

Voice and Hand Gesture based Home Automation for Physically Challenged

G. Bhaskar Phani Ram¹, P. Girish Kumar², G. Sai Bhargav³, K. Rohith⁴, S. Dolly Sree⁵

¹Asst. Professor, Dept. of ECE, Vardhaman College of Engineering, Telangana, India

²⁻⁵Dept. of ECE, Vardhaman College of Engineering, Telangana, India

Abstract - Physical disabilities for instance, paralysis, paraplegia, quadriplegia and Parkinson's illness, can incredibly constrain the self-governance of patients as for home living. Rehabilitation engineering is that the application of engineering sciences and technology to boost the standard of life for physically challenged people. A tool is intended for the physically challenged people to assist them in operating the house appliances individually. This Paper presents a system for voice and hand gesture controlled programme. This proposed system aims to control different home appliances. In this system MEMS accelerometer sensor is employed to detect hand motion and bluetooth module is employed to detect voice commands from the user and transmitted to microcontroller. This paper presents a low-cost voice and hand gesture based system to control the house Electronic devices using PIC microcontroller. PIC acts as the main part of gesture identification and speech recognition. The MEMS sensor which is connected to hand could be a xyz-axis accelerometer which senses the gesture of the hand and bluetooth module HC05 senses the voice commands through which the house electrical appliances are controlled using PIC16F877A controller.

Key Words: PIC 16f877a microcontroller, CCS PIC C compiler, Bluetooth module HC05; micro electro mechanical systems accelerometer adxl335.

1. INTRODUCTION

With the advancement in technology, home automation has made possible everywhere. Home automation is extremely useful for someone with disabilities in many aspects. Lots of individuals think that Home Automation could be a Luxury Thing. Home Automation isn't just a luxury one but, it's the way beyond. Physically paralyzed person is that the one who has lost his/her physical mobility. There are various sorts of paralysis. They are monoplegia (which effects just one arm or leg), hemiplegia (effects one arm and one leg on same side of body), paraplegia (effects both legs), quadriplegia (effects both arms and legs) . Such a physically paralyzed person wants to hunt other person's help even for his/her basic task like clothing, bathing, eating etc.. Things become even worse when there's no guardian to handle the care of such person. How such person would control the house appliances ? And, there are more such questions. Many people would say they'll hire some people whose duty is to take care of such people but, it's not a reliable solution. How much a new person would care about all the items. So we want to design a system where a paralyzed person are often ready to operate devices with the assistance of some simple hand gestures and with some voice commands. The user can wear MEMS accelerometer on a hand, through gestures they'll control powered devices like fan, light, etc., With the assistance of arduino voice control application on android phone someone can control home appliances through voice commands.

2. EXISTING SYSTEM

The present system uses accelerometer, microcontroller, RF transmitter and RF receiver and communication is established through RF signals. The accelerometer senses the hand gestures and signals are transmitted through RF transmitter to the receiver .At the receiver end RF receiver receives the transmitted signal compares with the already stored gestures. When the similar hand gestures are identified, then the suitable home appliances are controlled.

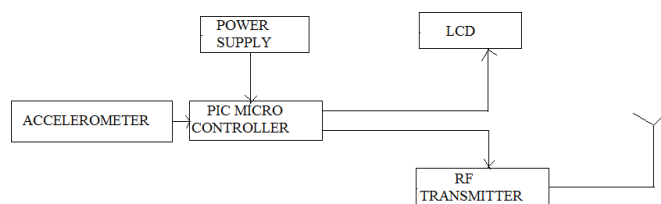


Fig -1. Block diagram for RF transmitter section

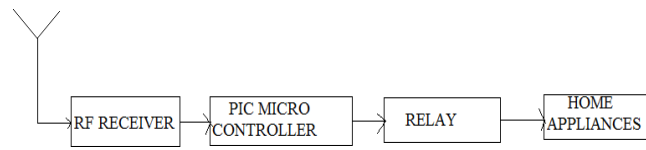


Fig -2. Block diagram for RF receiver section

The existing system uses two pic micro controllers which requires an extra power supply. This system seems to bulky because it has separate RF transmitter and RF receiver sections. It acts as a wireless system.

3. PROPOSED SYSTEM

In proposed system, the hardware of the existing system is modified by removing the RF transmitter and RF receiver sections i.e., making the whole circuit completely wired with single PIC microcontroller. And also adding an extra hardware Bluetooth HC05 module which enables the system for receiving voice commands through which the home appliances are controlled. The proposed system consists of the bluetooth module and MEMS sensor connected to the pic microcontroller. MEMS accelerometer generates analog values when certain gestures are made. These analog values are sent to ADC of the microcontroller. The PIC microcontroller processes these analog values into numbers. Using pic c compiler, a code is written on the microcontroller. So, the generated numbers are compared with the predetermined threshold numbers that are written in code which is dumped in microcontroller. According to that comparison, the appropriate home appliances are controlled. The bluetooth hc05 is connected to microcontroller via serial communication. The hc05 converts voice commands into text and then compared. If comparison is successful the appropriate home appliance is operated.

3.1 Flow Chart for Bluetooth Module: (voice based operation)

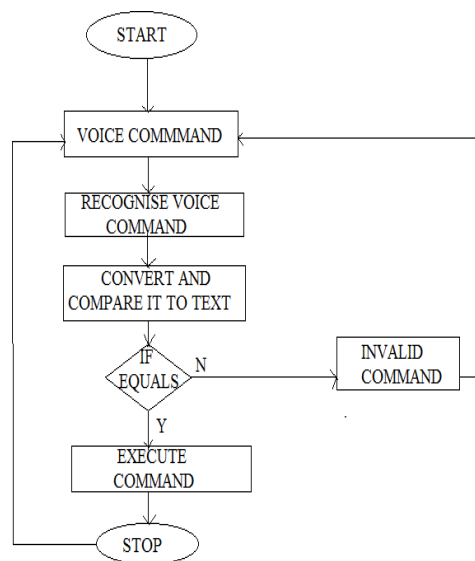


Fig -3: flow chart -I of the proposed system

3.2 Flow Chart for MEMS (Gesture based operation):

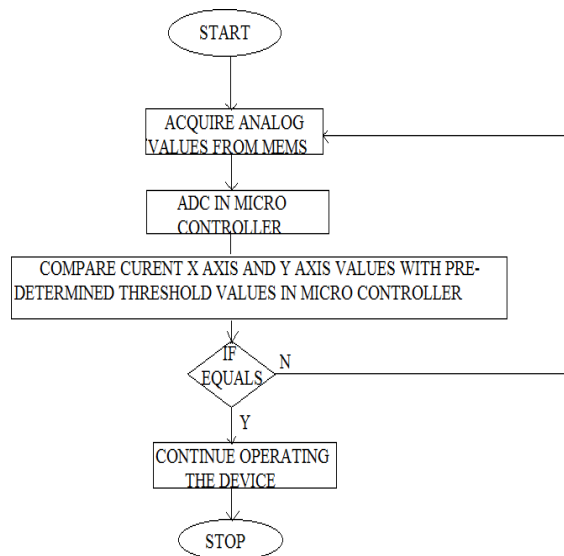


Fig -4: flow chart -II of the proposed system

The above flowcharts describes the procedures of operation of both MEMS and Bluetooth module HC05.

4. SYSTEM DESIGN

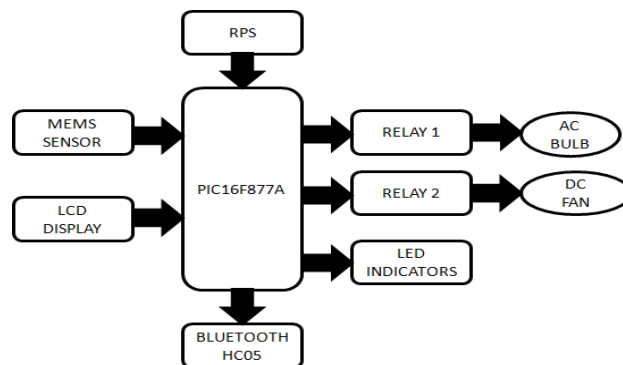


Fig -5: Block diagram of proposed system

Within the system, MEMS X-axis, Y-axis pins are connected to analog pins of the micro controller. The circuit is given External power supply. The transmitter of bluetooth module HC05 is connected to the receiver of microcontroller and vice-versa.

4.1 PIC Microcontroller

The module which we've got used is ADXL335 accelerometer module. MEMS accelerometers are micro- electromechanical systems which are basically u measure the static and dynamic forces of acceleration. In the proposed system aadxl335 accelerometer sensor are used for interaction with household appliance using recognized hand gestures. The ADXL335 could be a small, low power, 3-axis accelerometer with signal conditioned voltage outputs. It has excellent temperature stability. It is used in motion and tilt sensing applications.

4.2 MEMS Accelerometer Module

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4.3 Bluetooth Module

Bluetooth module Bluetooth module HC05 is meant for a relentless wireless serial connection setup. Its communication is established through serial communication which helps in making a easy method for interfacing with controller. This module is employed to communicate with devices which supports the Bluetooth functionality which may be a Phone or Laptop. There are many android applications that are already available which makes this process easier.

4.4 Regulated Power Supply

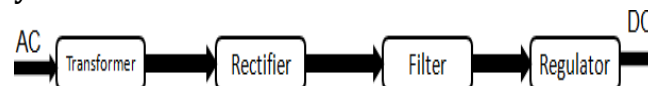


Fig -5: Block diagram of RPS

Regulated power supply is a power source to the entire system. RPS is required to produce the specified power supply .This whole RPS system comprises of Step down Transformer, rectifier, voltage regulator, and filter circuit in series for generation of 5V DC power so that the whole circuit is operated.

4.5 Software and Android Application for HC05

CCS C compiler is the software which is used for coding and pickit 3 dumper is employed for dumping the code into pic microcontroller. The android application Arduino Voice Control is employed to communicate with the HC05 module. This application works by pressing the mic button, then the it will stay up for you to mention a command. This app then displays the word that you simply have pronounced.

4.6 LCD Display

A 16*2 LCD display could be a small, flat display which uses light modulating properties of liquid crystals. Its operating voltage is 4.7V to 5.3V. It is an alphanumeric display module. It consists of two rows and every row can display 16 characters. In this proposed system, it is employed to display whether the devices are turned on/off.

4.7 Relays

A relay is solely a switch or are often a electromagnetic switch which is operated by a very little electric current that can be employed to turn on/off a way larger electric current. The fundamental activity of a relays comes in places where just a low-power signal are often utilized to control a circuit.

5. MERITS

The main advantage of this paper is to enhance the quality of lifetime of the physically challenged people. Also designed at low cost. It represents high compactness. This system also provides a someway for Rehabilitation Engineering.

6. RESULTS AND DISCUSSIONS

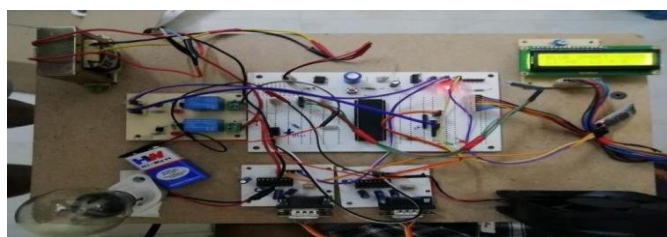


Fig -7: Complete hardware of the proposed system

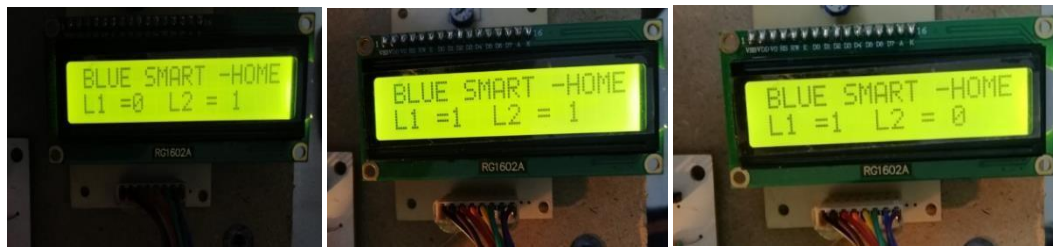


Fig -7.1 Fig -7.2 Fig -7.3

The figures 7.1,7.2 shows which devices are turned on /off and represented by 1 and 0. Fig 7.1 shows the second device is turned on. Fig 7.2 shows both devices are turned on. Fig 7.3 shows first device is turned on. This proposed system features a sliding switch which helps user to switch between the MEMS mode and Bluetooth mode.

A. When operated in MEMS mode:

- (i) When gesture is created i.e., ADXL335 tilted LEFT side, one device say a fan is turned on.
- (ii) When module ADXL335 tilted RIGHT side, another device say light is turned on.
- (iii) When module is tilted toward DOWN side, both devices are turned on.

B. When operated in bluetooth mode (through voice commands from android application):

- (i) When user says a or 1, first device is operated.
- (ii) When user says b or 2, second device is operated.
- (iii) When user says c or 3, both devices are operated.

This system is intended in such a way that when mems sensor is tilted in one direction, a device is turned on and that device is turned off if and only if the same gesture is created i.e., same tilt is created. The process is same with the android application. If user says 1 or a, the device goes into on mode and it should go off when user pronounces the identical word.

7. CONCLUSIONS

This paper has discussed a system which will help physically challenged people to manage house appliances by mere hand gestures. We've used Bluetooth module which helps to enable device switching through voice commands by an android application. In upcoming years more home appliances are controlled by incorporating the various types of sensors.

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