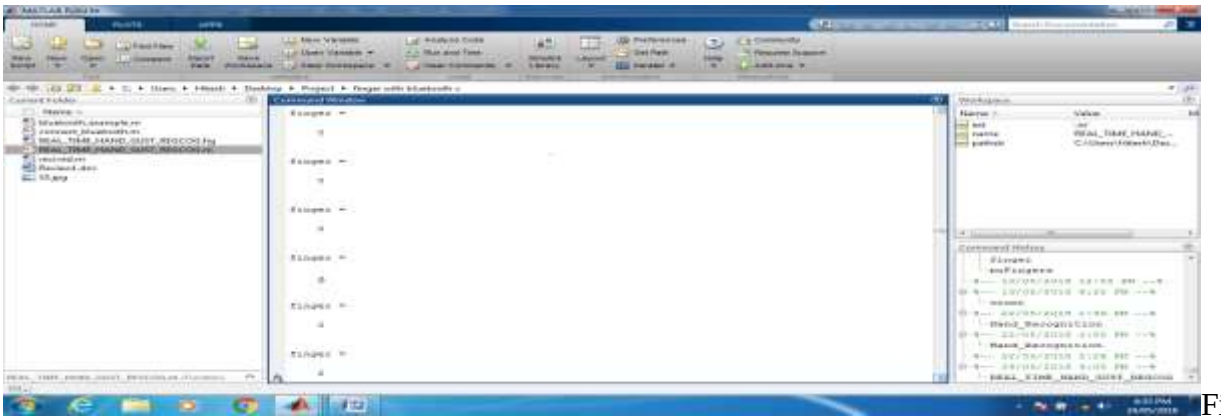


Fig 5.3: Result on command window when finger count is zero

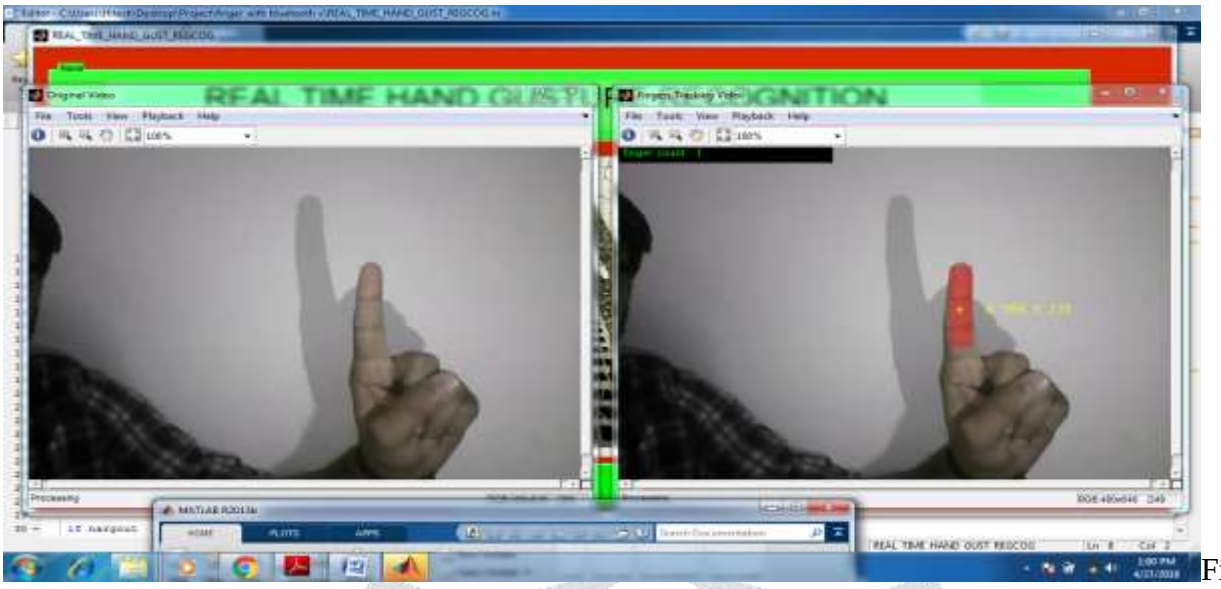


Fig 5.4: When finger count is 1

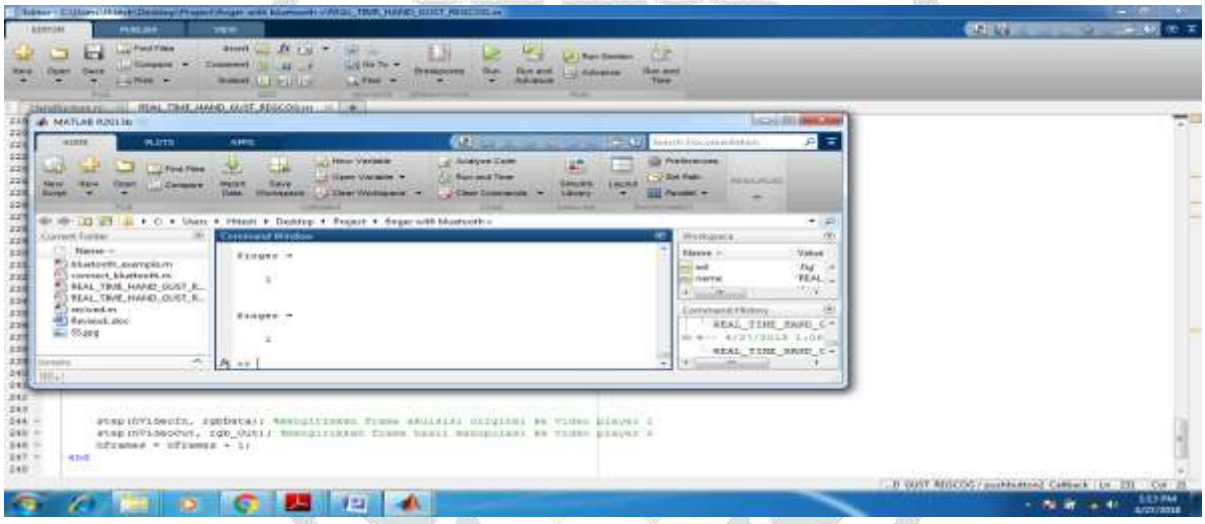


Fig 5.5: Result on command window when finger count is 1

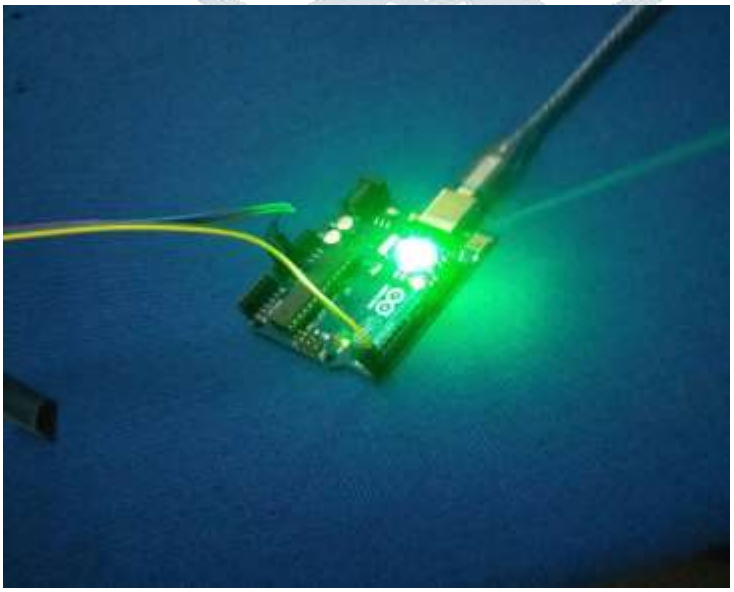


Fig 5.6: Result on Arduino when finger count is 1

When the input finger count is 1 the data is transmitted and the LED will glow at the Arduino end. The LED glow only when 1 is provided and for other the LED output is zero which means the data is not transmitted.

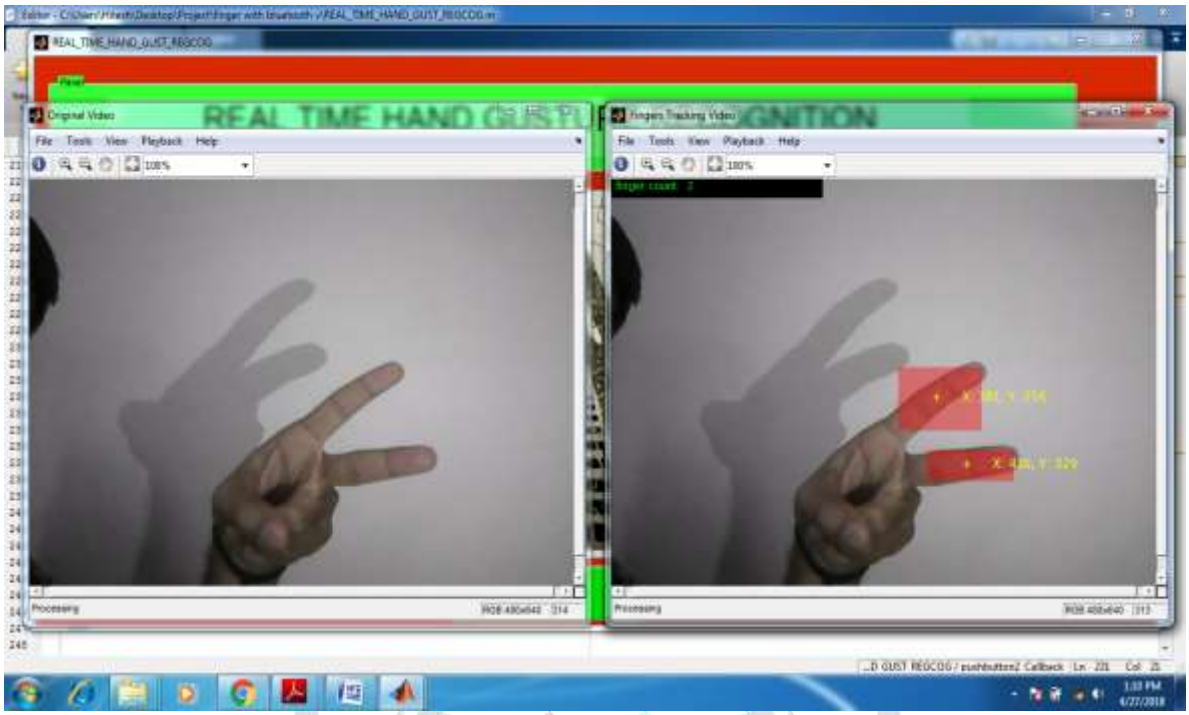


Fig 5.7: When finger count is 2

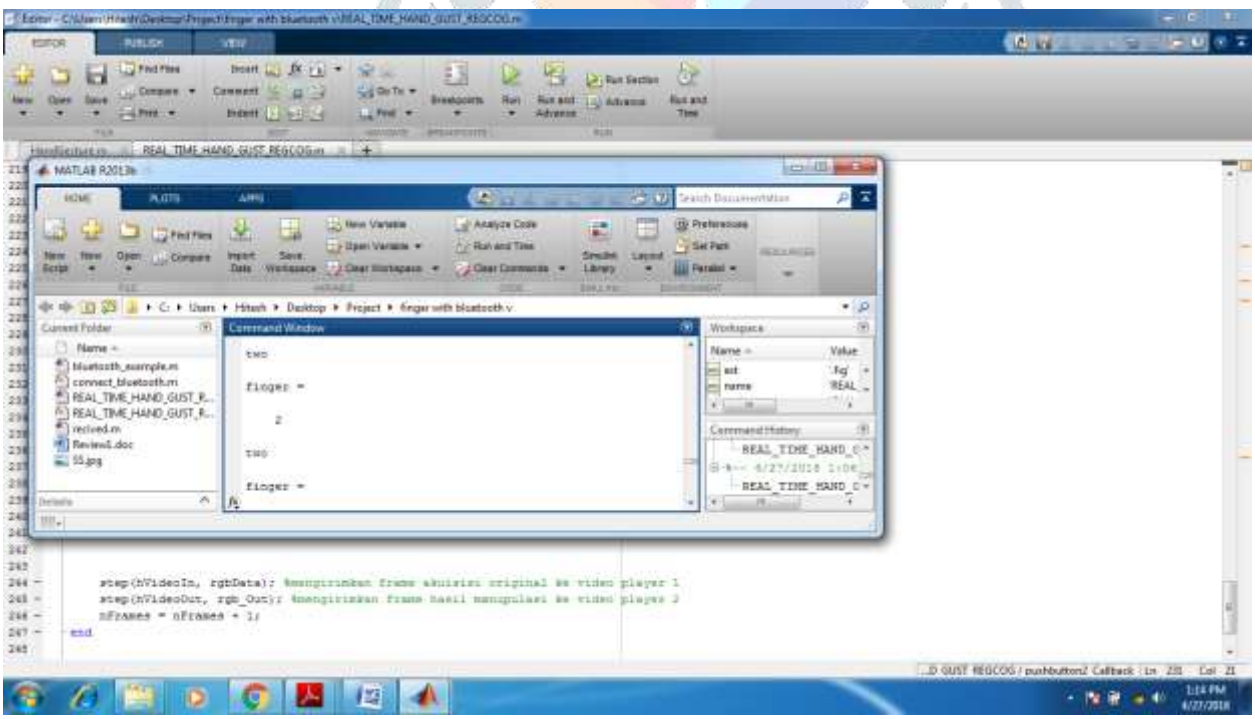


Fig 5.8: Result on command window when finger count is 2

CONCLUSION

Variable numbers of key frames are extracted for different input video input which indicates the dynamic nature of the code. The code may be utilized for different purposes of processing videos in the future. Key

frames or the representative frames obtained are enough to represent the complete video input. The main features of the video input are grabbed efficiently in the extracted key frames. Relatively lower number of key frames are extracted which reduces the size of the summarized video input. The main purpose of the proposed work is fulfilled since the efficiency of edge detection method is better than other methods in real time recognition. The input video is able to highlight the key contents of the original video shot. Image processing is also done to extract the fingers representing numbers. The key frames which are extracted are show the real time number finger count. These real number frame count transmits the data according to the number on which the data is transmitted and for others it will transmit no signal.

REFERENCES:

[1] Amornched Jinda-apiraksa, Warong Pongstiensak, and Toshiaki Kondo, ”A Simple Shape-Based Approach to Hand Gesture Recognition”, in Proceedings of IEEE International Conference on Electrical Engineering/Electronics Computer Telecommunications and Information Technology (ECTI-CON), Pathumthani, Thailand , pages 851-855, May 2010

[2] Meenakshi Panwar and Pawan Singh Mehra , “Hand Gesture Recognition for Human Computer Interaction”, in Proceedings of IEEE International Conference on Image Information Processing(ICIIP 2011), Waknaghat, India, November 2011.

[3] G. R. S. Murthy, R. S. Jadon, “A Review of Vision Based Hand Gestures Recognition”, International Journal of Information Technology and Knowledge Management, Volume-1, Issue-3, February 2012

[4] H, AL-JBARA.M, KIAH. H.A, JALAB.2012. Increased capacity of image based steganography using artificial neural network. AIP Conf. Proc, 2012. 20-25.

[5] S, SINGH.D, CHAUHAN. M, VATSA. R, SINGH. 2003. A robust skin color based face detection algorithm. Tamkang Journal of Science and Engineering, 6, 227-234.

[6] A. Just, Y. Rodriguze and S. Marcel, “Hand posture classification and recognition using the modified census transform,” 7th International Conference on Automatic Face and Gesture Recognition, April 2006, pp.351-356. [22] Daniel Kelly, Joh