International Journal of Ethics in Engineering & Management Education
Website: www.ijeee.in (ISSN: 2348-4748, Volume 1, Issue 4, April 2014)

DEVELOPMENT OF A WIRELESS SYSTEM FOR HANDICAPPED ASSISTANCE WITH GESTURE BASED APPLIANCE CONTROL

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Abstract: **This paper aims at designing Human - Appliance Interfacing Device utilizing hand gestures to communicate with remote wireless embedded systems, acting as an intermediary to an appliance. Common household appliances like lights, fans or any other electrical/electronic devices can be controlled using this system. Now the physically handicapped person will be able to switch on/off lights and increase/decrease the fan speed without any physical movement, but by just moving his limbs alone. As long as the device is attached to his limb subject is wirelessly connected to the devices in home. The device identifies the hand gesture pattern being executed with the help of a digital output MEMS accelerometer sensor and communicates to other nodes using wireless communication.**

Keywords: **Gesture recognition, Hand gesture, MEMS technology, ASK/RF Transmitter and receiver.**

1. INTRODUCTION

Physically handicapped and people suffering from certain kinds of illnesses are put into helpless situation. Their movements are so restricted that they should depend on others for simple tasks like turning on a light or fan at home. When they are left alone at home, they feel totally helpless. The gesture-based technology is currently an evolving trend that allows users to control various electronic devices using the hand gestures. Here is a system that can solve this problem.

The MEMS technology uses accelerometers for their operations. The MEMS based accelerometers, are used for acceleration detection in this application. The accelerometers are tiny devices which are capable of detecting the acceleration of the objects to which they are attached.

The microcontroller after analyzing the signals from the accelerometers, generates digital codes for each movement of the hand, these digital codes are modulated and transmitted using the ASK/RF transmitter

2. GESTURE AND GESTURE RECOGNITION

Expressive and meaningful body motions involving physical movements of the hands, arms or head can be extremely useful for, 1) conveying meaningful information, or 2) Interacting with the environment. This involves: 1) a posture: a static configuration without the movement of the body part and 2) a gesture: a dynamic movement of the body part. Generally, there exist many-to-one mappings from concepts to gestures and vice versa. They can broadly be of the following types:

- Hand and arm gestures: Recognition of hand poses, Sign languages, and entertainment applications (allowing children to play and interact in virtual environments).
- Head and face gestures: Some examples are a) nodding or head shaking, b) direction of eye gaze, c) raising the eyebrows, d) opening and closing the mouth, e) winking, f) Flaring the nostrils, e) looks of surprise, happiness, disgust, fear, sadness, and many others represent head and face gestures

Gesture recognition refers to the process of understanding and classifying meaningful movements of the hands, arms, face, or sometimes head. However hand gestures are the most expressive, natural, and intuitive and thus, most frequently used. Gesture recognition has become one of the hottest fields of research for its great significance in designing artificially intelligent human-computer interfaces for various applications which range from sign language through medical rehabilitation to virtual reality.

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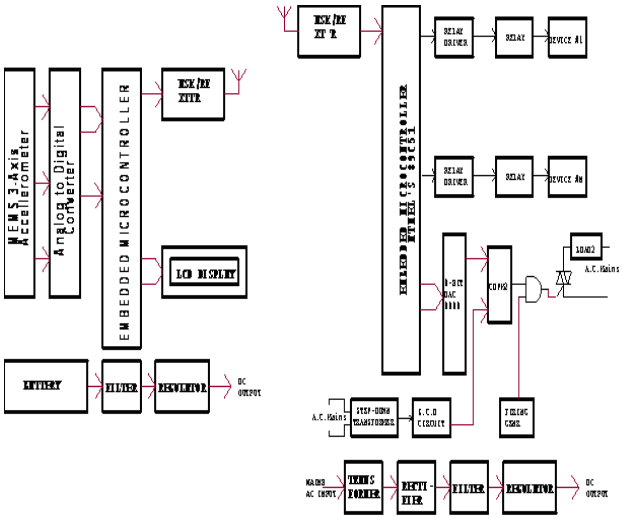
3. METHODOLOGY

The system proposed here can make things easy for physically challenged people. It consists of two units. One movable transmitter unit and a stationary controller unit mounted on the wall and connected to the home appliances (loads) with suitable electric wiring.

The transmitter unit is worn by the person with suitable temporary fastening like an elastic belt or a strap over his/her hand. This unit comprises of a microcontroller and associated circuitry to sense the hand movement gestures and convert them into commands and then sends them wirelessly to the controller unit using 433 MHz ASK/RF signals.

The controller is also an embedded microcontroller based system that has a 433 MHz ASK/RF receiver. It intercepts the commands wirelessly sent by the transmitter unit and understands the commands and carries out the task as per the commands to switch on/off lights or controlling speed of fan etc.

4. BLOCK DIAGRAM AND DESCRIPTION



The system consists of

- Embedded Microcontroller.
- Axis MEMS Accelerometer.
- Analog to Digital Converter.
- ASK/RF Transmitter
- ASK/RF Receiver
- Zero-Cross-Detector (ZCD)
- Ramp generator.
- Digital to Analog Converter (DAC).
- Comparator.
- Firing pulse generator.
- AC power controller.
- Relays and Relay Driver Circuits.
- LCD Display Panel.
- Power Supply.

Embedded Microcontroller: The Embedded microcontroller is the most important part of this system. This system consists of two microcontrollers, one in transmitter unit and another in controller unit. The microcontroller does all controlling activities of the system by executing a program stored into its memory. The microcontroller chosen for this project is ATMEL's 89C52.It is an 8-bit microcontroller with 8-K Bytes of internal flash program memory, 256-Byte Data memory and four 8-bit I/O ports, one serial port, two timers and 5 interrupts. Its instruction set is compatible with Intel's 8051 microcontroller. It is an ideal choice for compact embedded system design. The program for the microcontroller is developed in assembly language. The tools like Kiel, Ride or UMPS or the similar one can be used for developing and assembling the program and the hex file can be downloaded to the internal flash program memory of the microcontroller by using flash programmer instrument.

3-Axis MEMS Accelerometer: MEMS stands for Micro Electro Mechanical Sensor. A MEMS based accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibrating the accelerometer. By sensing the amount of dynamic acceleration, you can analyze the way the device is moving. An accelerometer produces a voltage proportional to the tilt and these voltages are fed to an Analog to Digital Converter and then to the microcontroller. The microcontroller routinely checks the outputs of the accelerometer and when it is tilted beyond a limit on either X or Y direction, it operates the appliances in appropriate directions. The X-axis is used for switching between light and fan loads and can be used for other loads also. The Y-axis is used to change the status, ON/OFF for light and Increase/Decrease in the speed of fan in steps.

5. ADVANTAGES

The gesture-based technology is currently an evolving trend that allows users to control various electronic devices using the hand gestures

- It is easy to learn and operate

- It is a compact system, flexible to user
- Less power consumption
- It is helpful to partially paralyzed people

6. CONCLUSION

The Result is a wearable glove that tracks basic movements, such that human-machine interaction is established Using natural hand movements. Researches show that gesture based applications can be used for many different things, entertainment, controlling home appliance, tele-care, tele-health, elderly or disable care. Now the physically handicapped person will be able to switch on/off lights and increase/decrease the fan speed without leaving his place by just moving his limbs alone.

7. REFERENCES

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