ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 3, March 2016

Motion Based Message Conveyor for Paralytic/Disabled

Aishwarya Desai[1], Nishigandha Pawar[2], Kshitija Desai[3], Noopur Behrani[4]

Student, Dept. of EXTC, VES Institute of Technology, Chembur, Mumbai, India[1]

Student, Dept. of EXTC, VES Institute of Technology, Chembur, Mumbai, India[2]

Student, Dept. of EXTC, VES Institute of Technology, Chembur, Mumbai, India[3]

Student, Dept. of EXTC, VES Institute of Technology, Chembur, Mumbai, India[4]

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. Our project provides a reliable, effective and simple yet important solution to various issues faced by nurses in traditionally communicating with disabled patients.

KEYWORDS: Patient communication, Accelerometer, Real time user defined medicine alarms, 434MHz RF communication.

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 this age old problem. 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 ward boy both of which have to attend to the patient constantly. Our objective 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. This will not only help the patient but also ease out the nurse's job. As a single nurse is responsible for a number of patients, the time required for each nurse to visit every patient to meet his needs will be saved. After the patient sends the message the nurse can remotely monitor their requests and provide assistance without any further delay. A buzzer located at the nurse's desk will alert the nurse in case of an emergency. To make the system more dynamic and decisive a real time medicine reminder is implemented to assist the nurse in her daily routine by providing time and medicine for each patient. All these ideas together thus focus on building a smart system to make patients self-sufficient, and assist the nurses at the same time.

II. RELATED WORK

In [3] authors used an actuator and a power and control section for the disabled to control the devices like fan, TV, Radio, Lamp, Wheel chair etc. It also employs a monitor that indicates the appliance or control the patient is using at a particular moment . The Monitor is electrically connected to the Power and Control Section. The Power and Control Section (Controller) houses the logic and power transmission components . This section provides three types of electrical outlets that allow up to twelve different appliances or devices to be connected. In [5] the severely disabled

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 3, March 2016

patients can not operate even the actuator, hence for such patients vestigial body signals can be used to control things or send messages. Bio signals like electrooculogram (EOG), the electromyogram (EMG), the mechanomyogram (MMG) and the conductance of the skin. In [1], hand gestures are used to control the wheel chair instead of a usual method of keypad. It also has a distress call system to alert the concerned people or family in times of emergency. In [6], a gesture recognition is done with the help of a sensor glove which consists of 5 accelerometer sensors. The gesture is recognized by comparing the acceleration values with the stored templates. According to recognized gesture, respective commands are played through speaker using voice chip.

III. PROPOSED METHODOLOGY

To overcome all the above drawbacks and meet the requirements of the system, we propose a system which mainly consists of a transmitter and a receiver section. In the transmitter section (at the patient side), a two axis accelerometer will be placed on the finger 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.[1]

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. 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.[4] 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.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 3, March 2016

IV. PROPOSED SYSTEM BLOCK DIAGRAM

1. Transmitter block diagram:

According to the proposed methodology, the following block diagrams were proposed to meet the requirements of the system. The heart of the transmitter unit is the accelerometer. This can be a two axis or a three axis static accelerometer connected to the analog inputs of the controller. It is interfaced with the controller to sense the acceleration. The controller is the second stage of the transmitter. The controller processes the data from the accelerometer and if the conditions are satisfied it sends the data to the next stage that is the transmitter. We have proposed and implemented an RF transmitter for its simplicity.[1] Another input to the controller is from push button which is used for emergency.

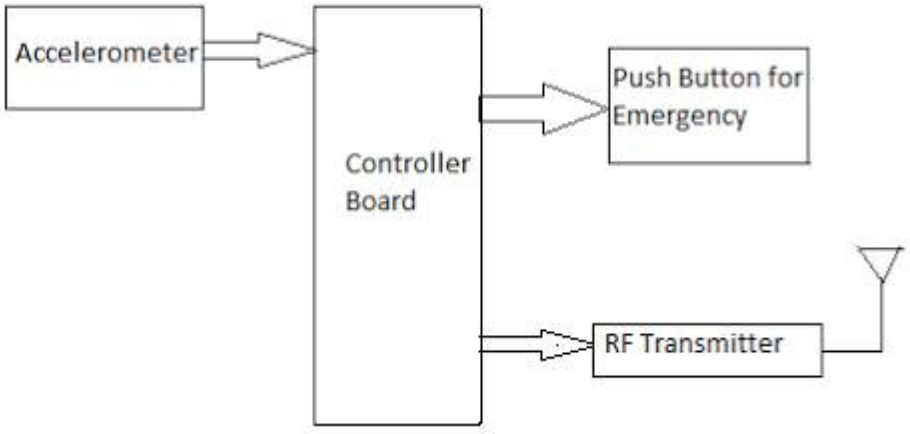

Fig 1: Transmitter unit

2. Receiver block diagram:

The receiver side includes the RF receiver which receives the messages and sends to the controller. the message is to be displayed on the LCD. For this the LCD is interfaced to the controller. Another function of the controller is to access the real time and set alarms for patients with the medicine name. This can be done in two ways: one way is to use a real time module and the second way is to do it using programming.

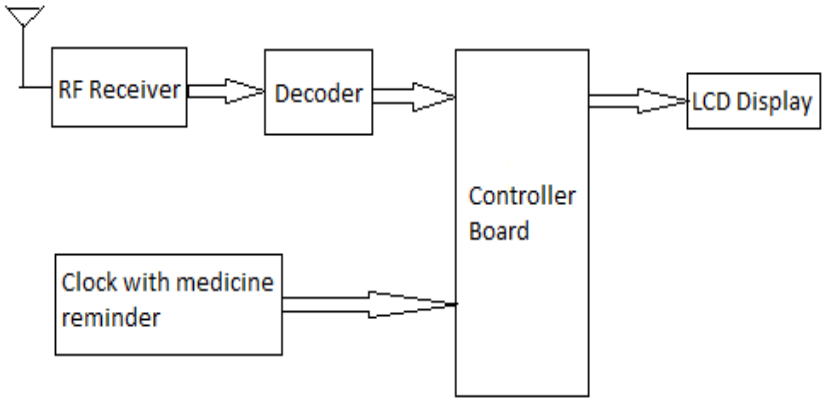

Fig 2: Receiver unit

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 3, March 2016

V. PSEUDO-CODES

1. Sensor Pseudo-Code :

1. Set controller pins as input for the 2 axis of accelerometer
2. Assign range for different angles
3. Read accelerometer values as analog input and down convert to a range of 0-5
4. If the read value lies in the give range then
   Send the message to the transmitter for that direction
   Else keep checking the value
5. Repeat step 3 and 4

2. Transmitter Pseudo-Code :

1. Initialize I/O and Interrupt Service Routine.
2. Initialize the transmission baud rate as 2000 bits per sec.
3. When message is present at the input of the transmitter, message length is calculated.
4. Each message is transmitted serially and till the message length turns 0.
5. Once the message length turns 0, wait till the next message to arrive by checking the inout pin to go high.

3. Receiver Pseudo-Code :

1. Initialize I/O and Interrupt Service Routine.
2. Initialise the transmission baud rate as 2000 bits per sec.
3. Initialize and start the receiver Phase Locked Loop.
4. Wait for the message to be received into the buffer and calculate the buffer length.
5. Till buffer length becomes 0 each message is received serially and displayed.

VI. RESULTS

Simulation of the project is done in the Arduino Software. The figure below shows the output in a serial monitor of the software. It shows the Real Time Clock (RTC) implementation and the received signals from the patients. Medicine Reminder is in synchronization with the RTC. Along with that we can see the different messages sent by the two patients. Our project result shows successful transmission of 4 messages from each patient. This window will be present at the receiver side that is at the nurse side. When no signal is transmitted only real time clock will be displayed on the screen. As soon as a message due to the motion of accelerometer is received it will be displayed on the screen. Identification of the message from different patients is made easy as patient number is sent along with the message. Medicine reminder program will display its output at a predefined stored time.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 3, March 2016

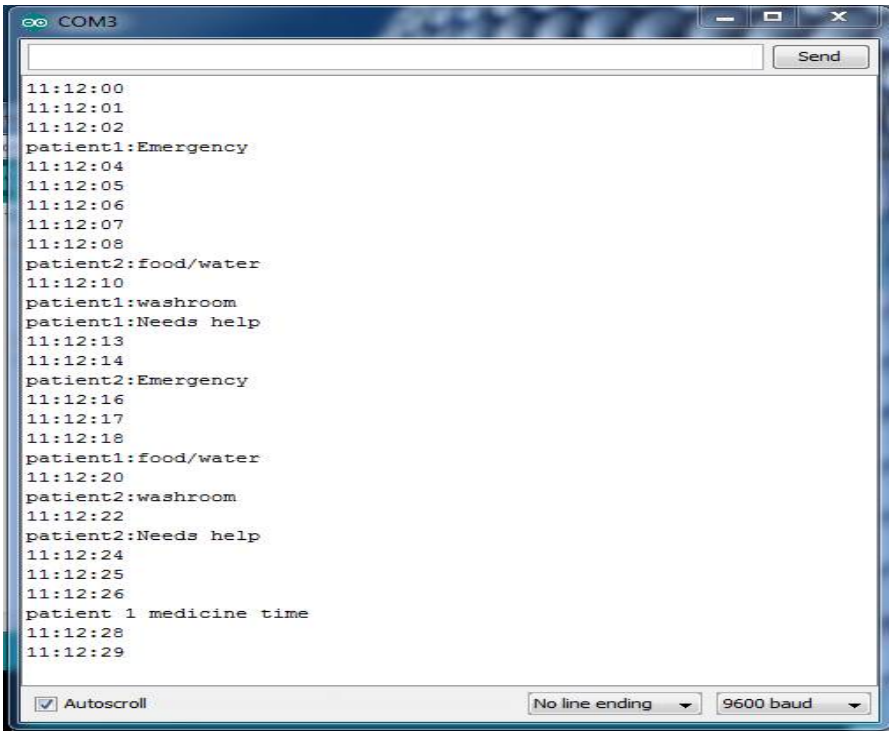

Fig 3 : Simulation result (Serial monitor of Arduino Software)

VII. CONCLUSION

This device has made conveyance of message possible only by the motion of a body part. The ease of message conveyance is the main advantage of this system along with the real time user defined medicine alarm. By implementing this system a simple device for paralyzed or disabled people can be achieved without the use of complex form of inputs. The prototype we have made is fully functional but restricted to a small area of operation. For a large area and transmission distance the type of communication used have to be more effective and faster. Our system successfully proves that this system is an excellent approach to be implemented at hospitals for patient-nurse communication. The project can be further developed into an automatic wheel chair wherein the wheelchair will be moved just by hand gesture. Also, along with only message transmission other data like body temperature, pulse rate etc. can also be transmitted to the nurse so that a real time record of all the patients is maintained.

REFERENCES

1. Shreedeep Gangopadhyay; Somsubhra Mukherjee; Soumya Chatterjee, *Intelligent gesture controlled wireless wheelchair for the physically handicapped*, Proceedings of Fifth IRAJ International Conference, 15th September 2013, Pune, India
2. https://www.pjrc.com/teensy/td_libs_Time.html
3. Ronald Arroyo, B .E .E .E. Clinical Engineer, *control and communication devices for the severely disabled*, Bioengineering Research Service Veterans Administration Prosthetics Centre 252 Seventh Avenue New York, New York 10001
4. http://playground.arduino.cc/Code/DateTime
5. YVONNE MAY NOLAN B.E., *control and communication for physically disabled people, based on vestigial signals from the body*
6. D. Vishnu Vardhan1 , P. Penchala Prasad, *Hand Gesture Recognition Application for Physically Disabled People*, International Journal of Science and Research (IJSR), Volume 3 Issue 8, August 2014
7. http://www.makeuseof.com/tag/how-and-why-to-add-a-real-time-clock-to-arduino/