Motion Based Message Conveyor for Paralytic/ Disabled Patient

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Abstract: **The main aim of the project is to implement a low cost reliable system which will help to establish communication between paralytic or disabled patients and a nurse. A patient can easily send messages to the nurse by just tilting an accelerometer connected to a body part capable of movement. This angle of tilt is sent to a central controller which then initiates communication between the patient (transmitter) and nurse (receiver) and also decides which message is to be transmitted based on the tilt angle. Each patient will have such a device installed on or around his body and all such patients will be centrally linked to the receiver at the nurse side. Along with this a real time medicine reminder and an emergency buzzer to simplify the work of the nurse was implemented. Output is shown on LCD as well as in the form of recorded voice with the help of voice recorder & playback apr33a3. Our project provides a reliable, effective and simple yet important solution to various issues faced by nurses in traditionally communicating with disabled patients.**

Index Terms**: Patient communication, Accelerometer, RF communication.** *(key words)*

I. INTRODUCTION :

Among the large number of advancements done in the medical sector, very few actually focus on helping patients with disabilities to communicate. Although monitoring systems make it easier for doctors to collect and observe a patient's vitals, there aren't many options for actual verbal communication for disabled patients. Here we propose a simple yet effective way to solve the problem of physically handicapped or disabled patient. The main purpose is to replace the conventional approach of patient-nurse communication with modern technologies that provide a much faster and reliable way to do so. In the current scenario, the patient has to be dependent on a family member or mostly a nurse both of which have to attend to the patient constantly. Objective of this method is to make such patients independent to communicate with the nurse by the simple task of tilting a device located on his finger or any other part of the body that is capable of movement. After the patient sends the message the nurse can remotely monitor their requests and provide assistance without any further delay.

Nowadays, a lot of active research is taking place in the wireless field and very less in its public implementations. Lot of techniques has been devised for sensing the hand gestures & doing the appropriate actions. A technique based on glove is a popular mode of recognizing hand gestures. It uses a sensor attached to a glove that detects hand movements. The user needs to have a transmitting device on his hand which consists of a sensor, i.e., 3- axis accelerometer. Movement of the hand in a particular direction will send a command to the LCD screen which will then display the information specified in direction. The transmitting device consists of a Comparator IC for assigning proper levels to input voltages from the accelerometer & an Encoder IC whose function is to encode the four bit data & after that it will be transmitted by an RF Transmitter module.

In today's world population is increasing rapidly. So there is a need for proper health care centers which need to be well maintained and developed. It not only reduced mobility of patients from one ward to other but also increased burden on patients. Also it consumes more space and has more power consumption. Moreover in hospitals bedside patient monitoring is done which allows multiple patients in one room. This not only causes disturbance but also lays the foundation of patient monitoring system. Patient monitoring is done at individual level. In one room one patient is there and multiple patient physiological parameters are measured individually. If there seems to be an emergency, an alarm system which is at receiver side informs to the nurse and the doctor. The user needs to have a transmitting device on his hand which consists of a sensor, i.e., 4- axis accelerometer. Movement of the hand in a particular direction will send a command to the LCD screen which will then display the information specified in direction. The transmitting device consists of a Comparator IC for assigning proper levels to input voltages from the accelerometer & an encoder IC whose function is to encode the four bit data & after that it will be transmitted by an RF Transmitter module.

II. LITERATURE REVIEW

In the system, Real Time Health Monitoring System using Arduino this method is to implement a prototype model for the real time patient monitoring system. The proposed method is used to measure the physical parameters like body temperature, heart beat rate, and oxygen level monitoring with the help of biosensors. By the system of Hand Gesture Recognition Application for Physically Disabled People we get the information that is a communication system which converts signal languages, used by dumb people, It is done based on a narrative hand gesture recognition technique. The solution approach consists of a hardware module and software module.[2]

In this system, we used Arduino Uno at the transmitter and receiver side. we establish the direct communication between patient and doctor or nurse by sending a message based on the motion. The main part of this system is Arduino Uno, In that we used ZigBee module for the transmission and reception of the signal and we measure the physical parameter of the patient. At the transmitter, we connected the accelerometer to the Arduino which sense the motion of the patient, also there is the heart beat

sensor and blood pressure sensor which measure the heart beat and blood pressure of patient. The temperature sensor is used to detect the body temperature of a patient.[3]

III. PROPOSED METHODOLOGY AND DISCUSSION

we propose a system which mainly consists of a transmitter and a receiver section. In the transmitter section (at the patient side), a four axis accelerometer will be placed on the any moveble part of the patient. This 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. Whenever patient needs any help he tilts the accelerometer in different directions. This acts as an input to the accelerometer while output of it is in volts that is connected to the controller board which acts as the processing unit. The output of the accelerometer depends on the tilt angles and is read by the controller. The controller maps the input voltages between 0 and 5 volts into integer values between 0 and 1023 as analog data from the range of 0-1023. This range provides a lot of sensitivity and a slight shift can lead to change in value. 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 front, back, forward and backward.These directions can be easily understood and used by any person using his/her thumb or any part of the body capable of moving in these directions. A predefined message catering to the basic needs of the patients and those required for emergency will be stored in the ranges assigned to a particular direction as mentioned above. For example: food/water is the message displayed when the patient moves his finger to the right. So on tilting the accelerometer to the right, it will send its value to the controller. If this value lies between the range assigned to the right direction the predefined message that is food/water in this case will be sent to the next module that is the RF transmitter module. The RF transmitter becomes active when a message is sent from the controller for transmission. RF transmitter and receiver works on the frequency of 434 MHz. The accelerometer will be connected to each patient and each patient will have a controller board and transmitter for sending his messages. For identification of different patients their name or number is sent to the nurse. All these transmitters can be connected centrally to one RF receiver which works on the same frequency as the transmitter. Thus the proposed system will provide a many to one communication. At the receiver side, RF receiver will receive the message and send it to the controller board on the receiver side which will then display the message on the LCD. On reception of the message, nurse will remotely take the required action to cater to the needs of the message. In case of emergency the patient has to just press a push button which will signal the processing board to send an emergency alarm to the receiver. The receiver will then signal the controller to activate the buzzer.

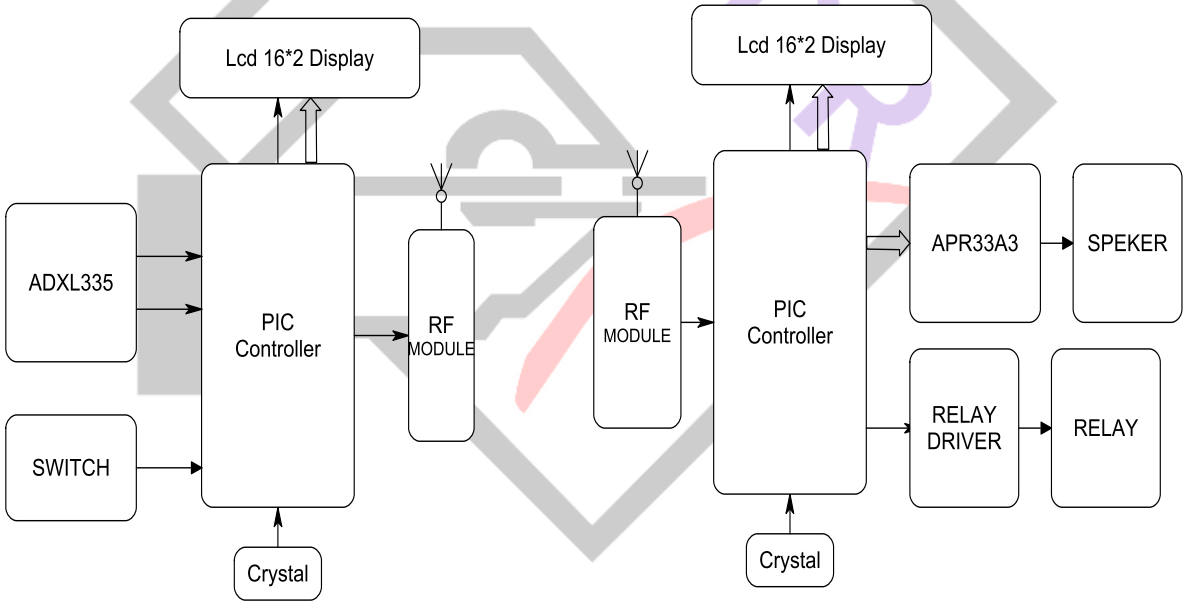

Figure 1-Block Diagram of Transmeter & Reciever Circuit

This will help the nurse to take care of the emergency as soon as possible. Taking medication at the right time is a serious business, the Medicine Reminder is another feature of this device to prompt the nurse the time to give patients their medicines. The Medicine Reminder is intended to be used by the nurse or caretaker so that a mistake is never made in giving the medicines. The medicine reminder is implemented using a real time clock. Usually for real time DS1307 Real time clock chip along with a battery is used, but this increases the amount of hardware used and makes the device bulky. So we propose a system in which the time table of all the patients will be stored in the database and the nurse will be reminded automatically when it's time to attend any patient according to the time table. This will be implemented by programming the controller board**.** On interfacing the LCD with the controller and feeding the code in the software, the real time clock runs the time on the display. Furthermore we can set an alarm time for medication schedule of a group of patients. When a particular alarm turns on, the display indicates Patient1 medicine, Patient2 medicine and so on. The system proposed will be user defined so that the nurse can change the timetable according to the needs as and when the patient changes.

IV. HARDWARE USED

PIC CONTROLER(PIC16F877A)

Figure 2- PIC Controller

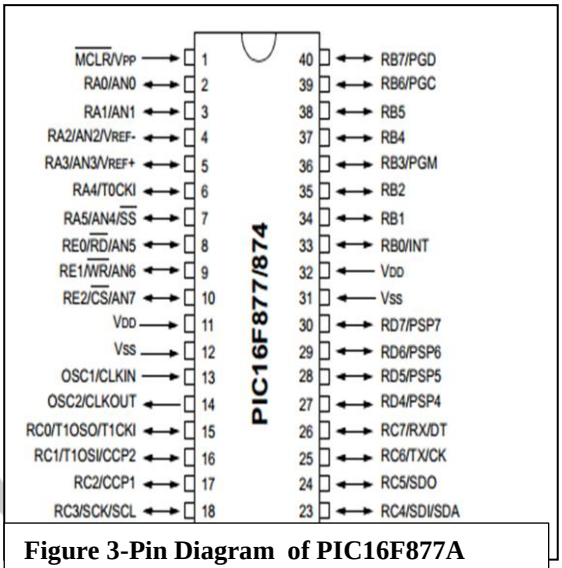

Figure 3-Pin Diagram of PIC16F877A

This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into an 40- or 44-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. The PIC16F877A features 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I²C™) bus and a Universal Asynchronous Receiver Transmitter (USART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.

V. RF MODULE

An **RF module** (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency (RF) communication.

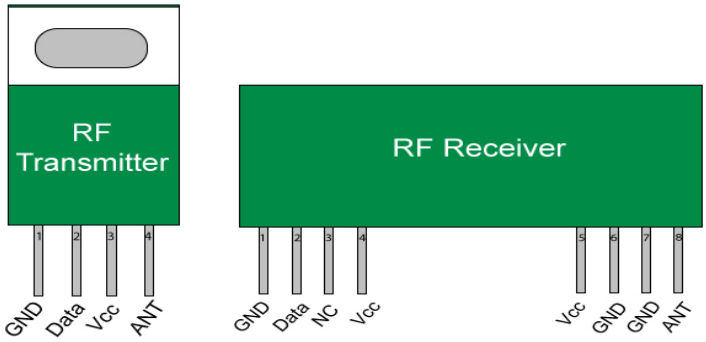

Figure 4- RF Transmitter & Reciever

Table 1- Specifications of RF Transmitter & Reciever

Parameter	Value
Working Voltage	3.3V to 5V DC regulated power supply
Current Consumption	25 mA
Frequency of Operation	2.4 GHz
Serial Baud rate	9600 bps or 115200 bps depending on jumper setting
Baud rate format	8-N-1; 1 Start bit, 8 Data bits, 1 Stop Bits, No Parity
RF Bit rate	250 kbps
RF Power Output	0 dbm
RF range	50-70 meters
On Board controller	STM8S003F3
RF Chipset	nRF24L01+ Enhanced version

Fig- Specifications of RF Transmitter & Reciever

VI. LCD 16*2 DISPLAY

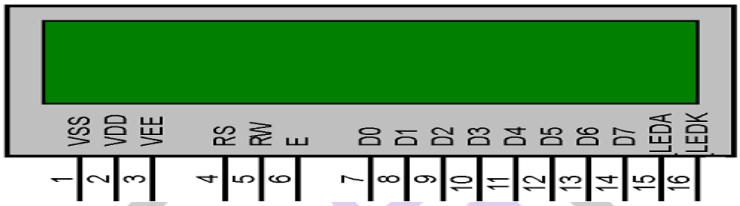

Figure 5-16x2 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on

VII. ACCELOROMETER(ADXL 335)

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. The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis. The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package (LFCSP_LQ).

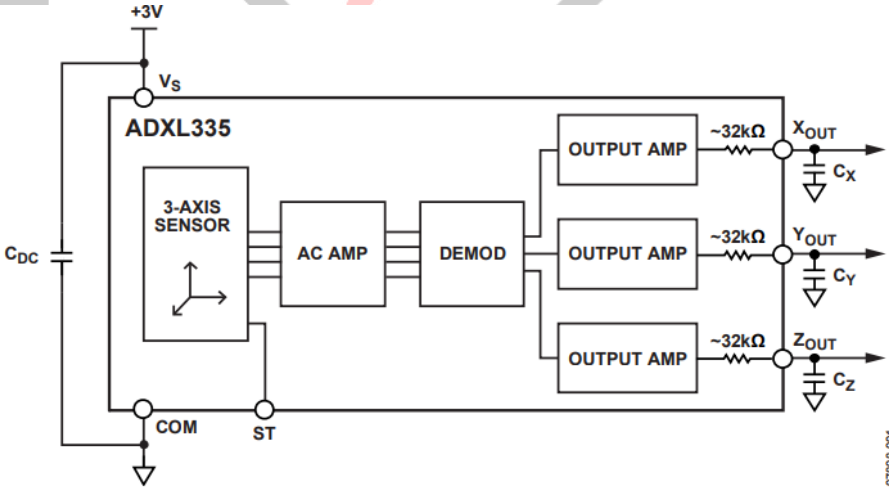

Figure 6- Functional Block Diagram of AXDL335

VIII. RELAY JQC3FC

Figure 7- Relay JQC3FC

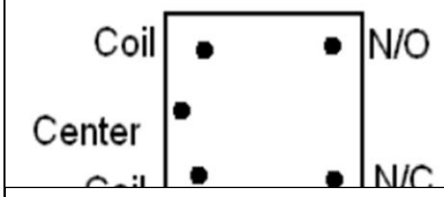

Figure 8-Back view of the Relay

A relay is an electrically activated switch. It consists of a coil internally which will creates a magnetic field that attracts a movable lever and then changes switch contacts when a current is flowing through it. The typical usage of relay is to allow a low DC voltage circuit to switch on or off a high voltage (DC or AC) circuit without direct electrical connection between them.

IX. ADVANTAGES,DISADVANTEGES & APPLICATIONS

5.1 Advantages:

- It help to doctor for 24 hours monitoring many patient at a time.
- It is reliable and effective.
- This system is simplest for solution to various issues faced by nurses in traditionally communicating with disabled patients.

5.2 Disadvantages:

- If connection is disturbed then communication between patient and nurse will lost.

5.3 Applications:

- It is more applicable in hospitals for 24 hours monitoring a patient.
- It is also applicable in house for monitoring a single patient.

X. RESULT

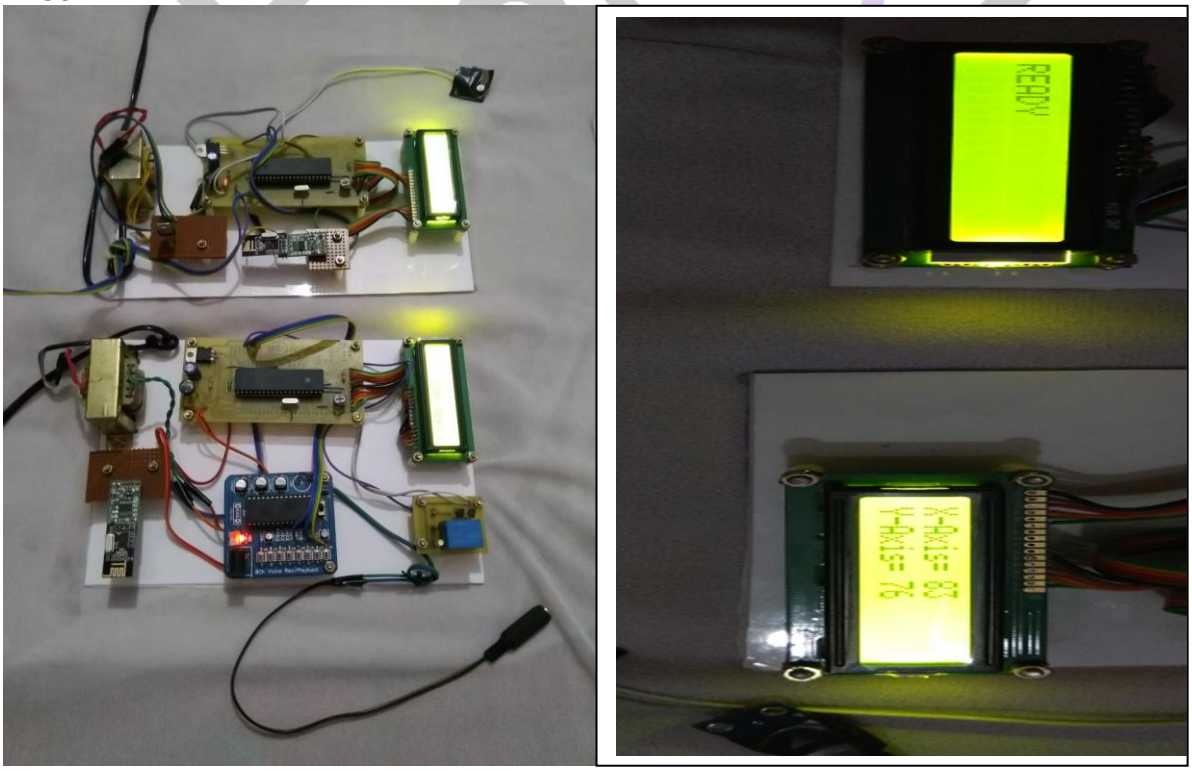

Figure 9 –system overview and output on LCD

XI. FUTURE SCOPE

We will use the Wi-Fi system for communication. By using Wi-Fi system we will expand the communication distance and transmit and receive message at the specific distance At the transmitter, we connected the accelerometer to the Arduino which

sense the motion of the patient, also there is the heart beat sensor and blood pressure sensor which measure the heart beat and blood pressure of patient. The temperature sensor is used to detect the body temperature of a patient.

XII. CONCLUSION

In this system where we can send the signal given by patients wirelessly through the gesture movement by body parts to the nurse, the information hence will be displayed on the LCD display.

Each patient will have such a device installed on or around his body and all such patients will be centrally linked to the receiver at the nurse side. Along with this a real time medicine reminder and an emergency buzzer to simplify the work of the nurse was implemented. Our system provides a reliable, effective and simple yet important solution to various issues faced by nurses in traditionally communicating with disabled patients.

XIII. ACKNOWLEDGEMENT

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