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Motion Based Message Conveyer and Prescription Reminder for Paralytic Patients

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ABSTRACT

Human beings suffering from paralysis become dependent on their family members or some assistive devices which assist them for their daily needs. In the current scenario family members who are taking care of patient have to attend the patient constantly. Sometimes because of the busy schedule of caretakers they are unable to monitor the patient constantly. In the proposed system, a simple yet effective method is implemented to paralytic patients or elderly people to convey the motion based messages to the caretakers. The system takes care of the situation wherein no one is present to attend the patient and thus sending a message through Global System for Mobile Communications (GSM) of what he wants to convey in SMS. The system also includes prescription reminder which assists patient and alert the caretaker.

Keywords: Accelerometer, GSM Module, Pseudo-codes, RF technology, RTC clock, Tilt.

1. INTRODUCTION

Recent advancements done in medical sector till today is not satisfactory and less focused on the patients and elderly person suffering from different disabilities, especially communicating with others. Despite the fact that monitoring Technologies [1] make it simpler for careers to gather and monitor a patient's vital signs, there are few choices for spoken communication.

To assist these folks, it is proposed to put up a straightforward solution to the issues that patients and older people face. The goal is to replace the traditional method of patient-care provider communication with a more efficient and dependable one using new technologies.

In the current scenario, the patient has to be dependent on a family member or nurse who has to attend the patient constantly. The system's aim is to provide these patients the freedom to speak with the caretaker by giving them the ability to move any fingers or other part of their body to tilt a gadget that is attached to it. This will benefit the patient and make the job of the career easier.

The human beings depend on medicine due to some illness/diseases etc. But Caretaker may tend to forget to give medicine because of their busy schedule. In such case, the proposed system plays an important role by reminding about the prescription on time and maintains the regular dosage of the patient.

The proposed system focused on the problems of many people concerning of medication and to resolve their problems by developing a system which not only help the patient but also the care taker.

2. LITERATURE REVIEW

It is noted and known from the literature that is available and the research that is done with regard to transmitting patient data using RF modules [2]. That was not a feasible implementation due to the RF module's limited range. The messages sent by the patients were also lost as the transmission distance increased. On the other side, if the buzzer malfunctions, the system won't alert the user to the patient's message.

In the Hand Gesture Recognition Application system for Physically Disabled People, user get the information by a communication system which is established between patient and the user. The system converts signal languages used by disabled people and transmitted in the form of message to user. It is done based on a narrative hand gesture recognition technique. The solution approach consists of a hardware module and the software module.

In the Hand Gesture Recognition system, Arduino Uno is used at both side of transmitter and receiver. The direct communication will be established between patient and caretaker by sending a message based on the motion of the patient.

The system developed [3] contains separate transmitting and receiving unit, RF module is used for the transmission and reception of the signal with GSM module to transmit the message to user's mobile number. At the transmitter, accelerometer is connected to the Arduino which allots the message based on the motion of the patient hand. The system also reminds the prescription of the patient at the time allotted.

3. PROBLEM IDENTIFICATION

The proposed system aims to implement the low cost reliable system for verbal communication between the patient and care taker. After the literature and Field survey, it is observed that there are few patient related problems which are need to be solved by developing a system.

The system has been proposed to solve the problems faced by the patient like:

• Difficulty in conveying the messages to care takers about the basic needs required by the patient.

• Unable to monitor the patients constantly because of the care takers busy schedule which make the improper intake of medications on time.

• Lack of equipment in favor of communication and prescription reminding for Paralytic / disabled patients [4].

5. METHODOLGY

The system implemented overcomes the drawbacks as discussed. The system with RF technology also involves GSM module to overcome the limitation of transmission distance. The GSM module sends the particular message to the user's registered number which notifies the user even when the buzzer breakdowns.

The proposed system has two sections

1. Transmitter section consists of accelerometer, controller, RF transmitter (Radio frequency).
2. Receiver section consists of RF receiver, controller, clock with medicine reminder, LCD display, buzzer, GSM Module.

In the transmitter section, the 9V DC Battery is used, which is converted into the required 5V constant DC Supply using the voltage regulator.

The system initiates with the accelerometer measuring the direction in which the hand has tilted. The output of the accelerometer is processed by microcontroller and allots the message based on the direction obtained. The basic emergency needs of the patient like need of water, medical emergency, washroom and time for food are allotted to each direction. This message is encoded and sent to receiver section using RF Transmitter.

For receiver section, the power supply is set up to get the constant DC output voltage of 3.3v - 5v.

Once the RF receiver receives the encoded data, it is then decoded and sent to microcontroller. The microcontroller processes the input and displays the message on the LCD Screen with buzzing sound to notify the care taker. Since there arises the limitation of transmitting range with RF module, the system is made to full fill the limitation using GSM Technology.

Here the message is not only displayed on the LCD screen but also sent to the registered mobile number using the GSM Technology. Thereby even after the RF transmitting and buzzer fails to notify the care taker, it can be achieved by GSM technology.

The other feature of the proposed system is "Prescription reminder" which alerts the care taker about the medications of the patient on time. Here the tablet name and the time to be given will be fed to microcontroller using the program. At the registered time, the controller not only displays the name on the LCD screen but also sends the message to the mobile number using GSM Technology.

5. PROPOSED SYSTEM BLOCK DIAGRAM

5.1 Transmitter block diagram

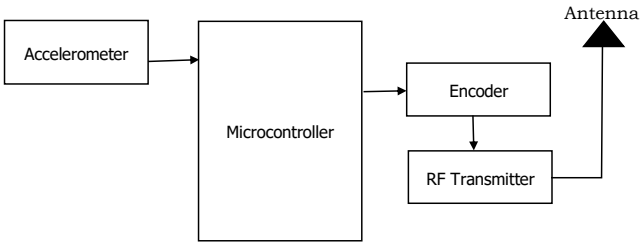

Fig. 1: Block diagram of the transmitter unit

The block diagram of the transmitter unit shown in fig.1 complies with the system requirements using the suggested methodology. The accelerometer is the brains of the transmitter unit. It can be a static accelerometer with two or three axes that is attached to the controller's analogue inputs. To sense the acceleration, it interfaces with the controller.

5.2 Receiver section

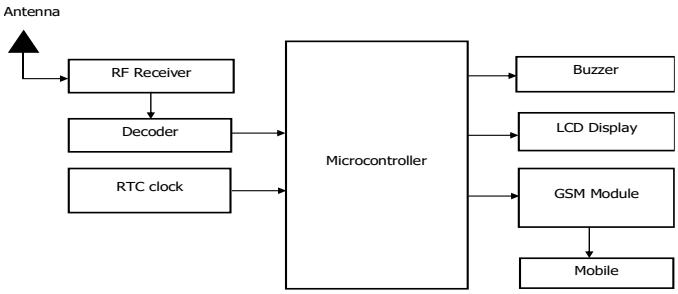

Fig. 2: Block diagram of Receiver unit

Block diagram of Receiver unit shown in fig, 2, consists of LCD display used to display the message of patient and the prescription on the screen with the buzzer sound to notify the user. The GSM module in the receiver unit is used to send the message or prescription to the registered user mobile number.

6. PSEUDO-CODES

6.1 Transmitter Pseudo-code

1. Setting the Arduino's reference level to 3.3V.
2. Declaring the RF and accelerometer input and output pins.
3. Addressing and installing the RF module.
4. Obtaining accelerometer readings.
5. Calculating the accelerometer's position by comparing the reading with a set of reference values.
6. Depending on the accelerometer's position, sending one of the messages.

6.2 Receiver Pseudo-code

1. Designating the input and output pins for the RF module, GSM, and LCD display.
2. If a message is received from the transmitter, the message is shown on the LCD screen, and the buzzer is activated for a predetermined amount of time.
3. RF module and GSM message transmission.
4. Checking to see if the transmitter has sent any additional messages.

7. HARDWARE SPECIFICATION

7.1 Arduino Uno

The Arduino UNO shown in fig.3 is an open-source microcontroller board created by Arduino.cc based on the Microchip ATmega328P microcontroller. Microcontroller is an Arduino Uno board and C language may be used for programming. Controller output data in accordance with programming.

Fig. 3: Arduino Uno

7.2 GSM Module

GSM Module shown in fig.4, is a standard developed by the European Telecommunications Standards Institute (ETSI). A GSM modem can be a dedicated modem device with a serial, USB or it can be a mobile phone that provides GSM modem capabilities. A GSM module is a chip or circuit that will be used to establish communication between a mobile device and a GSM system.

Fig. 4: GSM Module

7.3 Accelerometer (ADXL335)

The ADXL335 shown in fig.5 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs [5].

In tilt-sensing applications, it may measure the static acceleration of gravity as well as the dynamic acceleration brought on by motion, shock, or vibration. The CX, CY, and CZ capacitors are located at the XOUT, YOUT, and ZOUT pins, and they allow the user to choose the accelerometer's bandwidth. With a range of 0.5 Hz to 1600 Hz for the X and Y axes and 0.5 Hz to 550 Hz for the Z axis, bandwidths can be chosen to suit the application. The ADXL335 is offered in a tiny, low profile 16-lead, plastic lead frame chip scale package that measures 4 mm by 4 mm by 1.45 mm in size.

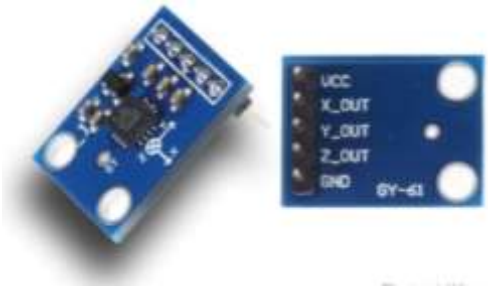

Fig. 5: Accelerometer

7.4 RF Module

A tiny electronic device called an RF module shown in fig.6, also known as a radio-frequency module, is used to send and/or receive radio signals between two devices. A radio frequency (RF) module combines an RF transmitter and an RF receiver. The transmitter and receiver pair utilizes a 433 MHz frequency.

The RF transmitter uses its RF antenna to wirelessly transmit serial data after receiving it. The transmission happens between 1Kbps and 10Kbps per second. The sent data is received by an RF receiver, which operates at the same frequency as the transmitter.

The transmitter's supply voltage ranges from 3 to 6 volts. The receiver's operating voltage is 5 volts.

Fig. 6: RF Module

8. RESULTS & DISCUSSION

8.1 No tilt

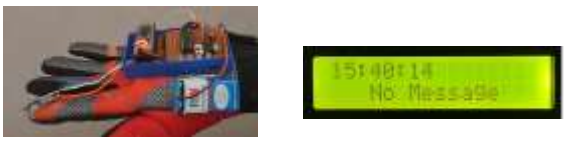

Fig. 7: Glove without tilt

Fig. 7 shows the glove held still without any tilt.

When the accelerometer on the glove is held still without any tilt, then the LCD Display will display “No message”.

8.2 Downward tilt

Fig. 8: Downward Tilt

The fig.8, shows the downward tilting of an accelerometer in transmitter unit.“I need Food” message displayed on LCD Display.Message notification on the user’s registered mobile number.

8.3 Right tilting

Fig. 9: Right Tilt

The fig.9 shows the right side tilting of accelerometer in transmitter unit.“Need to use washroom” message displayed on LCD Display. Message notification on the user’s registered mobile number.

8.4 Upward tilting

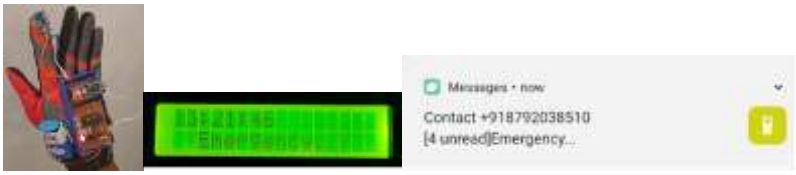

Fig 10: Upward Tilt

The fig.10 shows the upward tilting of accelerometer in transmitter unit.“Emergency” message displayed on LCD Display. Message notification on the user’s registered mobile number.

8.5 Left tilt

Fig. 11: Left Tilt

The fig.11, shows the left tilting of accelerometer in transmitter unit.

"I need water" message displayed on LCD Display.

Message notification on the user's registered mobile number.

8.6 Medicine Reminder

Fig. 12: Medicine Reminder

The fig. 12, shows the medicine reminder message displayed on LCD Display.

Message notification on the user's registered mobile number.

9. ADVANTAGES & DISADVANATGES

A. Merits

- Monitor the patient continuously
- It is reliable and effective
- Low cost

B. Limitations

- If connection is disturbed then communication between user and patient will be lost.
- No messages if patient is not able to move his body parts.

10. APPLICATIONS

- It is also applicable to monitor the elderly and disable patients.
- The system can be used for the elder patients to remember the prescriptions on time.

11. CONCLUSION

The system developed has made conveyance of message possible only by the motion of a body part. The message conveyance is real time and user defined prescription reminder. Using the system, we can successfully transmit messages from patients who are paralyzed or otherwise incapacitated to

caretakers. The buzzer sounds and a programmed message is displayed on the LCD when the patient tilts in a particular way. The user can still receive messages in their mobile device using the system's GSM Module even if they are not close enough to the receiver part to view the message displayed on LCD or if the buzzer does not alert them.

12. FUTURE WORK

The work done can be extended further to create an automatic wheelchair for the elderly or crippled that can be operated solely using hand gestures. Another sensor may be attached to the transmitter so that the physician or user can keep an eye on the patients' conditions in real time. As a result, the transmitter will be able to broadcast additional data to the user or doctor via the app, such as body temperature, blood pressure, ECG, EEG, and oxygen level. In hospitals, where each patient will have a distinct patient number and the nurse can quickly identify the patient using the patient number transmitted along with the message, this technology can also be utilised for many-to-one communication.

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