Fall Detection System for Monitoring Elderly People

S. Hitesh Kumar, R. Kavya Reddy, Preetha K.S

Abstract: ***Different fall-recognition arrangements have been already proposed to make a dependable observation framework for elderly individuals with high necessities on exactness, affectability and specificity. In this paper, an improved fall recognition framework is proposed for elderly individual observing that depends on keen sensors worn on the body and working through purchaser home systems. With treble limits, inadvertent falls can be distinguished in the home social insurance environment. By using data assembled from an accelerometer, cardio tachometer and shrewd sensors, the effects of falls can be logged and recognized from ordinary every day exercises. The proposed framework has been conveyed in a model framework as itemized in this paper***

Keywords: ARM, pulse sensor, GSM, GPS, MMA7660FC MEMS accelerometer, LPC2148 microcontroller

I. INTRODUCTION

As of late, numerous sorts of customer hardware gadgets have been created for home system applications. A customer home system generally contains different sorts of electronic gadgets, e.g. sensors and actuators, so that home clients can control them in a clever and programmed approach to enhance their personal satisfaction [1]. Some illustrative advances to actualize a home system include: IEEE 802.11, Ultra Wide Band (UWB), Bluetooth and ZigBee, and so on. ZigBee is reasonable for buyer home systems in light of the fact that different sensors can be conveyed to gather home information data in a circulated, self-sorting out way with moderately low power. Some run of the mill applications incorporate home computerization, home movement recognition (like fall identification) and home medicinal services, and so forth [2]. Kinsella and Phillips [3] found that the number of inhabitants in 65-andover matured individuals in the created nations will approach 20% of aggregate populace in the following 20 years and will clearly turn into a genuine human services issue soon.

One of most critical and capable employment of a person to deal with old individuals like fantastic moms and granddads who stay at home. There are numerous situations where they are taken consideration by a house keeper since now-a-days each one goes out to carry out an occupation. In the event that the cleaning specialists or workers are not exhibit at home then it turns into a major test to care for the elderly individuals. This Anticipate is expected to help such individuals to get the data if any anomalous condition has ascended to their elderly people. In this anticipate we utilize MEMS accelerometer and heartbeat sensor to screen the elderly individuals.

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S. Hitesh Kumar, Department of Electronics Engineering, Vellore Institute of Technology, VIT University, Vellore (Tamil Nadu). India.

R. Kavya Reddy, Department of Electronics Engineering, Vellore Institute of Technology, VIT University, Vellore (Tamil Nadu). India.

Preetha K.S, Department of Electronics Engineering, Vellore Institute of Technology, VIT University, Vellore (Tamil Nadu). India.

II. RELATED WORK

Wearable construct strategies frequently depend in light of brilliant sensors with implanted preparing. They can be appended to the human body or worn in their articles of clothing, attire or adornments. Zhang, Ren and Shi [4] proposed HONEY (Home human services sentinel framework), a three-stage location plan which comprised of an accelerometer, sound, picture and video cuts. Its development was to distinguish falls by utilizing a triaxial accelerometer, discourse acknowledgment, and on-interest video. In HONEY, once the fall occasion was identified, a ready email was promptly sent and the fall video was transferred to the system stockpiling for further examination. Bagalà et al. [5] gave an assessment of accelerometer-construct fall discovery calculations with respect to certifiable falls. They found that the affectability and specificity on genuine falls are much lower than that in an investigation situation. This rouses specialists to take all the more true situations into thought. Abbate et al. [6], [7] proposed a cell phone based fall identification framework with thought of the speeding up sign delivered by fall-like exercises of day by day lives Bai, Wu and Tsai [8] delineated a framework taking into account a 3-pivot accelerometer implanted in a PDA which had a GPS capacity for the client. In any case, because of the generally high vitality utilization of current advanced mobile phones, their framework must be dynamic for 40 hours with frontal area execution or at most 44 hours in foundation execution, which implies continuation of this framework is the most huge issue.

III. PROPOSED SYSTEM

The capacity of MEMS accelerometer is to distinguish the fall or development of the elderly individuals which is send as a twofold contribution to the miniaturized scale controller framework. The beat sensor is utilized to recognize the heart rate of the elderly people, if the heart rate is more normal heart beat(which is taken as threshold)it rises a hinder to the miniaturized scale controller. We have utilized LPC2148 as a small scale controller which contains ARM processor. If both of the situations said above has happened then the smaller scale controller instantly introduces the GPS which acquires the scope and longitude estimations of the location. The GSM sends the data to the relatives and close-by healing facilities to get prompt treatment. In along these lines we have outlined a model which is utilized to screen the elderly individuals constantly and send the data if there is any crisis.

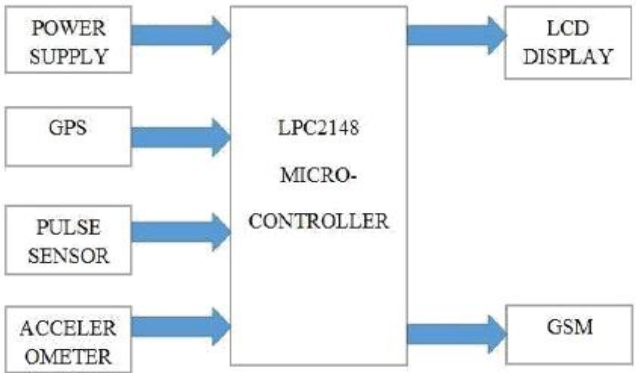


Fig. 1. Block diagram of prototype

IV. METHODOLOGY

To make the prototype we have to go through the following steps

1. Decided to use LPC2148 microcontroller which contains ARM processor
2. Interfacing MEMS accelerometer, pulse sensor, GSM and GPS modules to microcontroller
3. To write a embedded C program to be dumped in microcontroller to take inputs from accelerometer and pulse sensor and send the information through GSM

A. Interfacing MMA7660 FC accelerometer

MMA 7660 FC is a 3 axis accelerometer with a digital output. It sends the values to micro controller by using I2C protocol whichl uses SDA and SCL lines. When the SCL line is low the change in SDA line is considered as a bit by the micro controller Connections to micro controller

1) SCL - P0.2
2) SDA - P0.3
3) INT - P0.4

Values considered by the micro controller as shaken or fall

28- 11100 Shaked or FALL
29- 11101 Shaked
30- 11110 Shaked
31- 11111 shaked
32- 100000 Shaked
33- 100001 Shaked
34- 100010 Shaked
35- 100011 Shaked
36- 100100 Shaked

Whenever micro controller gets the above values as input from MMA7660 FC its considers as a fall and send the information through GSM

B. Interfacing GSM Module

The most commonly used digital cellular technology is GSM (Global System for Mobile communications). It is used for transmitting mobile voice and data services wirelessly. Integrating a GSM module to the LPC2148 helps to send message to relatives and family doctors. IEEE standard for GSM module is 802.21. The command "AT+CMGS" is used to send SMS and most of the commands used to control the GSM module from LPC2148 microcontroller starts with 'AT'. After the 'send' command is sent, some delay needs to be provided as the GSM module is slow or else it would result in "no response error." The data to be sent by SMS is given to the GSM module through Serial Communication. UART1(Universal Asynchronous Receiver/Transmitter) is connected to the GSM module. Communication between GSM module and microcontroller is based on UART which translates the received serial data from microcontroller to parallel information and vice versa.

C. Interfacing GPS

GPS is connected to the micro controller through UART0 .As soom as as the fall is detected the GPS gets initialized and obtains the latitude and longitude values of the location and sends the details through GSM

V. RESULTS

Initially put the plug into the 220 V ac switch board and a step down transformer is used to convert the voltage to 5V required by the microcontroller and on all the modules of the prototype. Now put the pulse sensor to finger of elderly people.

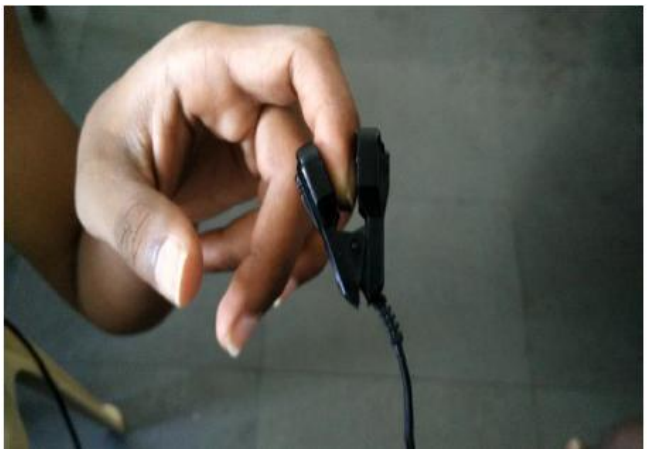


Fig. 2. Pulse Sensor to Elderly People

Now shake the accelerometer intentionally to be detected by the microcontroller. The figure shown below is MMA 7660FC MEMS accelerometer.

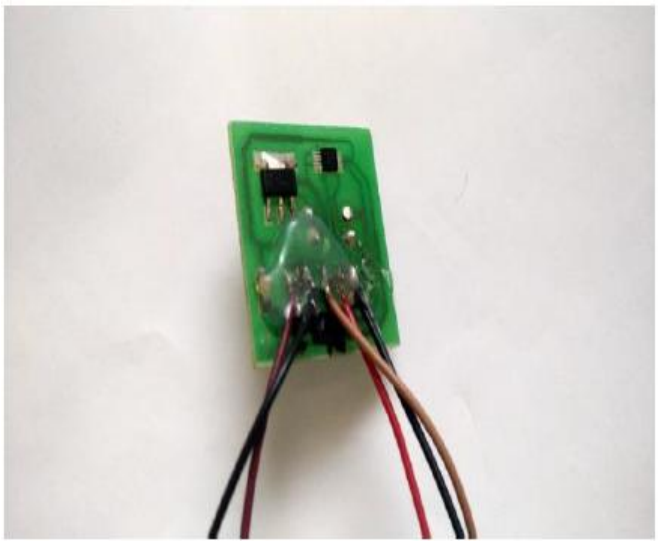


Fig. 3 Shaking MEMS Accelerometer

The pulse sensor plced to the finger of elderly people gets detected and the value is sent to the microcontroller. Now the pulse rate and shake detected by the microcontroller is

displayed on the LCD.

Fig.4. Displaying the Pulse Rate and Shake Detected

An After detecting the shake the GPS gets initialized and tracks downs the location and display latitude and longitude values in the LCD. The figure shown below is display of latitude and longitude values

Fig.5. Display of latitude and longitude values

1. After displaying latitude and longitude values the GSM gets activated and sends the message to realtives and doctors.

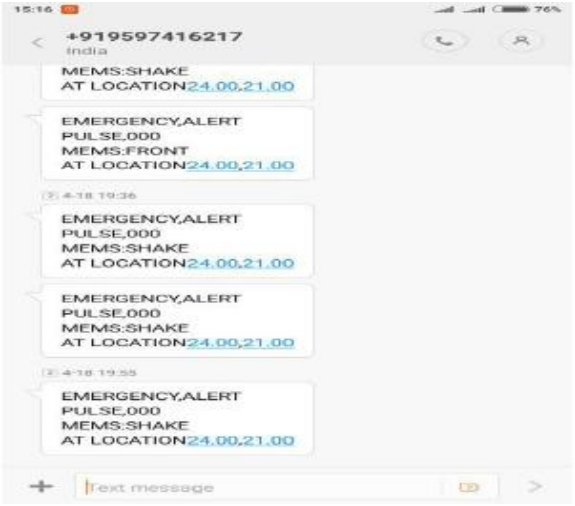
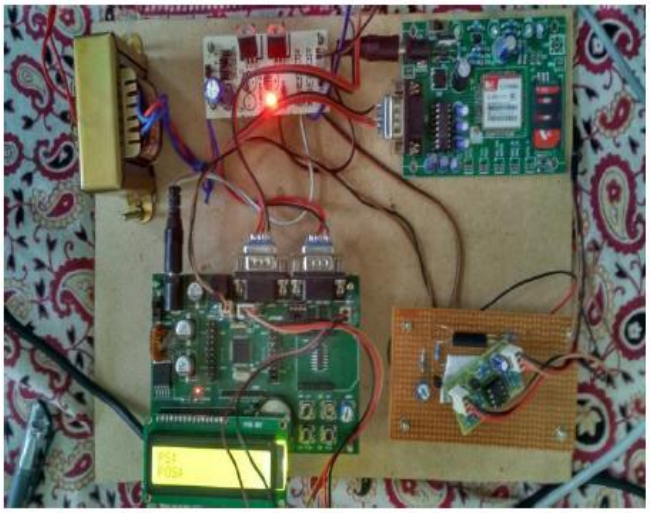


Fig.6. Message Received To the Mobile Phone

The overall picture of the prototype is shown below.



VI. CONCLUSION

In this paper we designed a prototype for detection of an elderly people using LPC2148 micro controller, MMA7660 FC accelerometer, pulse sensor, GSM and GPS modules. Also advancements can be made to wearable based methods by using concept of IOT (internet Of Things).In IOT we can transmit the signals from MEMS accelerometer in wireless manner which is very much comfortable to the users. Instead of using wired pulse sensor we can use bands to measure heart rate which are available in the market and sends the heart beat directly to the phone.

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