SMART GLOW ASSISTANCE SYSTEM FOR ILL AND DUMB PEOPLE

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Abstract: **this world so many of people facing the physically handicapped problems. In this situation they can't do their own works and every time they need others help. To face this problem, we have tried to make a system, it helps for physically handicapped persons, also for ill people who can't even walk in that period and dumb people. This paper presents a smart glove system that contains transmitter and receiver sections. We can fix the receiver part wherever we want in the home and it contains RF receiver, fan and bulb, speakers and raspberry pi controller. Transmitter part contains glove that can easily wearable to hand and it contains flex sensors, accelerometer and RF transmitter and Arduino microcontroller. It gives the voice output what they want to say, also gives the present location of patient and it can controls the devices like fan and bulb etc. In this we have used Zigbee for wireless communication, GPS module for getting location, Arduino controller for transmitter section and raspberry pi for receiver section.**

IndexTerms - *Flex sensor, Zigbee, RF transmitter and receiver, accelerometer, GPS module, Arduino and raspberry pi.*

I. INTRODUCTION

This paper presents an assisting device for ill, dump and handicapped people as the receiver section gets different signals from the transmitter section that contains a glove with flex sensors, accelerometer and RF transmitter. That glove can easily wearable to hand with this they can make voice output what they want to say, control the devices like fan and bulb without any others help and also, they can remind their family people with location when they are outside. Here we have used Zigbee for wireless communication between transmitter section and receiver section.

In the transmitter part flex sensors, accelerometer, Arduino UNO controller, GPS module, RF transmitter and Zigbee Transceiver are used to make different signals by ill, dumb and handicapped people. Flex sensors are stick across the fingers of the glove and these are connected to the Analog pins of Arduino microcontroller. By bending each finger gives different voice output at the receiver side. Three axes accelerometer is also attached to glove while any interrupt in mems it gives the signal to Arduino controller then it requests the GPS module to get location and transmit that to receiver using Zigbee transceivers on both sides of the system. RF transmitter is also attached to glove with this fan and bulb controlled by transmitting different signals to RF receiver.

In the receiver section all the things can be controlled by Raspberrypi3 which is connected to PC which display location transmitted by them. A relay device used to control the fan and bulb. Initially user requires some guidance for this system.

II. LITERATURE SURVEY

Various techniques have been employed in the recent past to achieve the objectives outlined in Section I. These include visual recognition techniques using image processing which, however, come with their own limitations [1]. Skin color detection, though a popular strategy used in computer vision-based algorithms, is sensitive to lighting conditions [2]. Moreover, a flexible and progressively adapting model for skin color recognition is a challenging task [1]. Besides, motion cues limit the gesturer to a stationary background [3].

The concept of wired gloves has also been used by researchers and developers in the recent past. Bend sensors and linear sensors together with back propagation (BP) algorithm were proposed in [4]. However, a difficulty faced by the gesturer wearing such a glove is the restriction he feels while wearing it. Bend sensors and accelerometers were used in a data glove that was used as an alternative to keyboards and mice for air writing and 3D sketching [5].

III. PROPOSED SYSTEM

The overall system block diagram is shown in Fig 1. The basic functions of the proposed system are:

- Detecting the finger movement using flex sensors.
- Speech output comes based upon this finger movements.
- Detecting the latitude and longitude values of the patient by using 3-axis accelerometer sensor.
- Controlling the devices like fan and bulb using RF transmitter and receiver.
- Wireless communication using Zigbee.

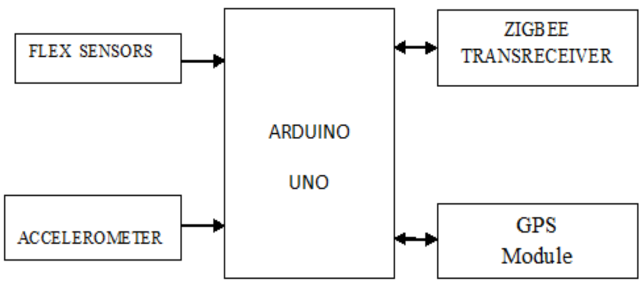

Figure 1: Block Diagram of Transmitter side

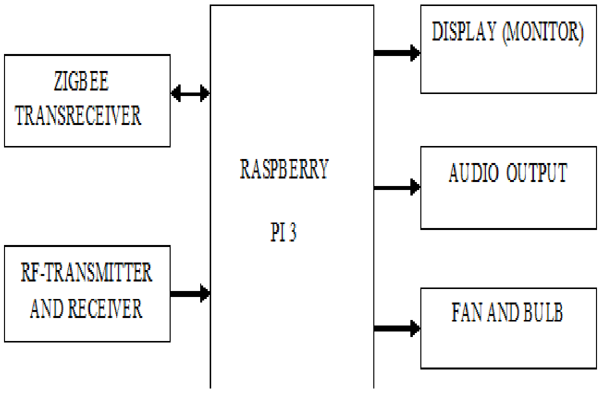

Figure 2: Block Diagram of Receiver side

IV. SYSTEM DESIGN

The block diagram in Figure 1 & 2 shows the entire design of the system, which includes the transmitter side and receiver side. In the transmitter side, there are four flex sensors and one accelerometer are attached to the glove to detect the bending of each finger and hand movement. The controller used in the transmitter side is Arduino UNO interfaced with Zigbee transceiver and GPS module. The transmitter is used to transmit the signals to the receiver. The flex sensors and Zigbee are interfaced with the microcontroller. In the receiver side, there is an Zigbee module to receive the signals. The microcontroller used in the receiver side is Raspberry pi3. In the receiver side RF transmitter and receiver modules are using for controlling devices like fan and bulb.

V. HIGH LEVEL DESIGN

In this section, we elaborate on different components and hardware modules used in the project. Our goal is to create a wireless device for the bed rest patients to make it easier for them to getting assistance from others. By using a group of sensors, we can determine the state of the hand by looking at numerical values being generated by the sensors. Flex Sensors are used as variable resistors to detect how much each finger is bent deformed, and the accelerometer can identify the orientation and hand movement. The flowchart of different layers inherent to the working of this project is shown in Figure 3

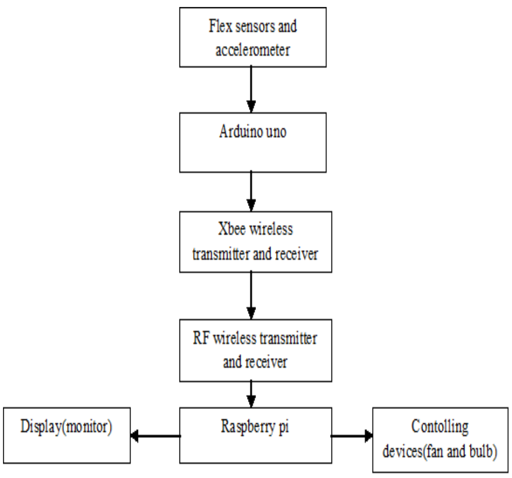

Figure 3: Flowchart of project

A. HARDWARE

i. Sensor Modules

a. Flex sensor:

Flex sensors are bidirectional sensors and these are unique component that changes resistance when bent either direction. It has nominal resistance of 25k ohms as the flex sensor is bent in one direction the resistance gradually increases. They measure the bend of fingers and generate analog output corresponding various bending angles. The connection of flex sensor is in figure 11.

b. Accelerometer:

An accelerometer is used to measure the orientation movements of the hand, which is also required to get the latitude and longitude values from the GPS module.

ii. Networking Modules:

a. Zigbee Module:

Zigbee is a standard-based specification for a suite of high-level communication protocols used to create personal area network with small, low-power digital radios. It provides the network infrastructure required for wireless sensor network applications. In the proposed system it we are using two Xbee's: One transmits the data from glove to another Xbee, which receive the data and transfer it to the processing unit.

Figure 4: Zigbee module for wireless data communication

a. GPS Module:

We are using GPS module L10-M29. this brings the high performance of the MTK positioning engine to the Industrial standard. It acquires and tracks the satellites in the shortest time even at indoor signal level. In the proposed system by using this GPS module we are obtaining the Latitude and Longitude values of the patients.

Figure 5:L10-M29 GPS Module

c. RF Module:

A radio frequency module is a small electronic device used to transmit and receive radio signals between two devices. In this proposed system we are using HT-12E and HT-12D with 433.92 MHz frequency to control device like fan and bulb through Relay.

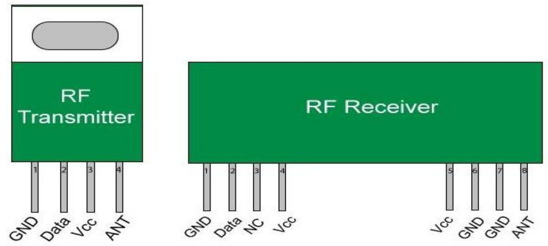

Figure 6 : RF transmitter and receiver

iii. Processing modules:

a. Arduino UNO:

At transmitter side we are using Arduino UNO. It is an open source computer hardware and software company, project and user community that designs and manufactures single board microcontrollers and microcontroller kits for building digital devices. It contains both Analog and digital pins. It also supports serial communication. It supports programming languages like c, c++.

Figure 7:Arduino UNO Microcontroller

In this proposed system, it is used to converts analog output data into digitals using ADC converter .it contains one UART support inbuilt only we can create two more UART support externally. It is also helpful for wireless communication by using serial pins.

b. Raspberry pi:

The Raspberry pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

In this proposed system it is used in the Receiver side. It get the signals from the transmitter by using Zigbee. By using the GPIO pins the serial communication will be done easily.

Figure 8: raspberry pi 3 BCM2835

c. E-speak module:

it is a speech synthesizer present in a raspberry pi .it is used to convert Text-to-Speech. By using this voice output is obtained from the speakers.

B. SOFTWARE

Arduino Software (IDE) is an open source software is used to program the Arduino at transmitter side and it is written in a c language and Raspbian software is used to program the raspberry pi3 at a receiver side and it is written in a Python language. The flow charts of the codes are illustrated in Figures 9 and 10. Figure 10 shows the flow chart of the software design in the transmitting side, while the receiver side flow chart of the software is shown in Figure 9. Figure 10 shows how the code in the transmitter side helps in transmitting the sign which user interprets. Once the user shows the gesture, the code in the transmitter side checks whether the values are in range for the particular output and if it is in range the transmitter transmit, else the code will wait for new values and the process keeps repeating.

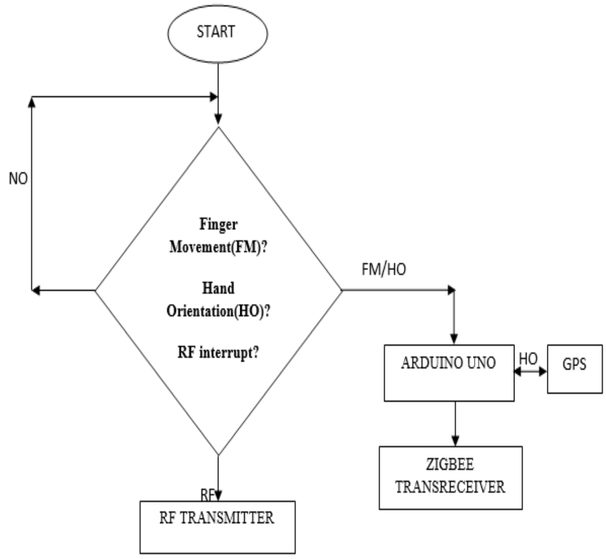

Figure 9: A flow chart for software transmitter side

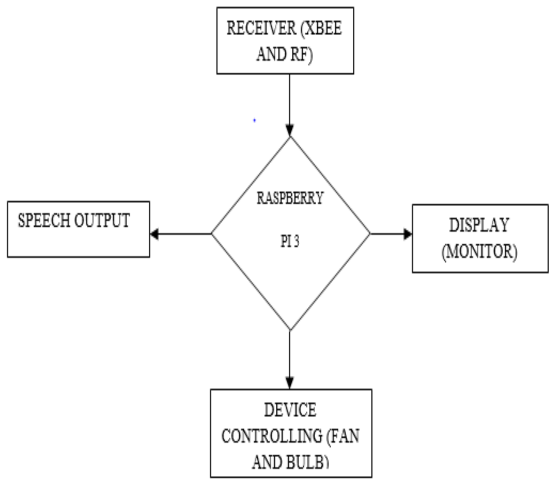

Figure 10: a flowchart for software receiver side

Figure 10 shows how the code in the receiver side works. Once the receiver receives a value, the code in the receiver side reads the value received and checks whether the letter received meets the requirements speech output will be obtained through speakers and it will be displayed on display and finally the devices will be controlled by using RF. This process will be repeated as long as there are values being transmitted from the transmitter side.

VI. LOGICAL STRUCTURE

Each flex sensor is treated as a variable resistor, with the resistance increasing as the flex sensor is bent. Each of the flex and accelerometer constitute a part of their own voltage divider circuit (VDC). The output is sent to the microcontroller unit (MCU), where analog values are converted to discrete digital binary values. The analog input to the MCU changes as a function of how much the finger is bent using flex sensor. The MCU's digital conversion in the transmitter side is then utilized by the c-based script to classify the gesture being made. The accelerometer (ADXL-335) uses the 12C interface to send data to Arduino microcontroller. the transmitter data is send to Raspberry pi 3 at receiver side to get the output based on requirement

VII. DETAILED WORKING

The data collected from the flex sensors and accelerometer is a simple range of analog values, which are processed and digitized before transmitting via Arduino UNO microcontroller. The output of flex sensors changes upon bending of the fingers. The accelerometer output depends upon the orientation of the hand. The data from each bending corresponds to a resistance value. Thus, resistive data is collected from the flex sensors and 3 bits from the accelerometer corresponding to each axis. This serial data is transmitted using Xbee transmitter and receiver, configured to transmit and receive data serially.

Once the data is received, it is processed by Raspberry pi 3 microprocessor and the output is shown according to its response. There are three applications will be performed by using the smart glow. First, the speech output will be obtained based on the finger movement. those finger movements will be sensed by Flex sensor. second, the patient in an emergency situation he will be tracked by using GPS module. this GPS module will be activated by the hand movement of a patient, those movements will be tracked by the accelerometer. If GPS module is activated it shows the Latitude and Longitude values of a patient location. finally, the patient can easily control the devices like fan and bulb using RF transmitter and receiver. All those activities will be displayed on a monitor which is connected to receiver side. All these modules setup will be showed in figure 12 & 13

VIII. RESULTS

The four flex sensors are connected with four 10 kΩ resistors, which are interfaced with the Arduino UNO in the transmitter side. As can be seen in Figure, each flex sensor is connected between +5 V and the resister 10 kΩ resistor. To make the system wireless we have added Zigbee transceiver module to the transmitter and receiver side which is interfaced directly to the Arduino. Along with the RF module in the receiver side, a LCD monitor has been connected on the Raspberry pi 3 to display the transmitting text. Finally, speaker is connected to Raspberry pi 3 to get speech output. All these components are mounted on a glove and on a board for flexibility. Figure 12 & 13 shows the final realized system.

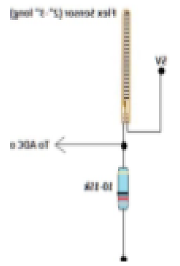

Figure 11: connection of flex sensor

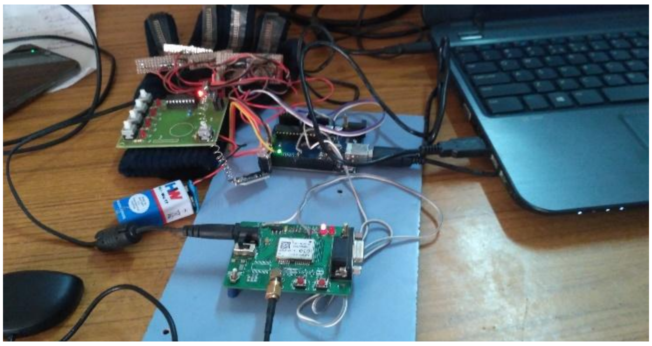

Figure 12:transmitter system

Figure 13: Receiver system

The final realized system in figure: 12 &13 has been tested and wearing the smart glove dose a finger or hand movement, the LCD displays the letter and GPS will give latitude and longitude values of patient and finally the speaker outputs. Figure show some of the results

Table 1: values of flex sensor and accelerometer

S.NO	COMPONENT	RESPONSE VALUE (DIGITAL VALUES)
1	FLEX SENSOR 1	1012-1021
2	FLEX SENSOR 2	756-810
3	FLEX SENSOR 3	815-820
4	FLEX SENSOR 4	850-860
5	MEMS SENSOR	<280(LEFT SIDE ORIENTATION)

IX. CONCLUSION & FUTURE WORK

This paper presents the smart glove assistive system for ILL and Dumb patients. The glove gives the speech output, control device and tracks the patient in an emergency situation. The important of the research is related to its aim to assist the ill and dumb patients who needs a bed rest for certain period of time and it also class of non-vocal people to communicate with others.

The future scope of this project is to achieve high degree of accuracy for gesture recognition using the smart glove. The glove must be used for live tracking of the patient to know the exact location and that information must be carried not nearest hospitals and ambulances and it is also used to monitor the patient health like pulse rate and heart beat etc.

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