International Journal of Latest Research in Engineering and Technology (IJLRET)
ISSN: 2454-5031
www.ijlret.com ǁ PP. 108-112

Gesture Based Smart Home Automation System Using Real Time Inputs

Chinmaya H G[1,a], Nithin kumar N[1], Sagar B[1], Vinay Raj K M[1]
[1] *Student of Dept. of Electrical & Electronics, SVIT, Bangalore-560064, India.*
[a]*chinmayahg.12ee@saividya.ac.in*
Ph.: (O) 080-2846 8191 / 96/97, (Fax): 080-2846 8191

Rekha Murthy[2,a,b]
[2]*Asst.Prof, Dept. of Electrical & Electronics, SVIT, Bangalore-560064, India.*
[a]*rekha.murthy@saividya.ac.in,* [b]*rekhmurthy@gmail.com*
Ph.: (O) 080-2846 8191 / 96/97, (Fax): 080-2846 8191

ABSTRACT: Home Automation technique is used to design and implement a remotely controlled, energy-efficient and highly scalable Smart Home with basic features that safeguard the residents' comfort and security. A Smart Home Automation system which uses Hand Gestures for disabled people to switch ON fans & lights of the house, power saving capabilities to switch ON lights only in presence of people, switch ON exterior lights based on light intensity is designed & developed. The system consists of a house network (sensors and appliance actuators and camera to respect controller; an Arduino microcontroller that communicates with a relay which is the user interface is used. Smart House uses video processing system and sensors, thus making it a cost-efficient hybrid system. Events can be programmed to be triggered under specific conditions, and this can have a great role in reducing the total energy consumed by some appliances. On the other hand, the system can suggest smart task scheduling. The scheduling algorithm presented is heuristic for the Resource-constrained-scheduling problem (RCPSP) with hybrid objective function merging both resource-leveling and weighted completion time considerations.

KEYWORDS: Arduino microcontroller, Resource constrained scheduling problem (RCPSP),Smart Home Automation system.

I. INTRODUCTION

Home automation is the use and control of home appliances remotely or automatically. Home automation satisfies the resident's needs and desires by adjustable light, temperature, ambient music, automatic shading, safety & security, even arrangement of wire. Home automation technologies are the latest fascination with housing mechanism. However, with the appearance of new electronic technologies and their combination with older, traditional building technologies, the smart home is at last becoming a reality. The basic idea of home automation is to monitor a dwelling place by using sensors and control systems. Through adjustable various mechanisms, user can enjoy customized heat, ventilation, lighting, and other servers in living condition. The more closely adjust the entire living mechanical system and loop control system, the intelligent home can provide a safer, more comfortable, and more energy economical living condition.

1.1 Motivation Of The Project

The basic problems faced by disabled people in day-to-day life in their own house to turn ON or OFF the equipments like lights, fans and difficulty in analyzing switches are observed many times.[1] And the major issue being faced by the country is loss of power (power shortage).[2] This power shortage can be solved by two ways majorly; one way is from load shedding & second way is that people should be enlightened to switch OFF the appliances when not needed. Often it is observed that the street lights in cities are usually forgotten to be switched OFF during the day and this can be solved by taking initiatives in order to switch OFF the street lights during day time, and to save power. In order to overcome these problems, we design & develop of a smart home automation system

1.2 Aim Of The Project

In order to overcome the problems encountered, we design & develop of a smart home automation system which uses

(i) Hand gestures for disabled people to switch ON or OFF fans & lights or equipments of the house, Here in this condition we are using camera to which live feed of hand gestures are given and from camera it goes to Central processor (Video processing system), Control signals from processing units are sent to relay, from relay different appliances can be controlled on given gestures.
(ii) Power saving capabilities to switch ON lights only in the presence of people, Here in this condition we are detecting when human is IN & OUT of the room from sensors, the signal from sensors is fed to microcontroller, then the control signal from the microcontroller is given to relay which controls the ON & OFF of the lights of the room respected to IN & OUT of humans.
(iii)Switch ON exterior lights based on light intensity, Here in this condition light intensities like dim, bright, are detected by the sensors & sent to microcontroller for processing, the processed signal is then fed to relay which in turn switch ON or OFF the lights based on intensities.

1.3 Methodology

The following methodology was followed during the project,

- Detailed study of Image Processing, Matlab and Arduino tools.
- Study and selection of suitable Arduino board for interfacing and its programming.
- Design of suitable hardware required.
- Building up suitable simulation required.
- Adjusting live feedback from camera for simulation.
- Choosing suitable colour model in Image Processing.
- Calculating suitable values of dilation & erosion for images.
- Testing real time inputs like gestures and sensitivity from simulation model.
- Processing of model prepared.
- Real time testing and its validation.

1.4 Block Diagram

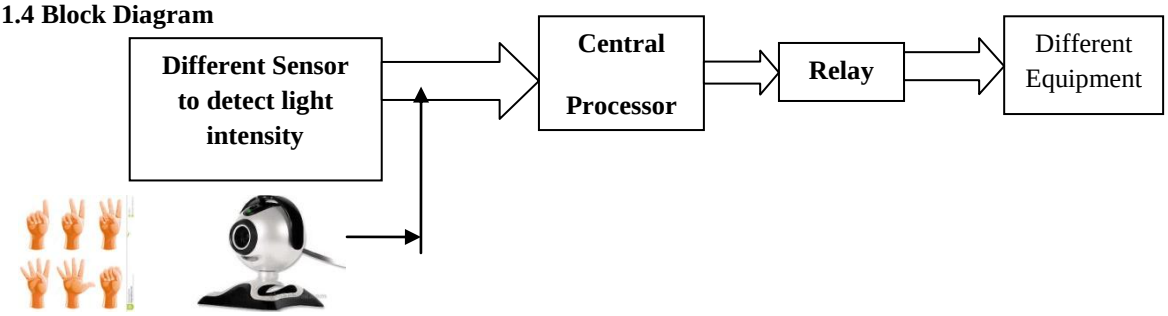

Fig.1.1 General Block diagram

Live Feed of Hand Gestures from camera goes to Central Processor(Video prossecing system), Control signals from processing unit are sent to relay, from relay different appliances can be controlled based on given gestures.

Human Presence is detected when human is IN & OUT of the room from sensors, the signal from the sensors is fed to microcontroller, then the control signal from the microcontroller is given to relay which controls the ON & OFF of the lights of the room respected to IN & OUT of humans.
Light Intensities like dim, bright, are detected by the sensors & sent to microcontroller for processing; the processed signal is then fed to relay which in turn switch ON or OFF the lights based on intensities.

II. IMAGE PROCESSING

2.1 Introduction

Image Processing is a technique to enhance raw images received from cameras/sensors placed on space probes, aircrafts and satellites or pictures taken in normal day-today life for various applications. An Image is rectangular graphical object.

As general-purpose computers became faster, they started to take over the role of dedicated hardware for all but the most specialized and compute-intensive operations. With the fast computers and signal processors available in the 2000s, digital image processing has become the most common form of image processing, and is generally used because it is not only the most versatile method, but also the cheapest. There are many types of image processing available today. Typical image processing is grouped into Processing, Filters, Morphology, Analysis, Color Processing, Operators and Frequency Domain.

Image processing is any form of information processing for which the input is an Image, such as photographs or frames of video; the output is not necessarily an image,but can be for instance a set of features of the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal processing techniques to it.

Image processing is the study of any algorithm that takes an image as input and returns an image as output.

Image Processing includes:

- Image display and printing
- Image editing and manipulation
- Image enhancement
- Feature detection
- Image compression
- Image enhancement
- Noise removal
- Restoration
- Feature detection
- Compression

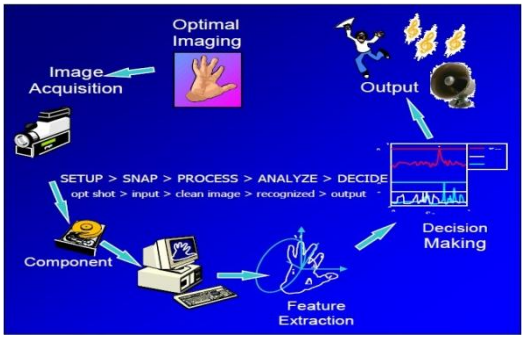

Fig.2.1 Image Processing Cycle

Image processing involves issues related to image representation, compression techniques and various complex operations, which can be carried out on the image data. The operations that come under image processing are image enhancement operations such as sharpening, blurring, brightening, edge enhancement etc. Image processing is any form of signal processing for which the input is an image, such as photographs or frames of video.

The output of image processing can be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Image processing usually refers to digital image processing.

Image processing is a branch of knowledge that tries to reach the same goal as human vision does. The process will not be the same but the objective is. The concept may or may not differ, depends on what sub task of the whole system is to be accomplished first. Machine look on something trough segregated details to do matching based on system's hardware capability. Human on the other hand, used as much information as possible and will decide at that instance, fulfilling directly to the objective of the vision task itself. That is why trying to have the same par with human capability especially from the recognition accuracy perspective is impossible with current technology advancement available.

This project develops an alternative human interface from web camera input. Further, this system will execute a set of playback instruction on a model of car audio playback function. This project will be build by using Lab VIEW Image Processing Software where block diagram programming is present. It is so far the easiest to program and troubleshoot through available step by step simulation function within.[3]

The information is being stored in a 3 plane of information. Each plane represents three colors that are red, green and yellow plane. Each plane has the intensity from 0 up to 255 or 8-bit of information per plane. These three color combination makes up all the color we could see in an RGB images.

Simple calculation of this are 8-bit information is as follow:-

$$2^n = \text{bit}, 2^8 = 256$$

The origin of this size started when the byte was introduced back then in the origin of information capacity now has its standard. Many of the techniques of digital image processing, or digital picture processing as it was often called, were developed in the 1960s at the Jet Propulsion Laboratory, MIT, Bell Labs, University of Maryland, and a few other places, with application to satellite imagery, wire photo standards conversion,

medical imaging, videophone, character recognition, and photo enhancement. Digital processing is most of the time preferable because of cost issue on top of falling trend of digital devices.

2.2 Flow Chart

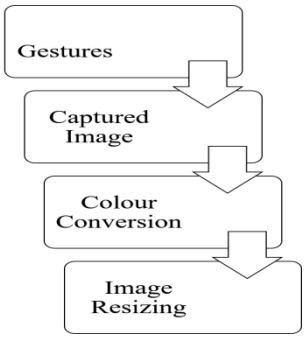

Fig.2.2 Image Processing Flow Chart

III. DISCUSSION ON RESULTS

3.1 Condition 1

This condition is for hand gesture processing. Process is as shown below.Live Feed of Hand Gestures from camera goes to Central Processor(Video prossecing system), Control signals from processing units are sent to relay, from relay different appliances can be controlled based on given gestures**.**

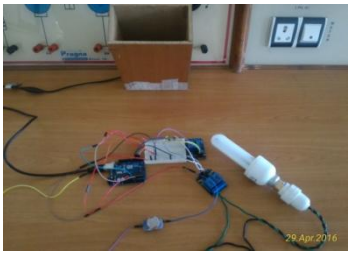

Fig.3.1 Experimental setup

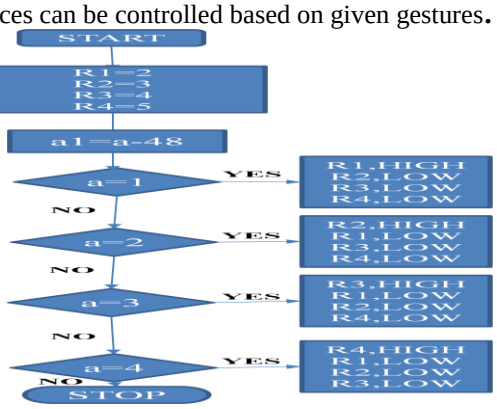

Fig.3.2 Flowchart of Relay actuation

3.2 Condition 2

This condition is for Outdoor Applications

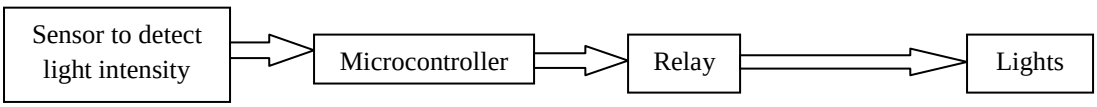

Fig.3.3 Block diagram for LDR

Light Intensities like dim, bright, are detected by the sensors & sent to microcontroller for processing; the processed signal is then fed to relay which in turn switch ON or OFF the lights based on intensities.

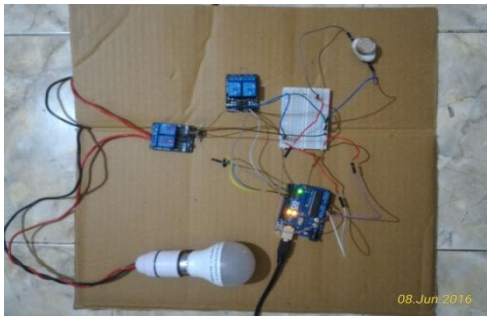

Fig.3.4 In Presence of exterior light (Intensity is HIGH)

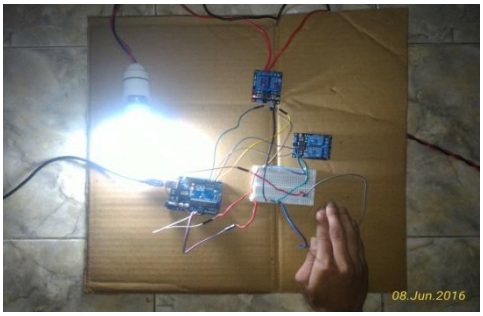

Fig.3.5 In Absence of exterior light (Intensity is LOW)

3.2.1 Flow Chart

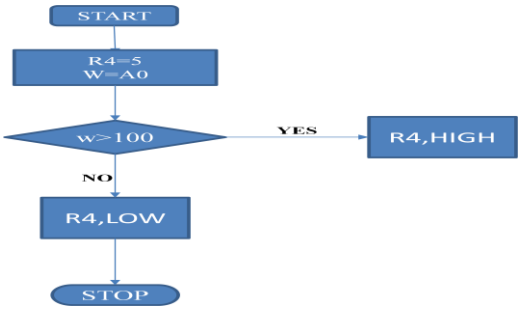

Fig.3.6 Flowchart of LDR

3.3 Condition 3

This condition is for indoor purposes.

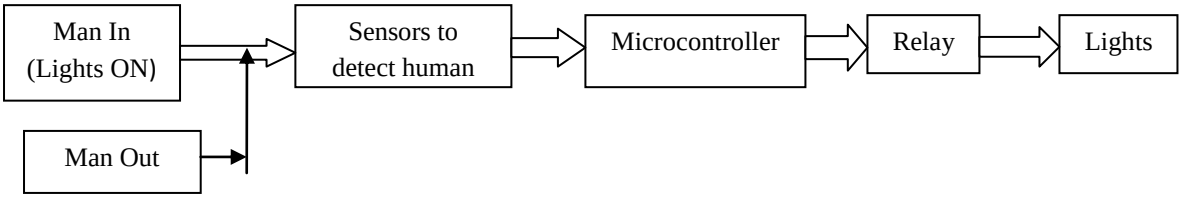

Fig.3.7 Block diagram for Ultrasonic Sensor

Human Presence is detected when human is IN & OUT of the room from sensors, the signal from the sensors is fed to microcontroller, then the control signal from the microcontroller is given to relay which controls the ON & OFF of the lights of the room respected to IN & OUT of humans.

IV.CONCLUSION AND FUTURE SCOPE

Gesture based home automation system provides efficient usage for disabled people in their day-to-day life as we have discussed in this project.

In this work SMARTENERGY is introduced, our framework for conserving energy in smart homes. Building on the idea that human daily activities at home are strongly related to the home electrical appliances, it has been shown that the introduction of sensors opens new perspective for the field of activity detection. With regard to future work, a great potential is already foreseen. This work focused on the one user/one activity scenario. As a next step, we will start working on scenarios where multiple users can utilize the system at the same time and where multiple and overlapping activities are taken into consideration.[7]

The usage of ultrasonic sensor based fan in home automation. Traditional usage of PIR/IR sensors was studied and their disadvantages were noted such as their poor tolerance to light reflections or in fact the temperature limits issues. The ultrasonic sensor used in the setup HC SR04 module is immune to such conditions and a small setup was tested using a 8051 microcontroller.

Hence this project helps disabled people efficiently and effectively.This project is economical compared to its previous versions. From this project energy dispute can be solved in our nation in many ways and save the energy hence leading to solve power shortage issues.

REFERENCES

[1]. https://www.quora.com/Disability-and-Disabilities/What-are-the-biggest-problems-which- physically-challenged-people face-in-their-day-to-day-life

[2]. Book : Understanding Energy Challenges in India by International Energy Agency

[3]. K. Irie, K. Umeda and N. Wakamura, “Construction of an Intelligent Room Based on Gesture Recognition,” in *2004 IEEE International Conference on Intelligent Robots and Systems*, Sandai, Japan, Oct 2004, pp 193-198.

[4]. A Guide to MATLAB: For Beginners and Experienced Users, Book by Brian R. Hunt, Jonathan Rosenberg, and Ronald L. Lipsma

[5]. http://in.mathworks.com/discovery/matlab-gui.html

[6]. J. Call Quer, Arduino Uno http://www.business-standard.com/article/opinion/rahl-tongia-a-smart-solution-to powershortage-111070500071_1.html