Gesture Based Home Automation System

Arathi P.N,S.Arthika,S.Ponmithra
UG Scholar
Department of Electronics and Instrumentation Engineering
Sri Ramakrishna Engineering College,
Coimbatore, Tamil Nadu, India
arathi.1406002@srec.ac.in

K.Srinivasan*,V.Rukkumani**
Professor& Head*, Associate Professor **
Department of Electronics and Instrumentation Engineering
Sri Ramakrishna Engineering College,
Coimbatore, Tamil Nadu, India
hod-eie@srec.ac.in

***Abstract*--- Automation is the essential need for the present world. There are various types of automations like building automation, industrial automation, Home automation, Artificial Intelligence, etc. Smart can be a potential application which provides support to elderly or disabled persons. Home automation is the use and control of home appliances remotely or automatically. Day by day the gap between machines and humans is being reduced. Nowadays hand gesture based home automation is getting more importance. Gesture recognition refers to recognising the motion of the human parts like hand, face, etc. Most of the electronic components manufactures focuses on the hand gesture basis. In this proposed work MATLAB based algorithm is used. This proposed work uses this tool for the recognition and processing of the hand gesture. The algorithm used for this proposed work is the object detection algorithm. At first the image is captured by the camera and it is processed by the MATLAB, if the preloaded gesture is matched with the existing gesture the data will be sent to the microcontroller, then the home appliances are controlled. There are other applications which could be controlled by a gesture such as media players, robots and virtual objects. The hardware module consists of camera, PIC microcontroller, fan, light, power supply, LED, GSM module. This hardware module is communicated with simulation software using a USB to serial converter bus which comes along with driver software.**

Keywords -Gesture control, MATLAB, Gesture recognition, home appliances.

I. INTRODUCTION

In this proposed work we have implemented the gesture controlled home automation using MATLAB simulation software through the microcontroller. Taking in concern the day to day challenges in the world with growing technologies in normal life, the following proposed work was created. The problem of disability is gaining more and more importance all over the world. At the same time there is a network of Non Governmental Organisations working for the development of persons with physical disabilities. Therefore providing solution for the inabilities is the prime moto of this work. Gesture plays a major role in this proposed work. A gesture is a form of non-vocal communication in that human body actions can be able to communicate the particular speech or communication or even messages. Gestures include movement of the hands, face, or other parts of the body. Gestures allow individuals to communicate a variety of feelings and thoughts, from contempt and hostility to approval and affection. There are other applications which could be controlled by a gestures include media players, remote controllers, robots, etc. Gesture recognition is the mathematical interpretation of a human motion by a computing device. In other words, interface with computers or other equipment using gestures of the human body, typically hand movements. In the gesture recognition technology, a camera reads the movements of the human body and communicates the data to a computer that uses the gestures as a input to control devices or applications.

II. SCOPE OF THIS WORK

Hand gestures are used to control the home appliances such as fans, lights, etc. The platform used for the recognition of the gesture is the MATLAB simulation tool. Once the first gesture is captured and processed, one appliance is controlled, then it is required to rerun the program. Research is going on process to control all the home appliances by the gestures once the program is on run. The future advancement will be based on the IoT basis, we can control the home appliances in and around the world by the help of internet of things. Not only the appliances but also these gestures are used to control volumes tuning, TV channels, speed controls, the regulator of a fan can be controlled

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according to the gesture. By the future advancement technologies gestures can be used to control cars and even software applications. It can provide high quality images, high performance, high accuracy and high reliable way to control the devices.

III. BLOCK DIAGRAM

The Figure 4.1 shows the block diagram of the Gesture based home automation system using Fast corner detection algorithm method along with the explanation of the algorithm of the Fast Fourier Transform. It represents the various steps involved in gesture recognition process along with the hardware components required for the controlling of the home appliances. In this the simulation tool for the processing of gesture image is interfaced with the hard ware using USB to serial converter.

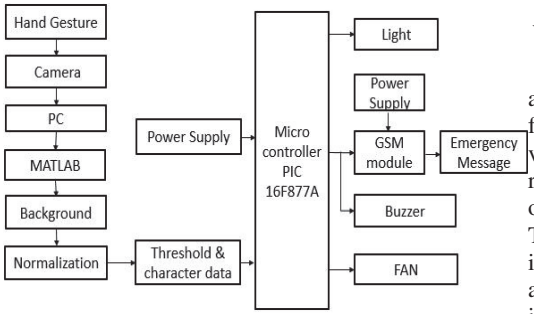

Figure 1. Block diagram of gesture based home automation system

IV. PROPOSED METHODOLOGY

Gesture controlled home automation is used to control and operate the home appliances for a differently disabled persons. The home appliances include fan, light, washing machine, etc. There several methods and platforms for the technique called gesture recognition technology. Platforms include MATLAB, LabVIEW, etc. The different methods includes vision based systems, glove based systems, method based on Acoustic, Tactile, Optical, Bionic and Motion. Gesture detection based on the MATLAB simulation tool is easy to process the image captured by the camera. But it is difficult to get the precise detection, because the matching of preloaded gesture with the existing gesture is a complex task. Object detection method directly detects the object, which has a high precise only. At first the real time image is captured from the webcam, then by using the NL Harris algorithm background separation, normalization, averaging 4 points and scaling filter can be done.To process the image and recognising the hand gesture will be the most difficult task. Such difficult task consists of two faces: In the first one, gestures of a hand may be vary for persons to persons and even gesture position of a hand also may varies. So that a gesture is preloaded in the MATLAB for the easy processing of the image. The second challenge is that the threshold value may varies for camera to camera, contrast and sometimes it may vary for background. In the MATLAB simulation tool an approximation of the threshold is loaded, it may differs from the plus or minus deviation range. If the measured threshold is within a range it enter into the loop and execute the forth coming process based on the algorithm.

V.VIDEO INPUT

The video input for this process is taken using a Web camera. By running the MATLAB program the camera is turned on after few seconds. Then the video starts running after that, if the gesture is shown against the video running in the real time process. The delay time for capturing the image in the running video is fixed. Finally the video is converted into the frames. The video size is adjusted to 640 x 480 pixels.

VI. CORNER POINT DETECTION ALGORITHM

Various applications requires keeping in mind at least two pictures at the end goal to concentrate data from them. For example, if two successive frames in a video sequence taken from a moving camera can be related, it is easy to extract information about the depth of objects in the environment and speed of the camera. The force method of comparing each pixel in the two images is computationally excessive for the majority of applications. Intuitively, one can image relate two images by matching only locations in the image that are in some way interesting Such indicates are alluded as intrigue focuses and are found used an intrigue point locator. Finding a connection between pictures is then performed utilizing just these focuses.

VII. HARDWARE DESCRIPTION

This chapter deals with the detailed description of all the hardware components and their functions. It describes about gesture recognition tools, PIC micro controller, GSM module. Its shown in figure

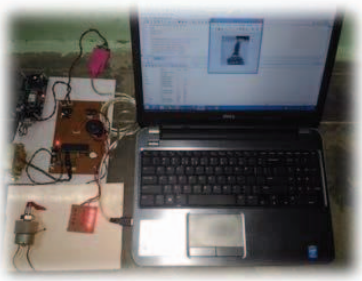

Figure 2. Overall Hardware Setup

It consists of power supply modules, gesture recognition tool, DC motors and LEDs.

A. GSM Module

GSM MODEM is a class of remote MODEM gadgets are intended for correspondence of a PC with the GSM arrange. It requires a SIM (Subscriber Identity Module) card just like cell phones to enact correspondence with the system. Additionally it has IMEI (International Mobile Equipment Identity) number like cell phones for their recognizable proof. A GSM MODEM can perform various operations like recieve, send or erase SMS messages in a SIM.Read, also include operations like seek phonebook passages and also it Make, Receive, or dismiss a voice call. The MODEM needs AT charges, for cooperating with processor or controller, which are imparted through serial correspondence. These charges are sent by the controller/processor. The MODEM sends back an outcome after it gets a charge. Various AT orders bolstered by the MODEM can be sent by the processor/controller/PC to associate with the GSM cell arrange.

Figure 3. GSM Module

B. DC Motor

A DC engine is any of a class of electrical machines that believers coordinate current electrical power into mechanical power. The widely usage of sorts depend on the strengths delivered by fields(ie;-attractive). Over a wide range ADC engine's speed can be controlled, used either as a variable supply voltage or by changing the quality of current in its field windings.DC engines are sometimes used as a part of apparatuses, toys, and machines. Moreover it is a lightweight engine that can work on direct present used for compact power tools and machines. Bigger DC engines are utilized as a part of electric vehicles, lift and derricks or in drives for steel rolling mills.

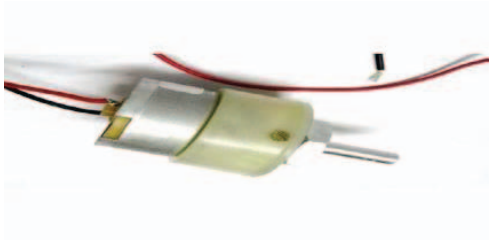

Figure 4. DC Motor

C. USB to Serial Converter

A standard RS232 USB to serial converter with a DB9 connector is generally simple to interface with a serial gadget, just associate the DB9 connector to the serial gadget, the DB9 connectors should be female/male to have the capacity to associate, and it is leeway in the event that one of the connectors has thumb screws and alternate has nuts. Generally disengaged connectors and converters are just used if the client needs to moreover ensure the gadget or hardware associated with the system (on the off chance that the gear is of high esteem), or if there are motivations to speculate high voltage spikes or comparable in the system.

VIII. SOFTWARE DESCRIPTION

A.MATLAB

MATLAB (framework research facility) is a multi-worldview fourth-era programming dialect. An exclusive programming dialect created by Math Works, MATLAB permits framework controls, plotting of capacities and information, execution of calculations, formation of UIs, and bury programs weitten different dialects including C, C++, Java, Fortran, Python. Even though MATLAB is planned basically for numerical processing, choice tool compartment utilizes MuPAD typical motor, providing access to basic registering capacities. An extra bundle, Simulink, includes graphical work bench and iconic design for dynamic and implanted frameworks.

IX. RESULTS AND DISCUSSION

GESTURE 1

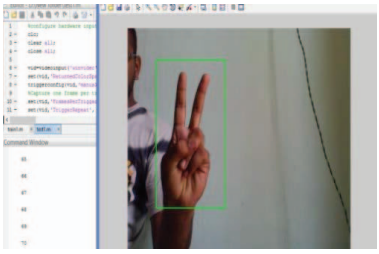

Figure 5.1.a captured image

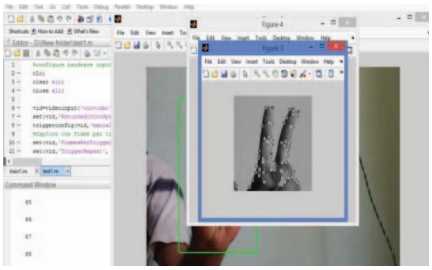

Figure 5.1.b processed image
GESTURE 2

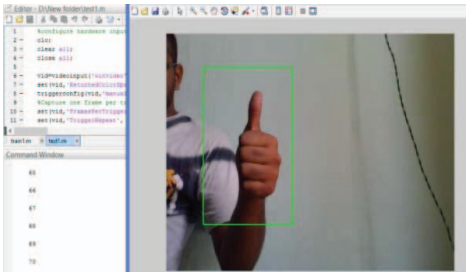

Figure 5.2.a captured image

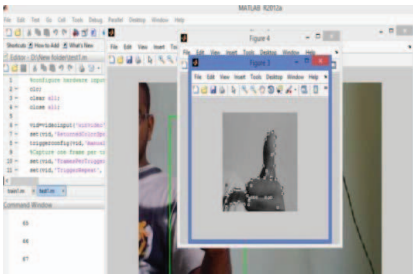

Figure 5.2.b processed image

X. CONCLUSION AND FUTURE WORK

A. Conclusion

In this proposed work the hand gestures are captured from the web camera and then the image is processed with the help of a simulation tool called MATLAB. Based on the gestures used the different threshold values are generated and the home appliances are controlled by the PIC microcontroller. This gesture recognition process is completely efficient for the light background, and in the same way the gesture recognition for the dark backgrounds and noisy conditions will differs by the threshold values. Corner point detection algorithm is used for the gesture processing and it is noiseless and effective for the recognition of the each gestures. Fast Fourier Transform algorithm is used for the fast processing of the gestures for the generation of the threshold. This method is very accurate than hand glove based gesture recognition process. The MATLAB compatible with PIC microcontroller is cost effective and easy to interface with PC than the Arduino compatible with MATLAB simulation tool.

B.Future Work

Hand motions are utilized to control the home machines, for example, fans, lights, and so on. The platform accessed for the acknowledgment of the motion is the MATLAB reproduction apparatus. The future headway will be founded on the IoT premise, we can control the home apparatuses in and around the globe by the assistance of web of things. The appliances uses these motions to control volumes tuning, TV channels, speed controls, the controller of a fan can be controlled by the signal. By the future progression innovations motions can be utilized to control autos and even programming applications.

XVI. REFERENCES

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