SMART GLOW SYSTEM FOR FRAIL AND DUMB PEOPLE

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Abstract -In the current scenario, large number of the people are facing the physically handicapped problems. At this point of time they are unable to do their work and can't get help from others all the time. In order to overcome thus problem, we have designed an equipment which not only help the handicapped citizens but also frail people who were even not able to talk or walk in daily life. This paper presents a smart glove network which contains transmitter and receiver section. The receiver section can be fixed at the time of requirement based on us which contains RF receiver, bulb, fan, raspberry pi controller and speakers. The transmitter has a glove that can fit easily to hand which contains accelerometer, flex sensor, RF transmitter and Arduino microcontroller. Equipment gives a voice message output which the patient wants to say. It not only gives the present location of him but also controls the devices like fan, bulb etc.., Zigbee is used for wireless communication whereas GPS is for location. In addition, both Arduino controller and Raspberry pi are used for transmitter section and receiver section respectively.

KEYWORDS – Arduino board and raspberry pi, RF transmitter and receiver, Flex sensor, GPS module, Zigbee, Accelerometer.

1. INTRODUCTION

In thus paper, we present a helping device for handicapped, dull and frail people where the receiver part receives the different types of signals from the transmitter part which has a glove with RF transmitter, flex sensor and accelerometer. It is easy to wear and use the voice command which they want to be done automatically. For instance, switching the bulb or putting of the fan, even it can also be used as remainder to their family members when they are out of reach. ZigBee is used like a interactor between transmitter and receiver.

At the transmitter side Arduino board and raspberry pi, RF transmitter and receiver, Flex sensor, GPS module, Zigbee, Accelerometer are helps showing different signals by handicapped, dull and frail persons. For regenerating different signals flex sensors are used across all the fingers which are connected to the analog pins of Arduino microcontroller. when the fingers are bent, each finger distinguishes in different voice outputs at the receiver side. While any interrupt occurs the three axes accelerometer which is attached to the glove sends a signal to the Arduino controller. Then GPS module is requested to get the location and sent to the receiver using Zigbee transceivers on both sides of system. The RF transmitter which is attached to the glove is used for controlling fan and bulb by transmitting different types of signals to RF receiver.

All the things at the receiver section can be controlled by Raspberry pi which is connected to laptop is used for displaying the location transmitted by them. For controlling the fan and bulb a switch is used. For operating this equipment user has to follow some guide lines.

II. LITERATURE SURVEY

Different techniques have proposed from the past in order to achieve the objectives outlined in section 1. visual recognition techniques using image processing is the one but it has some of the limitation like skin color detection, though a popular strategy used in computer vision-based algorithms, is sensitive to lighting conditions. Moreover, a flexible & progressively adapting model for skin color recognition is a challenging task. Besides, motion cues limit the gesturer to a stationary background. The concept of wired gloves has also been used by researchers and developers in the past years. Linear sensors and bend sensors together with back propagation (BP) algorithm were proposed. However, a major disadvantage by wearing the glove is that it feels like 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.

III. PROPOSED SYSTEM

The overall system block diagram is shown in Fig.

The basic functions of the proposed system are:

- Finger movement is detected using flex sensors.
- Based on the finger movements voice output is generated.
- 3-axis accelerometer sensor is used for detecting the latitude and longitude values of the RF transmitter and receiver are used for controlling the bulb and fan.
- Zigbee is used for Wireless communication.

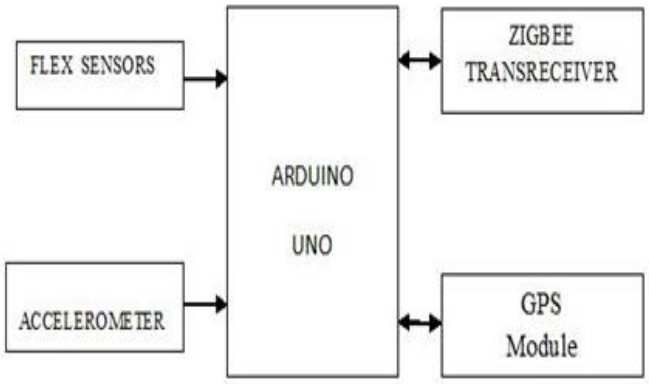

Figure 1: Block Diagram of Transmitter side

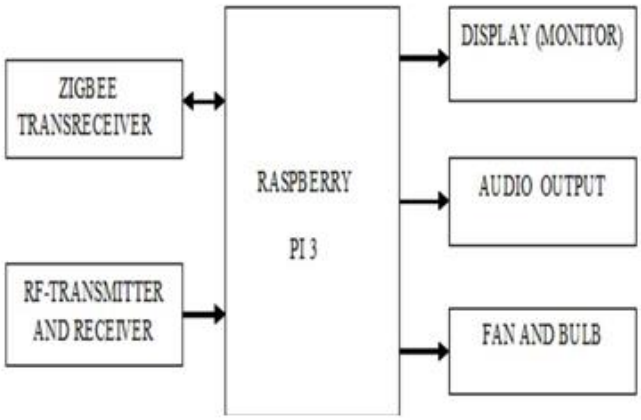

Figure 2: Block Diagram of Receiver part

IV. SYSTEM DESIGN

The Figure 1 & 2 shows the entire design of the equipment, where transmitter and receiver sides are included. At the transmitter part, it has four flex sensors and single accelerometer which are attached to the glove used to detect the bending of each finger and movement of hand. Arduino UNO is used as a controller at the transmitter side which is interfaced with Zigbee transceiver and GPS module. The transmitter is used for transferring the detected signals towards receiver. Both the flex sensors and Zigbee are interfaced with the microcontroller. Zigbee module is used for receiving the signals at the receiver side. Raspberry pi3 is used as a micro controller at the receiver side. RF transmitter and receiver modules are used for controlling devices like fan and bulb at the receiver end.

V. HIGH LEVEL DESIGN

In this section, we discuss briefly about the components and hardware tools used for completing thus project. The main aim of this project is to develop a wireless device for the physically handicapped who seek help from others. We can determine the hand movement by using the different sensors and can be identified using sensors which generate the numerical values. The bending of fingers is determined by using the flex sensors as variable resistors. Flow chart for the implementation is shown in the Figure 3.

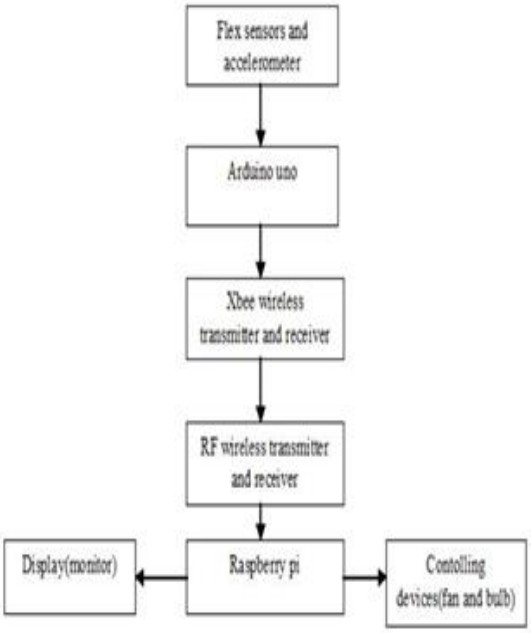

Figure 3: Flowchart of project

HARDWARE COMPONENTS.

I, sensor modules.

a. Accelerometer

Accelerometer is a device which can be used for the identification of hand movement and also for generating the latitude and longitude values from the GPS.

b. Flex sensor

The Flex Sensor patented technology is based on resistive carbon elements. As a variable printed resistor, the Flex Sensor achieves great form-factor on a thin flexible substrate. When the substrate is bent, the sensor produces a resistance output correlated to the bend radius—the smaller the radius, the higher the resistance value. Spectra Symbol has used this technology in supplying Flex Sensors for the Nintendo Power Glove, the P5 gaming glove

II. Networking modules

a. GPS module

L 10-M29 GPS module is used here because it brings high performance of the MTK positioning engine to the industrial standards.it easily track the satellite with less time even at low level areas also. In the proposed system by using this GPS module we are obtaining the Latitude and Longitude values of the patients.

Figure 4: L10-M29 GPS Module

b. RF module

We are using HT-12E AND HT-12D with 432.92 MHZ frequency to control the devices like bulb and fan.it is very small which is used for transmitting and receiving the signals between the two devices.

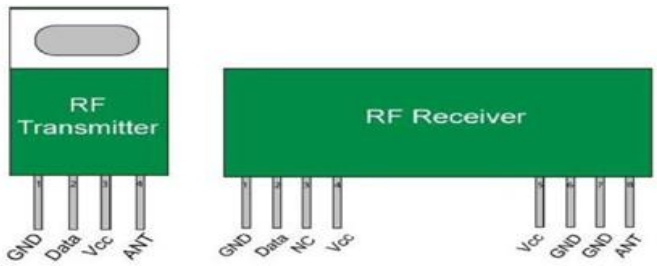

Figure 5: RF transmitter and receiver

c. 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 Zigbee's: One transmits the data from glove to another

Zigbee, which receive the data and transfer it to the processing unit.

Figure 6: Arduino UNO Microcontroller

III. Processing modules:

a. Arduino UNO:

At the 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 and 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 and 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 gets 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.

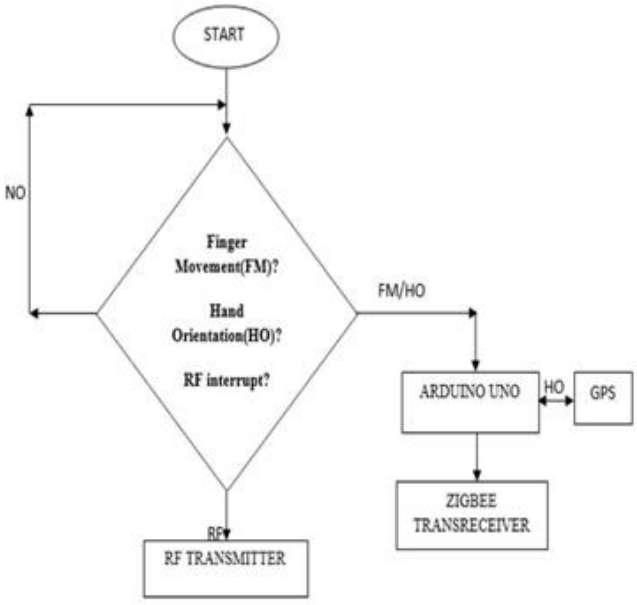

Figure 9: A flow chart for software transmitter side

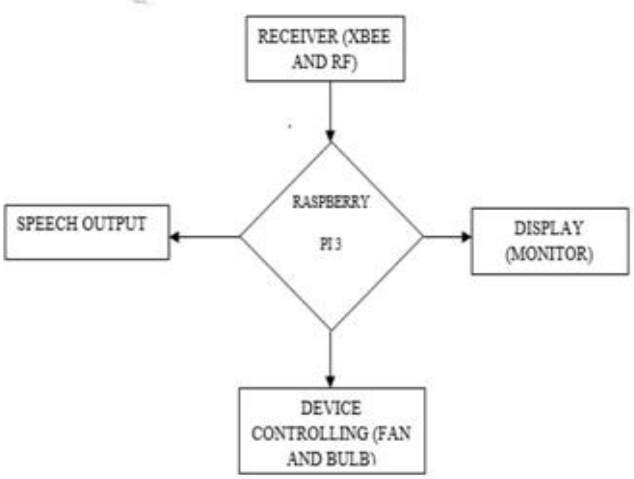

Figure 10: a flowchart for software receiver side

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 sent 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, the Arduino UNO is interfaced in the transmitter

side. In the 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: Construction of flux sensor

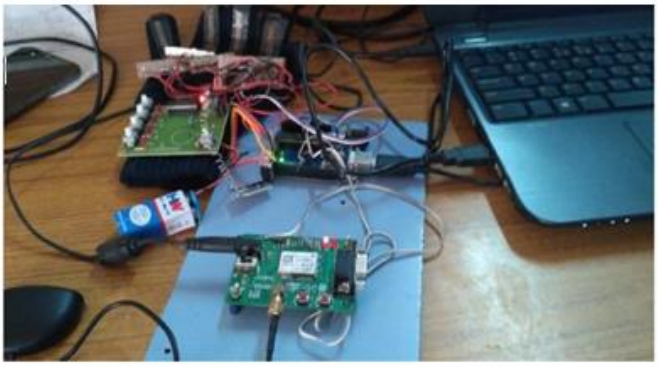

Figure 12: Transmitter system

Figure 13: Receiver system

The system has been tested. When the smart glove for 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	815-820
2	FLEX SENSOR 1	1012-1021
3	FLEX SENSOR 1	756-810
4	FLEX SENSOR 1	850-860
5	MEMS SENSOR	<280(LEFT SIDE ORIENTATION)

IX. CONCLUSION & FUTURE WORK

This paper presents the smart glove assistive system for Dumb and frail people. The glove gives the output and also track the patient. The main criteria of thus 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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