DESIGN AND CONSTRUCTION OF MEMS BASED PRE-FALL DETECTION USING GSM MODULE

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Abstract-The objective of this paper is to design and implement a fall detection and alert system to help the aged persons. It basically focuses to facilitate the help after a fall, by featuring on-demand or automatic communication between them and caregivers. The system consists of a wearable monitoring device, that is built for accurately distinguish falls from non-falls of aged persons and then, by using existing proven technologies (GPS, GSM/GPRS), alerts their caregivers. In addition, the device is able to alert caregivers that the user has left his place by sending an SMS containing his location (latitude and longitude coordinates) as soon as he crosses a predefined threshold distance. The developed prototype was evaluated and showed satisfactory performance**.**

Keywords - Microcontroller, GSM Module, Display, Software, Hardware

I. Introduction

In present era aged people's population is unprecedented for humanity during 20[th]century.Falling is a serious issue among old aged population; it leads to severe injuries and consequences. But this ageing process also puts a lot of challenges regarding national development, issues concerning heath of the elderly individual, the sustainability of families, and the ability of health care system to provide for ageing populations [1].

The terms "Elderly", "Older population" and "Senior citizens" are generalized to refer to people aged 60 years or older. People aged 80 years or older is referred as the oldest of old [2].

Inability to move after a fall means that the subject cannot ask for help by himself, which increases the percentage of fall-induced injuries significantly.Fracture is that the commonest injury in fall of associate degree old and there's conjointly an explicit risk to induce coma,braintrauma,anddisfunction. At most fall situations, the fall process is the mainsource of injury because of the high impact. But sometimes the late medical salvage may worse [3].

That means the quicker the salvagecomes,the less risk the old can face.Progress of technology brings a lot of prospects to assist North American country defend the old. Low power consumption components make it possible to realize MEMS (microelectro mechanical systems) sensors have simplified the design and implementation of sensor system. It makes it more convenient to locate the elderly in health monitoring. Beside these, mobile computing makes remote health monitoring easier to realize [4].

Several kinds of fall detection methods have been developed or applied in our life. One of them is computer vision based method. Cameras square measure distributed at restricted area to supply photos or videos of human activities to implement fall detection. External supports such as motion sensors could be used to enhance computer vision based fall detection method. These computer primarily based strategies work effectively in indoor atmosphere.However, they're exhausting to understand in out of doors. Atmosphere because the preparation of cameras is often restricted.

Motion sensor-based method is also commonly used. Accelerometer and gyroscope could provide linear and angular motion information directly. Sensor measurements or their proper fusion could be used to distinguish a real fall. There square measure many sorts of detection strategies that take issue in constitution of motion of sensors. The methodology is victimization associate in nursing measuring device. A single triaxial accelerometer can provide object's accelerations in three directions which include the influence of gravity. A coordinate is going to be engineered once the measuring device is fastened on human's body.

II. Working Pattern

A fall is defined as a person coming from normal level to another lower level called ground. The causes of protection system from falls be stable and reliable. The sensors that are generally used for fall detection are accelerometers and sensors. These sensors are self-confined inertial system with overall dimensions of less 1 cubic inch and at the same time it can trackdisorientation and other motions in real time.

The GSM modem is interfaced to a controller by using RS232 interface. GSM is used for transmitting and receive the message as per level by setting a specific threshold. In advanced, this system is used GPS which is interfaced by using RS232. This GPS module is used for track the exact location of fallen subject. The designed

system required +5V power supply by using a voltage regulator. In this paper system designed based on all (SMD) surface mount device. Because by exploitation this SMD parts overall PCB created by terribly less size as compared to different as a result of utilized by SMD part.
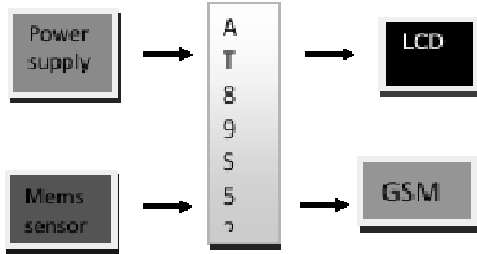
III.Block Diagram


Fig.1. Block diagram of of proposed system.

A.Power supply

Power supply is a reference to a source of electrical power. A device or system that provides electrical or different styles of energy to AN outputload or cluster of hundreds are named aninfluence provides unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. This power provides section is needed to convert AC signal to DC signal and conjointly to cut back the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage(no frequency) with the amplitude of +5V and +12V for various applications.

B.LCD:

We are using 16×2 alphanumeric Liquid Crystal Display (LCD) which means it can display Alphabets in 2 rows each displaying 16 characters.

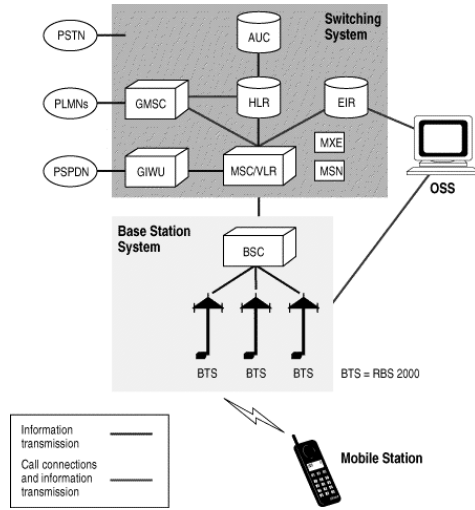#### a.Alphanumeric Liquid Crystal Display
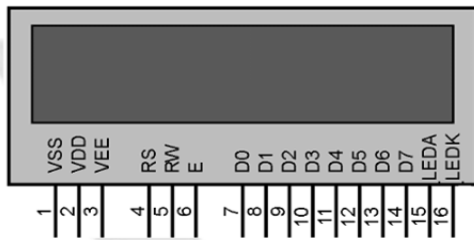
b.GSM Module:

Fig.2. Schematic of GSM module and 16×2 alphanumeric Liquid Crystal Display.

The GSM electronic is interfaced to a controller by exploitation RS232 interface.GSM is employed for transmittal and receive the message as per level by setting a particular threshold. In advanced, this system is used GPS which is interfaced by using RS232. This GPS module is used for track the exact location of fallen subject. The designed system required +5V powersupply by using a voltage regulator. In this paper system designed based on all (SMD) surface mount device.Because by using this SMD components overall PCB made by very less size as compared to other due to use by SMD component.
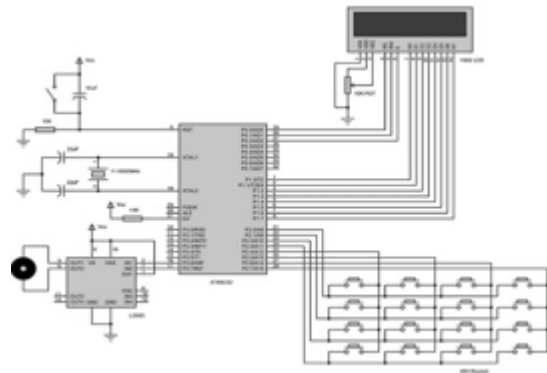
IV.Circuit And Pcb Layout

Fig.3. Circuit and PCB layout

A.Hardware components required:

- AT89S52 controller
- 8051 programming Board
- Programming Cable

- GSM Module
- 16×2 LCD
- Capacitors
- Resistors
- Transistors
- Connecting wires
- Voltage regulator

B.Software tools:

- Keil software

C.Description:

The design of the developed system is delineated. A wearable device is placed on human's waist. The system can detect the elderly's falling by acceleration analysis. Then it will get the elderly's geographic position and send fall alarm short message to caregivers. So the elderly who has fallen can get timely help to minimize the negative influence.

Choice of recognition feature has decisive significance to successful fall detection. Information like linear movements (e.g., displacement, velocity, and acceleration) and angular movements (e.g., angle, angular velocity, and angular acceleration) could be obtained directly or indirectly. Beside these, frequency domain parameters may will be extracted from basic sensor.

V. Result

When power supply is on then LED will on and it displays the LCD Then by the signal of GSM module the message will be sent to mobile that is baby felt. Simulation of project is performed on PROTEUS and the code was written Kiel software. Code for the microcontroller to run DC motors using the HBridge IC (L293D) is written. In the simulation the relevant data to the Microcontroller is send through GSM Module. The Microcontroller processed the data and sent the information to the Actuator IC (L293D). The Actuator IC upon receiving information showed response by giving display.

VI.Conclusion

In summary, we have presented and developed a fall detection system based on a single tri-axial accelerometer based wearable device. There is no special demand of the device's mounting orientation as a result of the algorithmic program doesn't claim the axes of measuring device to be mounted strictly.

VII. Acknowledgment

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