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INTELLEGENTLY CONNECTING THE HOME AUTOMATION SYSTEM TO THE WORLD USING IOT BY GESTURE BASED CONTROL

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Abstract : A Smart Home System gives access to the controllable household appliances and may help render the electricity supply in a household, controlling use and along these lines lessening utilization. It has also proven to be an incredible advantage for the elderly and disabled. A form of home automation systems called assistive domotics provides an extensive feature range that can help the ones with particular accessibility concerns in their homes. These technology systems and assisting equipment have emerged as a viable option for the needy, who would rather stay in their homes than move to assisted living facilities. This paper presents a glove -based home automation system which recognizes gestures and hence provides automated device control. Household devices can be controlled with simple gestures made while wearing the glove. A mobile application is also developed for the family members to keep track of the status and usage of devices. Hence, the system provides comfort to the specially-abled and simultaneously, it also keeps the caretakers informed.

1. Introduction

With the rapid growth of technology, it has become important to explore different parts of automation in our day to day lives. Systems such as Artificial Intelligence are poised to help the entire human workforce. Home automation means controlling electronic and electrical devices along with other manually operated things such as doors, windows. Smart homes [1] are efficient, cost effective, low power and realize the automation of a variety of domestic appliances. Handicapped patients, the elderly and people with disabilities who have problems with locomotion can benefit from such smart homes [2]. They can operate all appliances and devices with high performance from anywhere in the house. According to statistics released by the

United Nations (UN), the disabled account for 10 percent of the population in the world. 80 percent of these people are in developing countries. Census 2011(2016 updated) has revealed that over 22 million people in India are suffering from some kind of disability. This is equivalent to approximately 2.21% of the population. There is a need to provide a system which caters to the needs of the elderly and the disabled, which allows them and their health to be monitored remotely [3] for ease of all the parties involved. Such a system would provide much-needed assistance to them. While there are plenty of home automation systems in the market that control the appliances by voice [4-6], they do not uniformly cater to the needs of all kinds of disabled people such as the dumb, the elderly who cannot speak loud enough or the partially

paralyzed. These patients would be unable to speak well enough to give clear commands. There is also more scope for error in voice processing. This paper discusses a system which overcomes these hurdles and provides much needed help for people with special needs.

2. LITERATURE SURVEY:

A voice-controlled multi-functional Smart Home Automation System

Current availability of interactive technologies infrastructure such as internet bandwidth, increased processing power and connectivity through mobile devices at affordable costs have led to new concepts related to human living. Smart cities, smart life and internet of things etc. are few such evolving research domains. A prominent concept among these is 'Smart Home', which involves automation and interactive technologies. This paper proposes a multi-functional 'Smart Home Automation System' (SHAS), where users can use voice-commands to control their home-appliances and gadgets, for different functionalities and purposes. The proposed system can be adapted to a user's voice and recognise the voice-commands, independent of the speaker's personal characteristics such as accent. The system is aimed to be cost-effective, flexible and robust. The voice command recognition is achieved using a dedicated hardware module and an Arduino micro-controller board for commands processing and control. Performance evaluation is carried out by developing a multi-functional miniature prototype of the SHAS. Results of the experiments conducted are quite promising. The prototype SHAS can be used for converting existing homes into smart homes at relatively low cost and with convenience.

Health care in home automation systems with speech recognition and mobile technology

Home automation systems use technology to facilitate the lives of people using it, and it is especially useful for assisting the elderly and persons with special needs. These kinds of systems have been a popular research subject in last few years. In this work, I present the design and development of a system that provides a life assistant service in a home environment, a smart home-based healthcare system controlled with speech

recognition and mobile technology. This includes developing software with speech recognition, speech synthesis, face recognition, controls for Arduino hardware, and a smartphone application for remote controlling the system. With the developed system, elderly and persons with special needs can stay independently in their own home secure and with care facilities. This system is tailored towards the elderly and disabled, but it can also be embedded in any home and used by anybody. It provides healthcare, security, entertainment, and total local and remote control of home.

Gesture controlled home automation for differently challenged people

Everyday communication with the hearing population poses a major challenge to those with hearing loss. For this purpose, an automatic American Sign Language recognition system is developed using artificial neural network (ANN) and to translate the ASL alphabets into text and sound. A glove circuit is designed with flex sensors, 3axis accelerometer and EMG sensors to capture the gestures. The finger bending data is obtained from the flex sensors on each finger whereas the accelerometer provides the trajectories of the hand motion. Some local features are extracted from the ASL alphabets which are then classified using neural network. Finger bending data is transmitted via zigbee and given to driver circuit to control the home appliances. Keywords—Accelerometer, Artificial Neural Network, Electromyography, Flex Sensors, Sign Language Recognition.

3. EXISTING SYSTEM

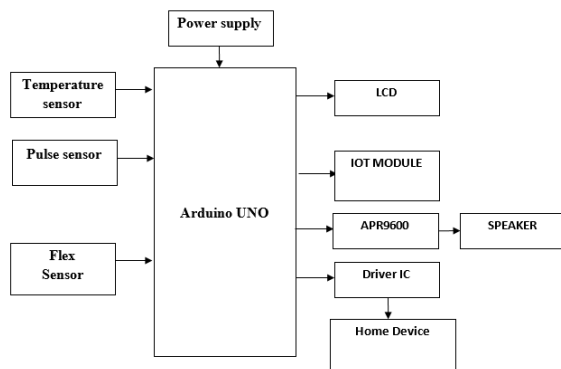
- Home Automation is the new trend in a consumer market.
- There are many home automation systems with different features and facilities.
- All the home automation systems are used to control home appliances through a remote control.
- The remote control can be a stationed unit or a wireless remote.
- The remote used for controlling appliances usually have keys or touch-based sensors.

3.1. PROPOSED SYSTEM

- The proposed system provides a gesture-controlled automated home based system which can be operated using a glove by the elderly or the disabled.

- The patient will perform gestures while wearing this glove.
- There is a central hub which receives data from the glove, interprets the gesture and switches the corresponding device on or off.
- The gesture mapping for devices is provided to the users.

Block diagram



4. ARDUINO



Overview:

Arduino Uno is a microcontroller board subject to the ATmega328P (datasheet). It has 14 pushed information/yield pins (of which 6 can be utilized as PWM yields), 6 essential information sources, a 16 MHz completed resonator (CSTCE16M0V53-R0), a USB alliance, a force jack, an ICSP header, and a reset button. It contains all that ordinary to help the microcontroller; on a crucial level interface it to a PC with a USB association or force it with an AC-to-DC connector or battery to begin. You can

intrude with your Uno without anguishing essentially overachieving something mistakenly, most central outcome possible you can trade the chip for two or three dollars and start once more. "Uno" suggests one in Italian and was picked to stamp the presence of Arduino Software (IDE) 1.0. The Uno board and structure 1.0 of Arduino Software (IDE) were the reference sorts of Arduino, direct made to unendingly current deliveries. The Uno board is the first in the headway of USB Arduino sheets and the reference model for the Arduino stage; for a sweeping once-over of current, past, or old sheets see the Arduino report of sheets. • Physical contraptions and sensors Physical contraptions and sensors can amass and see sagacious and multidimensional data, and check of the target state of a function uninhibitedly without human mediation. Besides, when contraptions capacity to get data with presented understanding, gadgets can act and respond. Condition setting will at that point be changed and the contraptions will reach out of the blue. In that limit, this assortment structure will be rehashed perseveringly. •

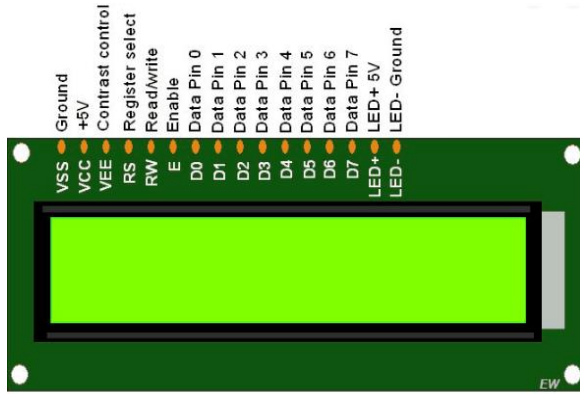
Connection and foundation Association and foundation, for example, cloud, security, covering ceaselessly, security, insistence, and controlling, pull in interminable, solid information and data stream and assessment circles.

5. LCD

LCD (Liquid Crystal Display) is such a level board show which utilizes fluid noteworthy stones in its major sort of development. LEDs have a gigantic and moving methodology of usage cases for clients and connections, as they can be customarily found in telephones, TVs, PC screens, and instrument sheets.

LCDs were a basic ricochet the degree that the development they eliminated, which breaker light-passing on the diode (LED) and gas-plasma shows. LCDs permitted partners to be all-around more meager than the cathode bar tube (CRT) development. LCDs eat up liberally less force than LED and gas-show shows since they search after the standard of deterring light instead of delivering it. Where a LED emanates light, the fluid tremendous stones in an LCD pass on a picture utilizing foundation edification.

As LCDs have supplanted dynamically sorted out superstar drives, LCDs have started being eliminated by new presentation improvements, for example, OLEDs.



6. FLEX SENSOR

A flex sensor or bend sensor is a sensor that measures the amount of deflection or bending. Usually the sensor is stuck to the surface, and resistance of sensor element is varied by bending the surface. Since the resistance is directly proportional to amount of bend it is used as goniometer, and often called flexible potentiometer.

FEATURES

- Angle Displacement Measurement
- Bends and Flexes physically with motion device
- Possible Uses
- Robotics
- Gaming (Virtual Motion)
- Medical Devices
- Computer Peripherals
- Musical Instruments
- Physical Therapy
- Simple Construction

MECHANICAL SPECIFICATIONS

- Life Cycle: >1 million
- Height: 0.43mm (0.017")
- Temperature Range: -35°C to +80°C

ELECTRICAL SPECIFICATIONS

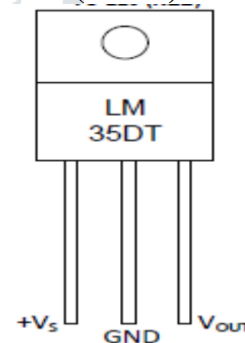
- Flat Resistance: 25K Ohms
- Resistance Tolerance: $\pm 30\%$
- Bend Resistance Range: 45K to 125K Ohms (depending on bend radius)
- Power Rating : 0.50 Watts continuous. 1 Watt Peak

7. TEMPERATURE SENSOR

Temperature is the most-measured process variable in industrial automation. Most commonly, a temperature sensor is used to convert temperature value to an electrical value. Temperature Sensors are the key to read temperatures correctly and to control temperature in industrial applications.

A large distinction can be made between temperature sensor types. Sensors differ a lot in properties such as contact-way, temperature range, calibrating method and sensing element. The temperature sensors contain a sensing element enclosed in housings of plastic or metal. With the help of conditioning circuits, the sensor will reflect the change of environmental temperature.

Temperature sensor (LM35)



Pin Definition

The definition of gray-scale sensor pin is

1. Signal Output
2. GND
3. Power

Features Of Temperature Sensor

- Calibrated directly in Celsius (centigrade)
- 0.5° C Ensured accuracy (at +25° C)
- Suitable for remote applications
- Operate from 4 to 30 V
- Low cost due to wafer-level trimming

8. APR 9600 VOICE IC:

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The IC is 28 pin device used to record & playback of maximum of 8 messages. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. the device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications.

The replayed sound exhibits high quality with a low noise level. Sampling rate for a 60 second recording period is 4.2 kHz that gives a sound record/replay bandwidth of 20Hz to 2.1 kHz. However, by changing an oscillation resistor, a sampling rate as high as 8.0 kHz can be achieved. This shortens the total length of sound recording to 32 seconds.

Total sound recording time can be varied from 32 seconds to 60 seconds by changing the value of a single resistor. The IC can operate in one of two modes: serial mode and parallel mode. In serial access mode, sound can be recorded in 256 sections. In parallel access mode, sound can be recorded in 2, 4 or 8 sections. The IC can be controlled simply using push button keys. It is also possible to control the IC using external digital circuitry such as micro-controllers and computers.

This APR9600 voice IC has 28 pin DIP package works in supply voltage between 4.5V & 6.5V. During recording and replaying, current consumption is 25 mA. In idle mode, the current drops to 1 mA. The APR9600 experimental board is an assembled PCB board consisting of an APR9600 IC, an electrets microphone, support components and necessary switches to allow users to explore all functions of the APR9600 chip. The oscillation resistor is chosen so that the total recording period is 60 seconds with a sampling rate of 4.2 kHz. The board measures 80mm by 55mm.

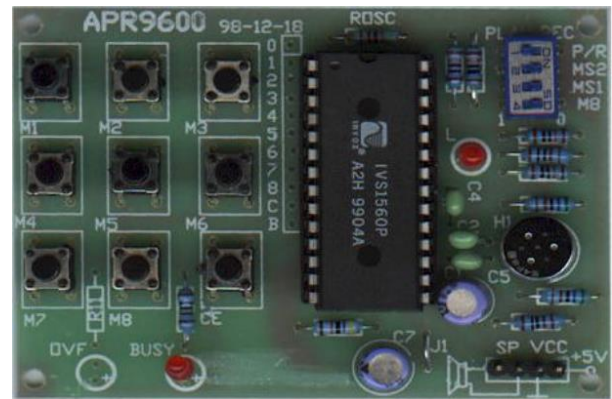


Fig: APR9600 Experimental board

SOFTWARE TOOLS

9. Arduino IDE (Integrated Development Environment)

The Arduino progress condition contains a word processor for including code, a message zone, a book maintains, a toolbar with gets for crucial cutoff regular environmental factors, and an improvement of menus. It interfaces with the Arduino contraption to move activities and talk with them.

Making Sketches

Programming made using Arduino is called follows. These depictions are written in the substance boss. Depictions are saved with the record progress .ino. It has featured for cutting/staying and for looking/dislodging content. The message a region gives input while saving and passing on what's more shows abuses. NB: Versions of the IDE before 1.0 saved draws with the expansion pde It is possible to open these records with understanding 1.0, you will be begun to save the sketch with the .ino progression on save.

The Arduino condition uses the opportunity of a sketchbook: a standard spot to store your undertakings (or depicts). The depictions in your sketchbook can be opened from the File Sketchbook menu or the Open catch on the toolbar.

Tabs, Multiple Files, and Compilation

Connects with you to figure out draws with more than one record (all of which appear in its own astounding tab). These can be typical Arduino code records (no new unexpected new

development), C reports (.c speeding up), C++ records (.cpp), or header records (.h).

ADVANTAGES

- It requires fewer components so its cost is low
- Small in size; due to small size we can place its hardware easily
- Light weight
- Flexible to users
- Easy to operate; anyone can operate it easily

DISADVANTAGES

- Accuracy and processing of system may be slow
- We may have some difficulty in operating with the buses

APPLICATIONS

- Useful for Physically challenged peoples
- Conveying information related operations
- Provides easy communication between the speech impaired people and the natural people
- Used for disabilities
- Handicaps

10. Conclusion

The system fulfils the aim of aiding the specially-abled and can help in controlling appliances and monitoring their activity remotely. The proposed system accurately identifies the gestures and performs the mapped task. Such a system will be extremely useful for those who wish to not avail of assisted living facilities. The system will provide similar facilities to provide some basic sense of independence to them. At the same time, this system will also help the caretakers and family members of those with special needs as a handy tool which will reduce their tension and

also elicit prompt action if required in case of emergencies.

The proposed system can be further modified from a prototype converted into a product using customized PCB (Printed Circuit Board) for a less bulky, easily wearable device. It would also use industry-level sensors which are more accurate. The system can be created using more sensitive sensors which will give scope for more gestures and hence more devices.

Voice control can also be added for devices to make the product comprehensive for covering most of the major types of disability. Security is a major issue in smart homes. While this system does not collect a lot of sensitive data, it is still preferable to have more security for the data and gloves.

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