

A Wireless IoT System towards Fall Detection in Stroke Patient

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Abstract— In this paper, fall monitoring through the internet of things (IoT) is able to provide assessment of daily life .all existing system for predicting abnormality in fall detection related parameters. Their accuracy is limited because consequences due to injuries are significantly affected by different event in the fall. The objective of this study is to present a multisensory system that investigates walking patterns to predict a cautious gait in stroke patient .The proposed system can continuously monitors the stroke patient conditions and warn the user about abnormal fall and possibly save them from forthcoming injuries from fear of falling. In this project to detects the gaits we are using mems technology. Here the mems detects the mechanical movement and give digital values like front, back, left, right and fall detections and update the data into web page and also gives the buzzer alert and also analysis the abnormality through high and low pulse rate and temperature of the stroke person or normal person and update into web page and sent message if any abnormal condition detected it will give buzzer alert.

Key words: IoT, Microcontroller, MemS, Accelerometer, Pulse Rate Sensor, GPRS

I. INTRODUCTION

Injuries due to a heart attack are a major health problem all over the world [1]. More than 85% of heart attack patients regain the capacity to walk but their gait differs from that of healthy subjects [2]. Fall accidents cause severe damage to health, sometimes even mortality in older adults with the increasing number of the elderly suffering from fall events wearable products are available [3] rehabilitation treatment may be improved by objective analysis of activities of daily living the feasibility of distinguishing several static and dynamic (walking, standing, etc.) using a small set of two or three uniaxial accelerometers mounted on the body was investigated [4]. . The structure of projected fall detection system core structure depends on a small programmed Controller Unit (MCU). The cardio techno and measuring system area unit integrated on one single board, recording real time acceleration and heartbeat. Every acceleration and heart beat data is initial captured by analog-digital converter (ADC). Then, the digital signal is transmitted to the MCU for any method.

II. HARDWARE DESCRIPTION

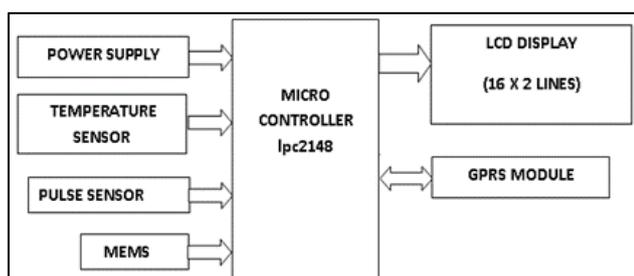


Fig. 1: Block Diagram

A. Microcontroller [LPC2148]

- 1) ARM stands for Advanced RISC Machines. It is a 32 bit processor core, used for high end application. It is widely used in Advanced Robotic Applications.
- 2) 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 3) 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory. 128-bit wide interface/accelerator enables high-speed 60 MHz operation.
- 4) In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader
- 5) CPU operating voltage range of 3.0 V to 3.6 V (3.3 V \pm 10 %) with 5 V tolerant I/O

B. Power Supply

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can be broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as “Regulated D.C Power Supply”. A step-down transformer convert high voltage to low voltage 230v to 18v .transformer output in the form of alternating current but we need in direct current for that bridge rectifier required .filter capacitor is used to remove AC current, regulator is used to provide the constant current supply.

C. MEMS

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 user configurable samples per second. Low Voltage Operation is Analog Voltage: 2.4 V - 3.6 V, Digital Voltage: 1.71 V - 3.6 V

1) Orientation Detection Logic

MMA7660FC gives the customer the capability to do orientation detection for such applications as Portrait/Landscape in Mobile Phone/PDA/ PMP. The tilt orientation of the device is in 3 dimensions and is identified in its last known static position. This enables a product to set its display orientation appropriately to either portrait/landscape mode, or to turn off the display if the product is placed upside down. The sensor provides six different positions including: Left, Right, Up, Down, Back, and Front, shown in Table1.

Orientation	Xg	Yg	Zg
Shake	$ X > +1.3g$	or $ Y > +1.3g$	or $ Z > +1.3g$
Up	$ Z < 0.8g$ and $ X > Y $ and $X < 0$		
Down	$ Z < 0.8g$ and $ X > Y $ and $X > 0$		
Right	$ Z < 0.8g$ and $ Y > X $ and $Y < 0$		
Left	$ Z < 0.8g$ and $ Y > X $ and $Y > 0$		
Back	$Z < -0.25g$		
Front	$Z > 0.25g$		

Table 1: (Orientation Detection Logic)

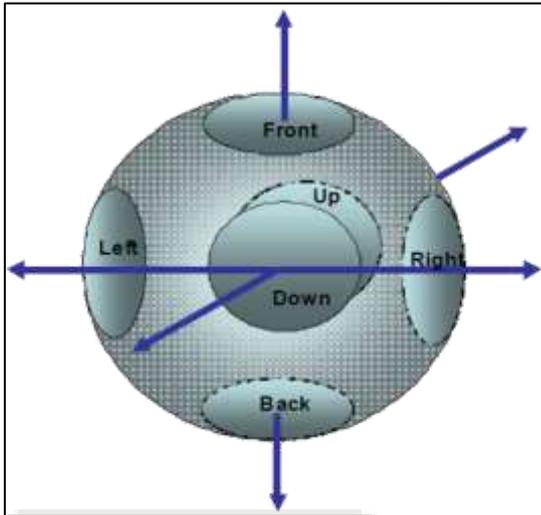


Fig. 2: (Orientation Detection Logic in 3 Dimensional Space)

D. Pulse Sensor

Pulse sensor is also called as Heart Beat Sensor. The sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the light must pass through finger and detected at other end. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated on top by a LED which blinks on each heartbeat.

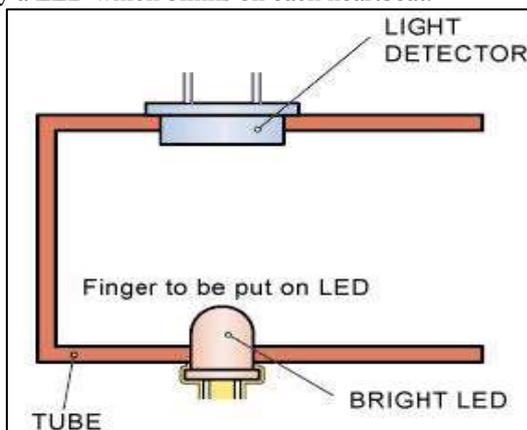


Fig. 3:

E. Temperature Sensor - The LM35

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in oC) .The scale factor is .01V/oC .The

LM35 does not require any external calibration and maintains an accuracy of +/-0.4 oC at room temperature and +/- 0.8 oC over a range of 0 oC to +100 oC. Another important characteristic of the LM35DZ is that it draws only 60 micro amps from its supply and possesses a low self-heating capability.

F. Liquid Crystal Display

The LCD's don't generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCD's have long life and a wide operating temperature range. The ability to display numbers, characters and graphics. This is in contract to LEDs, which are limited to numbers and a few characters.

G. GPRS

GPRS ,will increase opportunities for higher revenues and enable new, differentiated services and tariff dimensions to be offered (such as a charge for the number of kilobytes of data transferred).Voltage: 3.7-4.2V, Support networks: Global quad-band network ,Module size: 2.5cm x 2.3cm ,TTL serial port for serial port, you can link directly to the microcontroller.

III. SOFTWARE DESIGN

- Keil u Vision
- Flash magic

KEIL u Vision is an IDE for embedded c language .we need to import the utilities and libraries according to the controller we are using .can perform a very detailed simulation of a micro controller along with external signals. The flash magic is programming utility .the C/C++program written will be processed into Hex file i.e.in.hex format it is necessary to dump the hex file on to the microcontroller.

IV. IMPLEMENTATION

in exiting system ,sudden person falls due to stroke occurs ,to overcome this problem we are using microcontroller and all the sensors interfaced ,it continuously checks the pulse rate of the person ,t e heart beat module set to 70 pulses it means the normal pulse rate of person ,the heart of the person a maximum temperature is to set accelerometer detection then any one of the sensors exceeds then motion of the person will be captured and sent information to the authorized persons through GPRS technology in this paper the arm7 based lpc2148 microcontroller and smart sensors like temperature accelerometer and pulse rate

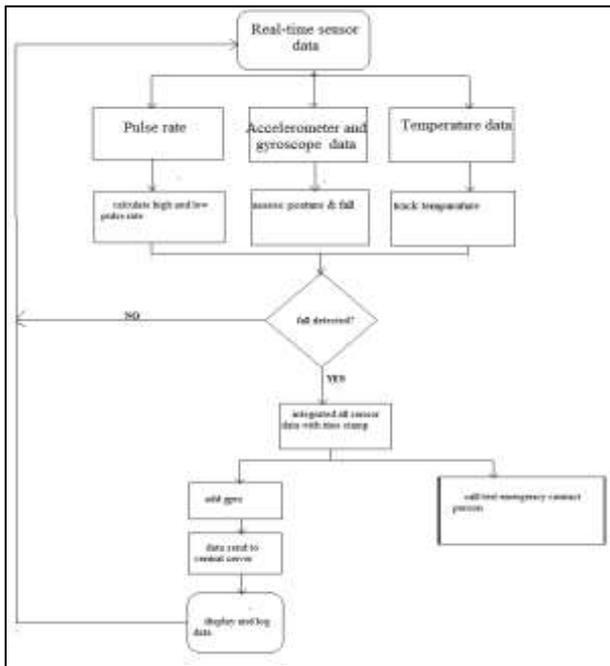


Fig. 4: Flow Chart of Real Time Fall Detection in Stroke Patient

V. CONCLUSIONS

In the old age of every person needed immediate help for the disorders like heart stroke, fever or even person fall down. In the old age they needed help or at least they require immediate help especially in the cases like person fall down or even heart stroke. With the help of our project we can reduce the major damages for all persons in all cases. The proposed system will be very helpful for elderly people. The smart sensors are interfaced to ARM (Advanced risc machine) and the heart beat sensors count will be set to the normal pulse rate of the person if it exceeds then the immediate action will be processed by the controller by using iot based GPS technology and tri-axis orientation/motion detection sensor.

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