

DESIGN AND DEVELOPMENT OF EMBEDDED PROCESSOR BASED HUMAN FALL DETECTION SYSTEM

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ABSTRACT:

Health monitoring systems have quickly advanced to monitor patient health conditions, in created system center around monitoring the patient's body position, temperature, heartbeat and different parameters. In health monitoring system with edges, unintentional falls can be recognized in the readings from heartbeat rate sensor, temperature sensor, PH sensor, accelerometer (MEMS) sensor and ECG are thought about by Microcontroller. On the off chance that any sensor perusing crosses the edge esteem, at that point fall is distinguished. So as to enhance the personal satisfaction of the patients, this work is an endeavor to make in the field of fall detection system.

Keywords - Sensor Device, Accelerometer, GPS, GSM, Raspberry Pi 3 and RFID Reader

I. INTRODUCTION:

The fundamental point of the undertaking is planning and usage of fall detection system utilizing embedded processor. This system has the capability to recognize the fall area of the patient either the patient is in Indoor or Outdoor by utilizing RFID and GPS; it can detect temperature and heartbeat of the patient.

Falls are a noteworthy reason for such huge numbers of wounds and clinic affirmations. In this manner, the consideration giving procedure and the personal satisfaction of kids, grown-ups and more seasoned individuals can be enhancing the life expectancy of the people by embracing systems for the fall detection system. This venture introduces a fall detection system that monitors the developments of patients, perceives a fall, and consequently sends a demand for help to the parental figures. To diminish the issue of false alerts, the system incorporates novel methods for the acknowledgment of those exercises of everyday living that could be wrongly misled as falls, (for example, sitting on a seat or lying on a bunk). To confine the exasperating of the system, a little outer

detecting unit can likewise be utilized for the recuperation of development information.

II.EXISTING SYSTEM:

The existing fall detection system depends on a PC server through ZigBee, Bluetooth and different remote technologies, which results in remote innovation with constrained choices of interfacing with specific clients just and even it may not work, if the remote infrastructure gets changed.

III.PROPOSED SYSTEM:

In this system if the patient's pulse changes severely, the sensors will enact and the GSM modem will send the refreshed parameters directly to the specialist's cell phone or to the close-by medical clinic, the patients' health through GSM shield to send a SMS message containing the readings, patient ID and the area of the patient which has been taken by means of GPS shield, which will be useful to send a rescue vehicle to the patient's area. The patient's anomalous conditions will caution the disabled person by means of signal or voice message and LED markers gives prompt help and treatment. The following area decides the precise position of client. An indoor following by utilizing RFID peruse in a microcontroller to identify the RFID labels and position on base station show. The outside following by utilizing GPS beneficiary which peruses the scope and longitude organizes and show on the LCD.

ADVANTAGES:

1. Real time health monitoring
2. Efficient design.
3. Automatic fall detection.
4. Track the location of the patient using RFID and GPS Receiver.
5. Low power consumption.
6. Monitoring of the health parameters.

A.BLOCK DIAGRAM:

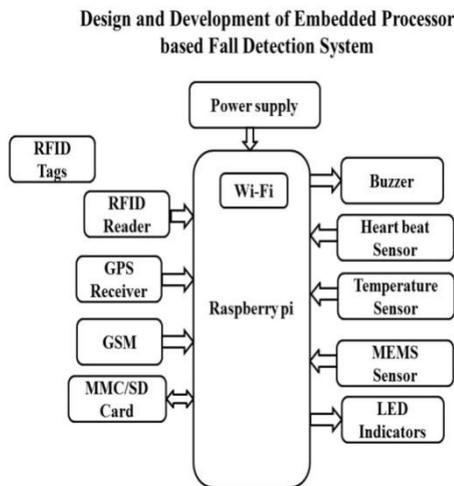


Fig 1: Block Diagram

IV.HARDWARE DESCRIPTION:

The system mainly consists of Raspberry Pi, RFID Reader, GPS, GSM, Temperature sensor, heart beat sensor, MEMS sensor, Buzzer are interfaced to the processor. Fall detection can be sensed by using MEMS sensor and Outdoor location can be track by GPS module. Radio Frequency Identifier (RFID) tags are used to track the location of the patient if he is in Indoor. Patient health parameters like temperature, heart rate values can be sensed by Temperature sensor, Heartbeat sensor. Buzzer gives the audible alert and GSM send the SMS to the predefined number if the parameter values are exceeded by the predefined value and also in the case of fall detection. Caregiver monitors all these values in the webpage using Wi-Fi. To do this intelligent process Raspberry pi is programmed with python language in LINUX operating system.

A.RASPBERRY PI

The Raspberry Pi is a movement of little single-board PCs made in the United Kingdom by the Raspberry Pi foundation. Raspberry Pi-3 Model B released in February 2016 is bundled with on-board Wi-Fi, Bluetooth and USB Boot capacities. As of January 2017, Raspberry Pi 3 Model B is the most forward-thinking mainline Raspberry Pi.

Raspberry Pi sheets are assessed between US\$5-35. It joins diverse features, for instance, ARM immaculate central planning unit (CPU) and an on-chip outlines dealing with unit (GPU, a video focus IV). CPU speed ranges from 700MHz to 1.2GHz for the Pi 3

and on board memory keep running from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the working system and program memory in either the SDHC or Micro SDHC sizes.

Most boards have some place in the scope of one and four USB spaces, HDMI and composite video yield, and a 3.5mm phone jack for sound, Lower measurement of yield is given by different GPIO pins which support essential traditions like PC. The model B has an 8P8C Ethernet port and the Pi 3 and Pi Zero W have on board Wi-Fi 802.11n and Bluetooth



Fig.2.Raspberry Pi 3

B.GSM

GSM framework was produced as a digital framework utilizing time division various access (TDMA) strategy for communication reason. A GSM digitizes and diminishes the information, at that point sends it down through a channel with two distinct floods of customer information, each in its own specific schedule vacancy. The digital framework has a capacity to convey 64 kbps to 120 Mbps of information rates. The GSM modem is appeared in Fig.4



Fig 3.GSM Modem

C.RFID

RFID is an abbreviation for Radio Frequency Identification. RFID (radio recurrence recognizable proof) is an innovation that joins the utilization of electromagnetic or electrostatic coupling in the radio recurrence (RF) part of the electromagnetic spectrum to extraordinarily distinguish an item, creature, or

person. RFID is coming into expanding use in industry as an option in contrast to the scanner tag. The benefit of RFID is that it doesn't require direct contact or viewable pathway checking.

A RFID system comprises of three segments: an antenna and transceiver (frequently joined into one per user) and a transponder (the tag). The antenna utilizes radio recurrence waves to transmit a flag that initiates the transponder. Whenever enacted, the tag transmits information back to the antenna. The information is utilized to advise a programmable rationale controller that an activity ought to happen. The activity could be as basic as raising an entrance door or as confounded as interfacing with a database to do a fiscal exchange.

D.MEMS SENSOR

The MMA7660FC is a ± 1.5 g 3-Axis Accelerometer with Digital Output (I2C). It is a very low power, low profile capacitive MEMS sensor featuring a low pass filter, compensation for 0g offset and gain errors, and conversion to 6-bit digital values at a user configurable samples per second. The device can be used for sensor data changes, product orientation, and gesture detection through an interrupt pin (INT). The device is housed in a small 3mm x 3mm x 0.9mm DFN package.



Fig 4: MEMS Sensor

E.HEARTBEAT SENSOR

The Heart Rate Ear clip kit contains an ear cut and a recipient module. The pulse measure unit can be utilized to monitor pulse of patient and athlete. The outcome can be shown on a screen by means of the sequential port and can be put something aside for examination. The whole system is a high affectability, low power utilization and versatile.

Model: MED03212P



Fig 5: Heart beat sensor

F.GPS

A GPS receiver calculates its position by precisely timing the signals sent by the GPS satellites high above the Earth. The receiver utilizes the messages it receives to determine the transit time of each message and computes the distances to each satellite. These distances along with the satellites' locations are used with the possible aid of trilateration to compute the position of the receiver. This position is then displayed, perhaps with a moving map display or latitude and longitude; elevation information may be included. Many GPS units also show derived information such as direction and speed, calculated from position changes.



Fig.6:GPS Receiver

V.SOFTWARE DESCRIPTION

Python IDE is a free and open source software that is used to write codes, integrate several modules and libraries. It is available for installation into PC with Windows, Linux and MAC. For Example, Spyder, PyCharm, etc. Here we using Python distribution is Anaconda. Anaconda has collection of different libraries and resources.

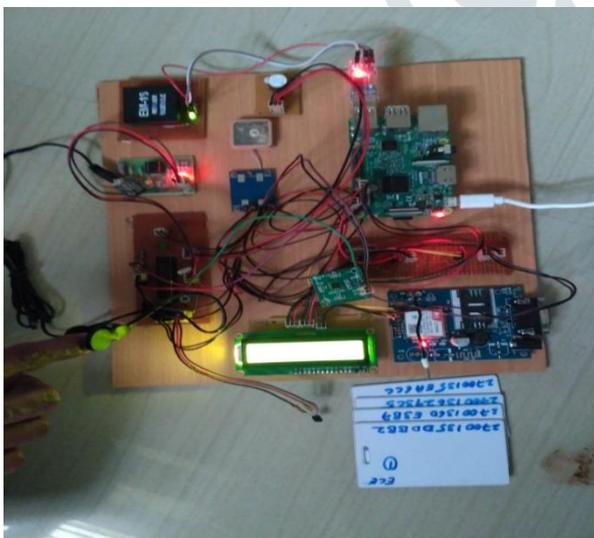
The user interface is a combination of HTML, JavaScript, and CSS. The user interface (UI) is everything designed into an information device with which a human being may interact including display screen, keyboard, mouse, light pen, the appearance of a desktop, illuminated characters, help messages, and how an application program.

The python scripts are stored in the folder /var/www/html/ with an extension.py. Before linking the scripts in PHP, it is necessary to make them executable by using the following command `sudo chmod +x scriptname.py`

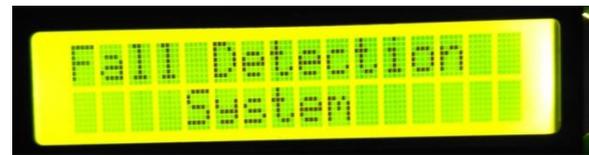
VI.RESULTS

The project “**Design and Development of Embedded Processor based Human fall detection system**” is designing and implementation of Human fall detection system using embedded processor. This system has the capability to detect the fall location of the patient either the patient is in Indoor or Outdoor by using RFID and GPS, it can sense temperature and heartbeat of the patient.

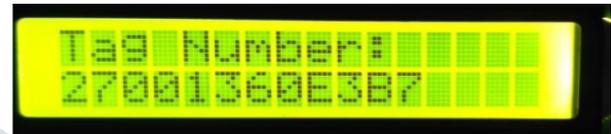
Steps: Human fall detection system Set Up



1. After providing the power supply the LCD, RFID reader, Raspberry Pi initialization happens and then it displays as “Human fall detection system”.



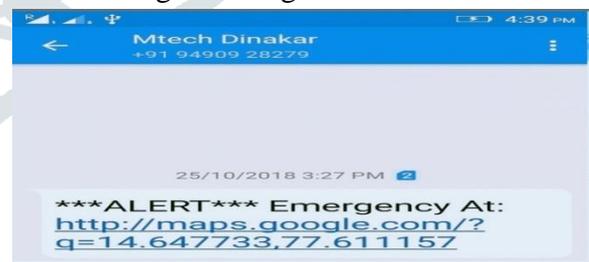
2. Suppose the person is in Room 2 and if any emergency situation detects, then an alert to family members with help of RFID reader reads the RFID card all data about person and send the information of caregivers.



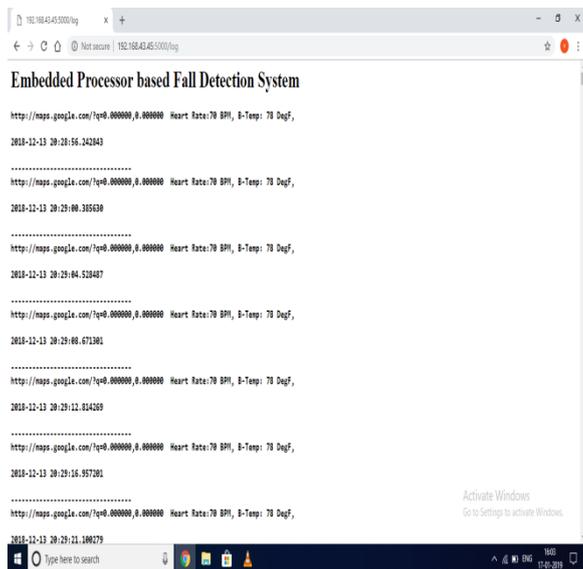
3. Fall detection occurred at “Room No:2” and it shows RFID Tag number displayed on the LCD then immediately taken the action based on the Heart rate and patient body temperature.



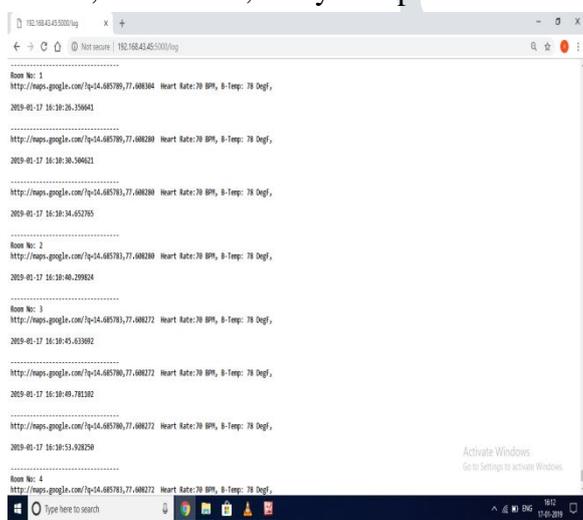
4. If any emergency situation detects, then an alert to family members with help of GSM about patients accident occurred location and send the alert message to caregivers.



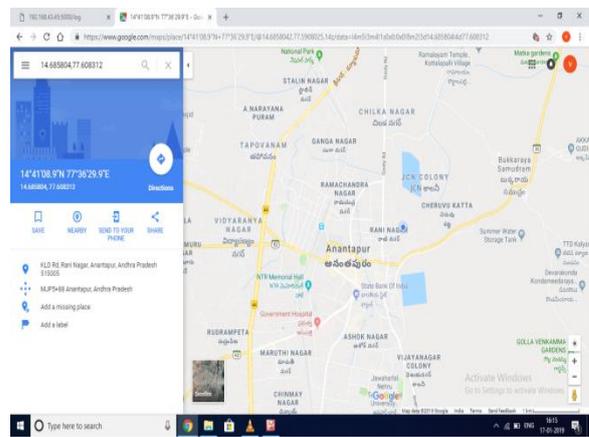
5. When person is going outside home also the Human fall detection system working efficiently and effectively with help GPS and it will send the alert messages to the caretaker. With help GPS we can easily access that person location will be shared to the registered contact.



6. Display of patient information by using RFID tags and GPS location in the order Room 1, 2, 3 and 4 with Longitude and Latitude values, Heart Rate, Body Temperature.



7. We can easily find out the patients location by using RFID and GSM Technologies. GPS location display of Longitude and Latitude values.



VII.CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been designed and tested successfully.

VIII.FUTURE SCOPE:

We can add a GPS module in Human fall detection system using Raspberry Pi and Wi-Fi module projects. The GPS modules will find out the position or the location of the patient using the longitude and latitude values, and then it will send these locations to the cloud that is the IOT using the Wi-Fi module. Then doctors can find out the position of the patient in case they have to take some preventive action. By using this system we can save the time and for blind person tracking it is very easy.

We can also extend this system by adding ECG, EEG sensor and SpO2 sensor which gives the electrical activity of the heart and oxygen levels in the blood respectively.

IX. ACKNOWLEDGEMENT

We would like to thank all the authors of different research papers referred during writing this paper. It was very knowledge gaining and helpful for the further research to be done in future.

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