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IoT Based Fall Detection and Monitoring System for Old Aged People

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ABSTRACT: Various fall-detection solutions have been previously proposed to create a reliable surveillance system for elderly people with high requirements on accuracy, sensitivity and specificity. In this project, an enhanced fall detection system is proposed for elderly person monitoring that is based on smart sensors worn on the body and operating through consumer home networks. With treble thresholds, accidental falls can be detected in the home healthcare environment. By utilizing information gathered from an accelerometer, cardio tachometer and smart sensors, the impacts of falls can be logged and distinguished from normal daily activities. The proposed system has been deployed in a prototype system as detailed in this paper. From a test group of 30 healthy participants, it was found that the proposed fall detection system can achieve a high detection accuracy of 97.5%, while the sensitivity and specificity are 96.8% and 98.1% respectively. Therefore, this system can reliably be developed and deployed into a consumer product for use as an elderly person monitoring device with high accuracy and a low false positive rate.

KEYWORDS: Fall detection, Internet of Things, Accelerometer sensor, Threshold detection

I. INTRODUCTION

In recent years, many types of consumer electronic devices have been developed for home network applications. A consumer home network usually contains various types of electronic devices like sensors and actuators, so that home users can control them in an intelligent and automatic way to improve their quality of life. Some representative technologies to implement a home network are Ultra Wide Band, Bluetooth and accelerometer. Accelerometer is suitable for consumer home networks because various sensors can be deployed to collect home data information in a distributed, self-organizing manner with relatively low power. The structure of projected fall detection system core structure relies on a Micro programmed Controller Unit (MCU). The cardio tachometer and accelerometer are integrated on one single board, recording real time acceleration and heart beat. Each acceleration and heart beat information is first captured by analog-to-digital converter (ADC). Then, the digital signal is transmitted to the MCU for any process. The system is complemented with a customer interface designed to watch information in period. This system is designed such that it can help the elder persons who are residing in the house. Global Positioning System consists of a constellation of 21 satellites orbiting the earth every 12 hours at a height of approximately 10,900 nautical miles. Six orbital planes contain four satellites each and have an angle of inclination of 55 degrees with respect to the plane of the earth's equator. Control of the system is aided by five globally located monitoring stations. These stations continuously evaluate the system performance and upload data which is then rebroadcast to the user.

II. METHODOLOGY

An initiatory estimation of the body movement can be obtained from the Signal Magnitude Vector (SMV) defined as:

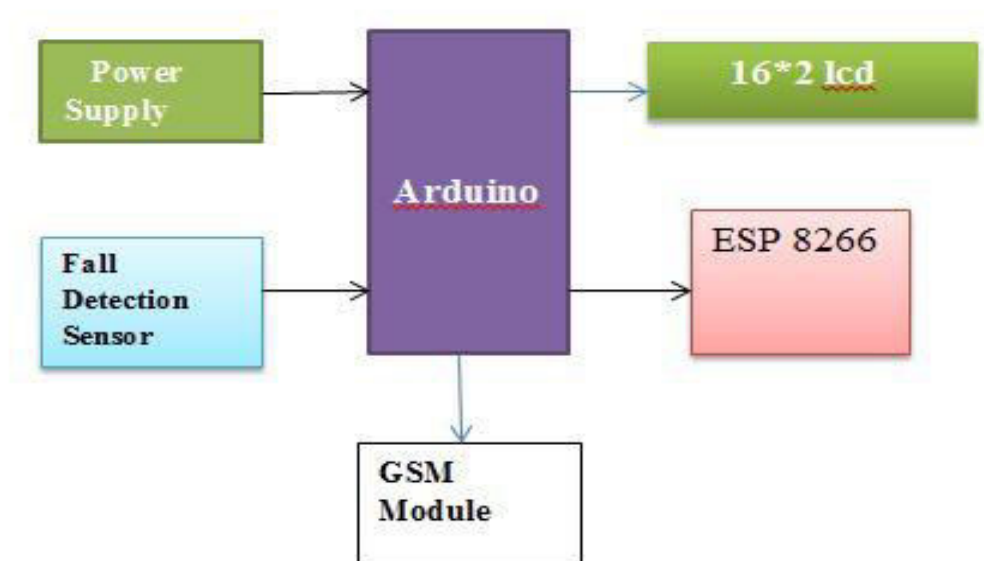
$$SMV = \sqrt{(A_x)^2 + (A_y)^2 + (A_z)^2} \quad \text{..... (1)}$$

Where A_x , A_y , A_z represent the outputs of x-axial, y-axial and z-axial, respectively. Since the direction of possible falls cannot be predicted, it is inappropriate to use only one output of the axis. At the beginning, acceleration due to gravity, g , lies in the z direction. The acceleration changes along with body movement, furthermore, vibration becomes significant when the fall happens. A typical fall events ends with the person lying on the ground or leaning on walls, or furniture that will cause a significant change in trunk angle. In this case, it is desirable to consider changes on the trunk angle to detect whether the detected acceleration was due to fall event. Trunk angle can be defined as angle between the SMV and positive z -axis and can be calculated by trigonometric function as $\Theta = \arccos(A_z/SMV)$ (2) III.

RELATED WORK Many fall detection techniques are available to detect fall detection rate, some of the techniques are

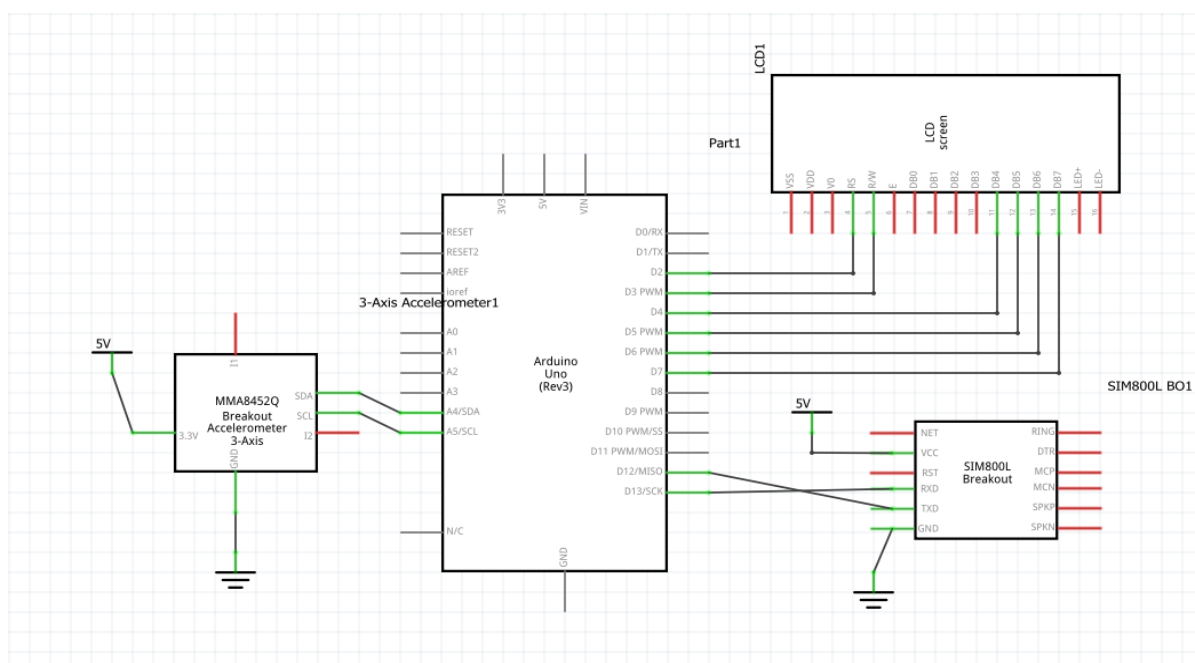
described in this existing system which are illustrated below very clearly. I. Akyildiz, W.Su,Y. Sankarasubramaniam, and E.Cayirci, have designed “Wireless Sensor Networks: A Survey”. Which describes two thirds of elderly with hip fracture never regain their pre-fracture activity status and one-third require nursing home placement. Given these facts, human behavior analysis can contribute with a strong point both on the prevention and detection of this type of hazardous.

Block Diagram



Fig(1): Block diagram of system

Schematic



Fig(2): Connection diagram of system



III. CONCLUSION

A sensor interface design based on arduino uno is proposed. An enhanced fall detection system using on-body smart sensor is implemented and deployed which can successfully detect accidental fall and decreased pulse rate in elderly people. Accidental falls can be detected by using wearable sensor (accelerometer) by setting a value of 1.01g, decreased heart rate can be detected using a wearable sensor (Cardio tachometer) by setting a value of 79 as pulse rate. Ideally combining GPS and GSM with this on-body smart sensor can help to communicate the outputs and track the location of impact of elderly people wearable sensor system can be of good use to monitor elderly people and GPS location tracking along with this system provides a logical solution which is unique in this proposal.

REFERENCES

- [1] I. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "Wireless sensor networks: a survey," Journal of Computer Networks, vol. 38, no. 4, pp. 393-422, March 2002.
- [2] J. Yick, B. Mukherjee, and D. Ghosal, "Wireless sensor network survey," Journal of Computer Networks, vol. 52, no. 12, pp. 2292- 2330, Aug. 2008.
- [3] K. Kinsella and D. R. Phillips, "Global aging: the challenge of success," Population Bulletin, vol. 60, 2005.
- [4] Tabulation on the 2010 population census of the people's republic of China, China Statistics, May 2013, on-line.
- [5] S. Demura, S. Shin, S. Takahashi, and S. Yamaji, "Relationshipsbetween gait properties on soft surfaces, physical function, and fall riskbfor the elderly," Advances in Aging Research, vol. 2, pp. 57-64, Mayb2013.
- [6] S. R. Lord and J. Dayhew, "Visual risk factors for falls in older people,"bJournal of American Geriatrics Society, vol. 49, no. 5, pp. 508-515, Dec. 2001.
- [7] WHO, "The injury chart-book: a graphical overview of the global burden of injury," Geneva: WHO, pp. 43-50, 2012. [8] M. Mubashir, L. Shao, and L. Seed, "A survey on fall detection: Principles and approaches," Neurocomputing, vol. 100, no. 16, pp. 144-152, Jan. 2013. [9] Q. Zhang, L. Ren, and W. Shi, "HONEY a multimodality fall detection and telecare system," Telemedicine and e-Health, vol. 19, no. 5, pp. 415- 429, Apr. 2013



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