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HVAC and Audio Control System using Gesture Recognition in Cars

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Abstract*: Gesture recognition technology entails a wide variety of touch-free interaction capabilities which controls notably contribute to easing our interaction with devices, reducing the need for a keys, or button. To recognize the different hand gestures for different control system in cars is done through image processing. A new method for the hand gestures is that, the hand part gets extracted from the background using background subtraction algorithm using raspberry pi, there is no need of buttons for using of some equipments in different vehicles by using an advanced technology. In gesture recognition technology we can control the audio and HVAC system automatically instead of searching for a particular button, which causes distraction while driving.

***Keywords* : About four key words or phrases in alphabetical order, separated by commas.**

I. INTRODUCTION

The act of acquiring a physical controller would require too much time, gestures are used as an alternate control mechanism Gesture recognition is of great importance for human computer interaction and it also helps to clarify the spoken commands. Gesture recognition is especially valuable in many of the applications involving interaction for several reasons in regular works. A gesture is nothing but without speaking to each other we can tell it by the motion of fingers. There are two types of gesture recognition which is vision based and also sensor based gesture recognition. In sensor based, it is cost effective and also we observe that there is lesser portability. By using this background subtraction method we can overcome the drawback. By using raspberry pi, where its motion of the finger is controlled by the camera which is connected to it.

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II. LITERATURE REVIEW

Robotics has developed over numerous years and furthermore they had been impact with more incidence frequency in human life. It won't require some investment to turn into a need as opposed to an instrument. As of now, automation machine existence has became primary for the excellent growth in various individual organizations and manufacturing department [1]. Kinect of a shading camera, a determination of 1920 x 1080, 30 frames for each second, and also with this it provides a technique to structure of bones in a body that follows up to six persons at the same time with a component of 26 juncture removal from the whole. It permits to be a device it will be utilized in mechanical part to present a controller of a automation machine controller.

Real Time vision based framework has been proposed to screen various objects which is assembled dependent on the raspberry pi, robot movement and route are finished by utilizing various headings. The entire procedure is finished by finding the curved frame and convexity abandons which is utilized for following and has a strong identification level in capturing and recognition of particular finger [2].

In [3] CAN protocol is different from all the other similar protocols.CAN decreases the converse effects and accepts a good flexibility in the time-triggered communication.. Beds give various determinations to each sort of it that can be changeable height of the whole bed, the head, and the feet, movable side rails and electronic buttons to work both the bed and other close by electronic gadgets [4]. Vision based hand motion recognition framework has been explored from the alternate points of view among which vision based methodologies give the more normal and instinctive interfaces[5] utilizing gloves they have been implemented. A real-time hand tracking and feature removing algorithm is chosen to follow the moving hand and take the required of the hand region, at that point we utilize the Fourier descriptor (FD) to define some temporal features and movement examination to describe the spatial features. We consolidate both the temporal as well as spatial parts of the input picture arrangement as our feature vector[6].

G. Senthil kumar et al.[7] developed a technology in the embedded field which mainly focuses on the image acquisition based on the controller board. By this system, the output is too fast to run the process between the camera acquisition system and also the controller board but there is a drawback with precision in the technology.

Aliksei Tepljekov [8] invented different types for the real world to see optically helping computers describe the real world visibly, and also it give a result for those strategies allowed by Open CV, then executed a portion of those in a advanced controller board based function for recognizing and following of things. A portion appropriate to helpful the data additionally sends by the particular function used, for example, arranges and proportion, for different PC on the system of connections that transmits an proper question. It is not reasonable for real-world functions, so there might be some late result.

Inspite of numerous confinements, for example, self impediment among body segments, numerous investigations of motion haven evolved on two dimensional information because of the less multifaceted nature along with the ease of result acquiring[9][10].

III. METHODOLOGY

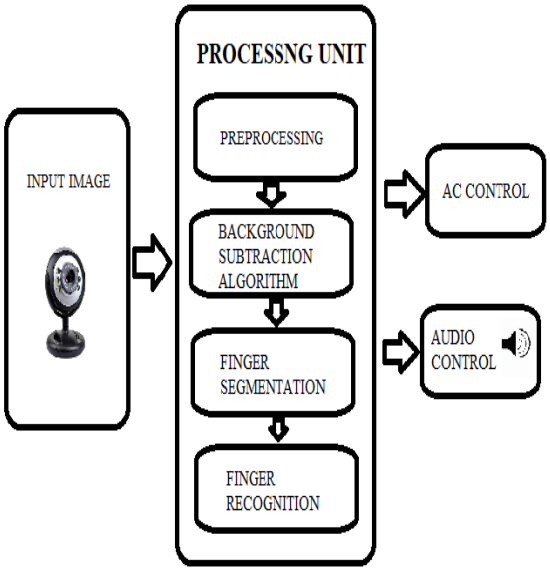

Fig 3.1: Block Diagram

A. Background subtraction method

There is a moving object and a fixed camera catches the sequence of objects in the background. Because most of the surroundings is constant, the surroundings colour should be fixed at the same position. Nonetheless, in reality, all the surroundings colours are often unnoticed by moving passing objects, so that methods for obtaining information are used to obtain the background.

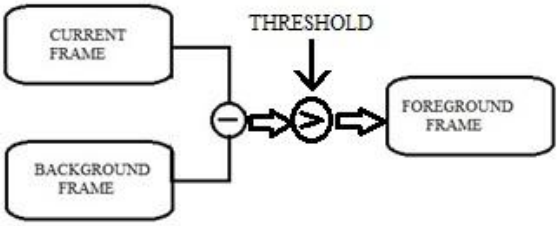

Fig 3.2 Background Modeling Process

In this algorithm, background extraction techniques are based on the approach that should be considered as the surroundings color with the best frequency appearance within an observation time window. The main drawback of such methods is that the background observation time is not dynamically changed in the presence of surroundings masking. Thus, when it is obtained observation time is too short, and for a long time the moving object obscures the surroundings, the moving object is likely to be mistaken for the surroundings, causing misjudgment.

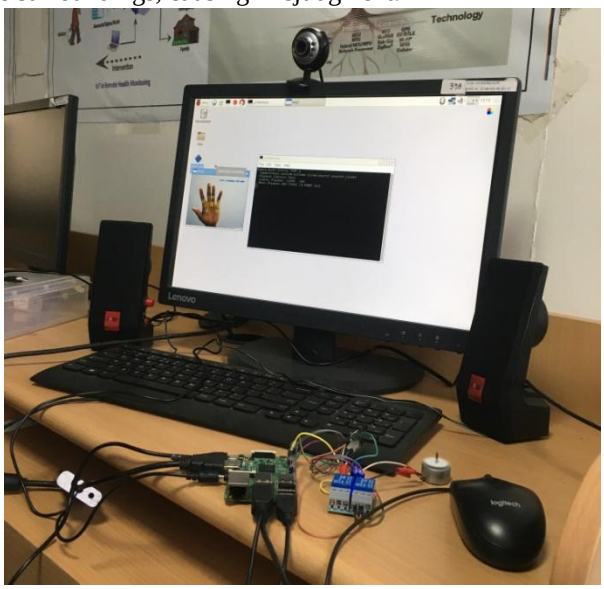

Fig 3.3 Extreme points in contour

B. Hand segmentation

Division is the way toward removing the objects of enthusiasm from a picture, the object of interest is the hand of the client. Once the hand get detected, the white pixels obtained in the binary image are recognised as the hand section and remaining black pixels belong to the background.

Because of the absence of strong constraints on the scene's composition and illumination, we needed to reject segmentation methods dependent on thresholding grayscale pictures. The best approach is to segment the hand from the colour of the user's skin. It makes a normal of the colors and afterward the middle value of colors as lower and higher thresholds to discover the user's skin.

C. Threshold calculation

The picture is first changed over to the HSV shading space. The test pictures are partitioned in their three channels: H, S and V. For each channel we figure the mean worth, from that point low and high limit esteems are registered, with the exception of the "value" channel (V).

D. Binarisation

The operator basically sets to 1 all the pixels contained between the low and high edges and to 0 the various pixels.

E. Hand and Finger detection

The smallest convex set containing the hand form, utilizing the convex Hull work. By building the bounding rectangle of the curved frame.

The rectangle will be utilized to calculate focal point of the hand and to do scale invariant calculations.
The purposes of crossing point between the hand contour and convex structure are spared in an exhibit, they will be utilized to find the finger tips. For each point in the finger tips exhibit the deformities cluster for the two closest focuses on the x axis are seen.There should be proper comments of the reviewers for the purpose of acceptance/ rejection. There should be minimum 01 to 02 week time window for it.

IV. RASBERRY PI

The size of the processor is gradually reducing and the speed of it is gradually increasing. Raspberry Pi is fully customized and used just as a computer board. Raspberry pi is a very high level processor for the cloud related projects so that it can send the data very efficiently. It has a lot of advantages in using Raspberry pi when compared to any other processors. Raspberry Pi is utilized within the wrist worn device as its computing power and wireless communication abilities make an extraordinary expansion to the Internet of Things (IoT) dominion, because it easily permits device-to-device information trade (real time graphing in plotly) and intelligent environments development that depend on smart devices communicating with each other in order to collect vast amounts of useful data in real time.

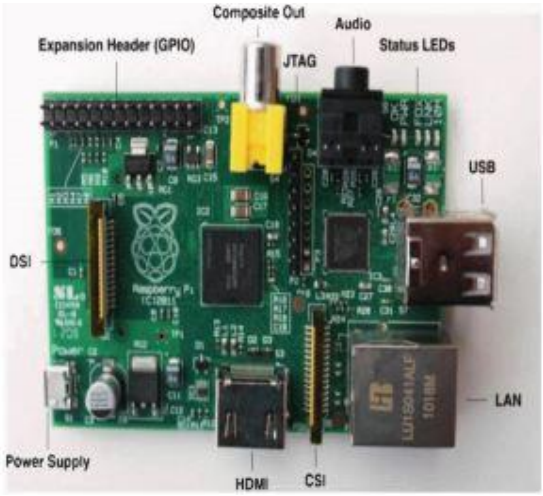

Fig 4.1 Raspberry pi3

V. EXPERIMENTAL RESULTS

Fig 5.1 Real time hand gesture

Table 5.1 Recognition rate for different gestures

Number of fingers	Gesture Performed	Recognition rate				
		5	10	15	20	25
1	High ventilator AC ON and OFF	43	61	66	72	88
2	Audio ON and OFF	35	55	67	85	90
3	Audio volume increase	47	65	63	75	87
4	Audio volume decrease	55	52	61	90	80
5	Relay switch ON and OFF	41	55	72	87	83

VI. CONCLUSION AND FUTURE

This investigation builds up a smart wireless automation system which can provide assistance to drivers by different gestures for each specific cause. Another strategy for hand sign detection is presented in the proposed method. The hand area is identified from the background by the background subtraction technique. At that point, the palm and fingers are divided. The presentation of our technique is assessed on an dataset of different hand pictures. This can be successfully used in the real world applications. Depend upon the gesture given by the user we can control various applications in car.
By using both background subtraction and hog and haar cascade we can get the better accuracy because it has more processing power.

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