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MOTION BASED MESSAGE CONVEYOR FOR PARALYTIC/DISABLED PEOPLE

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ABSTRACT

This is an innovative application that can help the disabled/paralytic patients to convey messages or call nurse by using simple gesture movements since paralytic or disabled patients cannot press a button or ring to call a nurse when they need. Even if they can move a particular body part like moving their hand up to a limit or moving their leg up to a limit, this system can be mounted on mobile body part and just by a simple movement or a gesture, and they can pass on various messages and call the attendant. Objective of this project is implementing a relatively less expensive system that helps in establishment of communication between disabled or paralytic patients and nurse/caretaker.

Keywords*: Quadriplegia, LPC2148 microcontroller, ADXL335, HC-05, Speech module.*

1. INTRODUCTION

Among the enormous number of advancements done in the medical sector, very few actually focus on helping patients with disabilities to communicate. Here we propose a simple and effective way to solve the problem of physically handicapped or disabled patients. The main purpose is to replace the conventional approach of patient-nurse communication with modern technologies which is much faster and reliable way to do so. In the current scenario, the patient has to be dependent on a family member /nurse who have to attend to the patient constantly. Objective of this method is to make such patients independent to communicate with the nurse just by tilting a device located on his any other mobile body part like leg, hand. Movement of the mobile body part in a particular direction will send a message to the phone which will then display and speak out the message specified in direction. The user needs to have a transmitting device which consists of a sensor, i.e., 3- axis accelerometer. This will not only help the patient but also ease out the nurse's job.

In first paper the main objective is to make centralized patient monitoring system. Zigbee is wireless transmission technology is adopted [1].

In second paper Accelerometer is connected to Arduino Uno controller which will acts as an input. The heart of our system is Accelerometer [2].

Third paper is the recognition of hand gestures has been fully explained. Gesture recognition takes place using a sensor glove, consisting of five acceleration sensors and a microcontroller [3].

2. PROPOSED METHODOLOGY

The ADXL335 accelerometer is capable of measuring the static acceleration due to gravity and thus finding the angle at which the device is tilted with respect to the earth [4]. Whenever patient wants to convey any message he tilts the accelerometer in different directions. This acts as an input to the accelerometer while output of it is in volts which will display on mobile application. The output of the accelerometer depends on the different tilted angles. The controller maps the input voltages between 0 to 5 volts. To reduce the complexity and provide a simple way for the patients, we reduced its sensitivity by mapping it to 0-5 volts and then provided a range for left, right, forward and backward. These directions can be easily understood and used by any person using his/her any part of the body capable of moving in these directions.

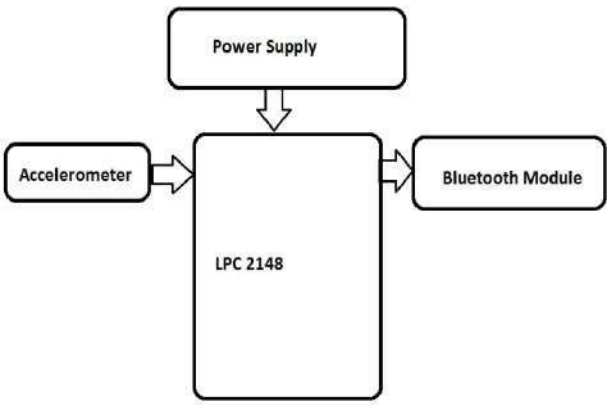


Fig.1 Block diagram

A predefined messages catering to the basic needs of the patients will be stored in the ranges assigned to a particular directions. For example: 'I am hungry' is the message, when the patient moves his mobile body part to the right. So, on tilting the accelerometer to the right, it will send particular message to the controller. If this value lies between the ranges assigned to the right direction the predefined message that is 'I am hungry' in this case will be sent. The accelerometer will be connected to patient with HC-05 Bluetooth module. The proposed system will provide communication between paralytic/disabled patients and nurse/caretaker.

At the receiver side, message will display and speak out on "*Arduino Bluetooth Text to Speech*" mobile application. The mobile's Bluetooth should be paired with the HC-05 Bluetooth model. After receiving the message, nurse will take the required action to cater to the needs of the message. As medicine and water is also important, 'I need medicine' and 'I need water' message is implemented in it. This system will help to Nurse or Doctor to take care of each patient.

3. HARDWARE USED

3.1 LPC2148 MICROCONTROLLER

LPC2148 microcontroller has developed by Philips (NPX semiconductor) company It has so many built-in peripherals and features. Therefore, it has become so efficient and reliable as compared to other microcontrollers. It is 16 bit or 32-bit ARM 7 based microcontroller.

Fig.2 LPC2148 ARM7 DEVELOPMENT BOARD

3.2 HC-05 Bluetooth Module

The HC-05 is a popular module which can add two-way (full- duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop.

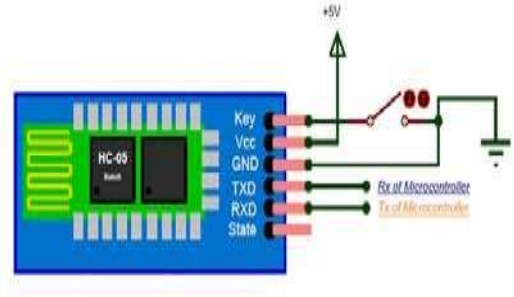


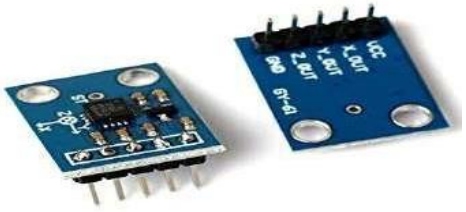
Fig.3 HC-05 Bluetooth Module Interface

There are many android applications that are already available which makes this process a lot easier. The module communicates with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USART.

ACCELEROMETER

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g.

It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or



vibration.Apart from ADXL335 IC this module also consists of a 3.3V voltage regulator IC.

Fig.4 ADXL335Accelerometer

ARDUINO BLUETOOTH TEXT TO SPEECH

This smart phone app receives text messages via Bluetooth from a paired Bluetooth device, i.e., our LPC2148 microcontroller with an HC-05 module. It then converts the received text into speech.

4. FLOW CHART

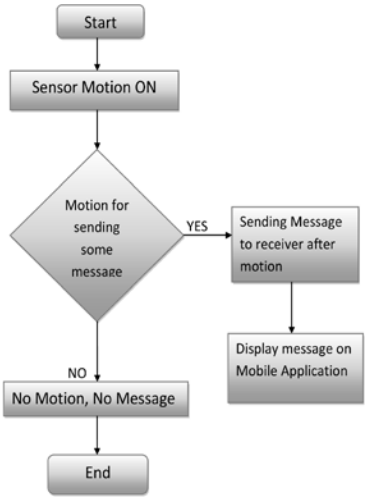
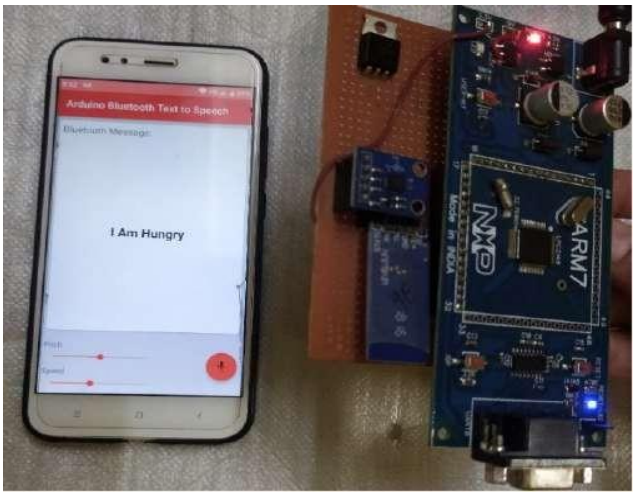


Fig.5 Flow Chart

The working flow chart of proposed system is as shown in above figure. The process will be as follows:-

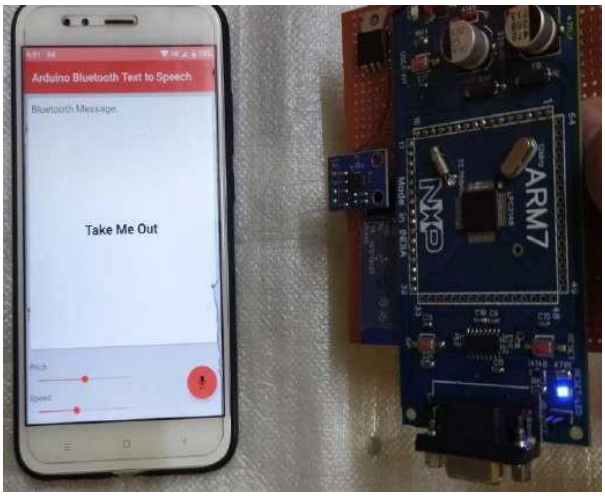
To work the device there needs to be the motion of accelerometer in any direction. There will be programmed instructions for every movement. If there is motion of the device in any direction then there will be a programmed message will be sent to the receiver which will be displayed on the Arduino "Bluetooth Based Text to Speech mobile application". If the device is steady i.e. there is no any device motion then there will be no message. So, process will end.

5. RESULT



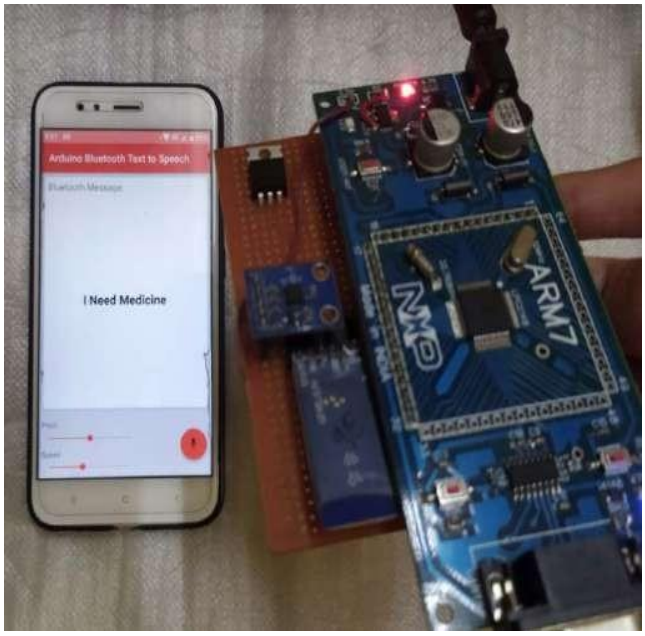
Result 1

As shown in above outcome, when system is tilted at right direction, it will send message that 'I am Hungry' to the nurse/caretaker on mobile application ***"Arduino Bluetooth Text to Speech".***



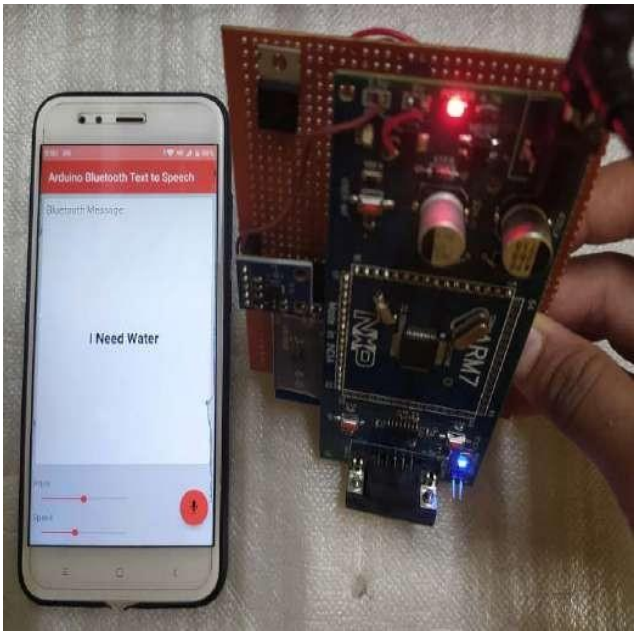
Result 2

In above outcome, when system is tilted at left direction, it will send message that 'Take Me Out' to the nurse/caretaker on mobile.



Result 3

When system is tilted at front, it will send message that 'I Need Medicine' to the nurse/caretaker on mobile application as shown in above result.



Result 4

When system is tilted at back, it will send message that 'I Need Water' to the nurse/caretaker on mobile.

6. CONCLUSION

As motion based message conveyor system is design to make communication easy between patients and Doctor/Nurse/Caretaker. Hence, a proficient approach has been implemented between patient-nurse communications. In this system, just by tilting the accelerometer in different direction they can easily convey message to the nurse or Doctor. By using this system paralytic and disabled people are capable of being independent by performing small movement for conveying their messages. This makes the communication fast and effective.

7. FUTURE SCOPE

To enhance the feature of this system, one of the feature that can be added is the network part in which the messages can be sent via Wi-Fi. Another additional feature can be added in the domain of communication that is, making a phone call instead of messages[6]. Sometimes, due to any sort of hardware failure or lost of power supply, if the message has been failed to be sent, then a phone call may be initiated conveying the message that the patient is waiting for the respective nurse/doctor/care-taker. This entire system may further be developed by introducing communication via any Android app which creates an interface for the patient-nurse communication.

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