Hi-Tech Automation Technology for Old Age Home

Devid Banoth[1], Ali Mubeen[1], Naremula Naresh[1], Mohd Abdul Raheem[1], MD. Touseef Sumer[1]

[1]Department of ECE, Lords Institute of Engineering and Technology Hyderabad, India

[2]Assistant Professor, Department of ECE, Lords Institute of Engineering and Technology Hyderabad, India

ABSTRACT

Smart old age homes are recognized as a suitable medium for an independent and comfortable existence for older and disabled people in the present era. The wireless home automation system used in this research enables fall detection, Bluetooth control switching, location tracking, and health monitoring. The Home appliances like a TV, light, or fan can be remotely controlled using a Bluetooth control switching system. etc. Clinical viewpoints and heavy use of the location tracking and health monitoring system care. To prevent accidental injury and death, a fall detection system has been incorporated. This document will to create a smart senior home, put your attention on integrating automation and health monitoring systems.

Keywords : Arduino , Bluetooth control switching system

I. INTRODUCTION

Recent statistics show a rise in the population of senior citizens. Age-related physical weakness makes elderly persons more vulnerable to accidents of various kinds. On the other hand, some persons have physical limitations that prevent them from doing certain motions and tasks. An assisted-living facility might be one of the better options for a lot of senior people. However, the annual cost is very high.

Even if the majority of older people want to remain in their homes, it is still necessary to regularly monitor their activities and health in order to offer them prompt assistance. A smart home is a technologically advanced home that allows for increased security, easier communication, and automation of household tasks.

Being able to stay in their homes, where they feel more comfortable, and regularly monitor their health through the applications, smart homes can significantly improve the lives of the elderly. Smart homes can assist caregivers in many ways to enhance the quality of the services they offer because they are designed to cater to the particular needs of the elderly. In residential health and surroundings, smart home systems may typically be built and maintained without any complication. Intelligent monitoring software tracks the use of household electronic appliances, gathers information from various health monitoring sensors, and instantly recognizes activity patterns in a smart home along with a complementing electronic system.

II. SMART OLD AGE HOME

Modern sensing technology combined with smart houses can provide in-home, self-learning care solutions that can assist ease your mind by continuously monitoring the elderly. A control panel, a collection of distributed sensors and motion detectors to track a person's movements around the house and detect the use of electrical appliances, a collection of Bluetooth-based systems, mobile and web-based apps, and a remote management tool are the typical components of a smart home. The goal of smart home systems is to gather real-time data on monitored people's daily activity levels, medical issue levels, and learn to recognize their unique patterns in the process. Smart home systems warn the manager of the senior living facility and the rest of the management team when those monitored patterns depart from the norm patterns, enabling them to take immediate action.

The majority of smart home features rely on a wireless sensor. In order to measure physiological characteristics, the wireless sensor comprises of numerous distributed sensor nodes placed throughout the surroundings. The wireless sensor network detects daily activities and aging-related lifestyles of senior people living in old age homes as it gathers information about the monitored person's health and activities. Based on the classification model of regular and irregular sensor activity, smart homes enable the prediction of the unexpected behavior of the monitored person using the created activity pattern. Smart house systems based on wireless sensor networks can be easily deployed in already-built homes with little to no alterations or harm.

III. RELATED WORK

Since most smart home implementations generally make use of a wireless sensor network, researchers focus not only on hardware and software technologies designed to implement smart home functions but also communication technologies. Considering the recent developments on wireless networking technologies for short-range applications and the communication requirements in the context of the smart home functional areas must be analyzed properly in order to qualify the suitability of candidate wireless standards. Liu in presents the design and implementation of a prototype smart home system based on ZigBee and GSM/GPRS network. The author explains not only the design of the home network but also how the smart home functions are remotely monitored and controlled. Mendes et al. in investigate the suitability of short-range wireless technologies for smart home services. The authors prove that none of the analyzed wireless protocols alone appears to satisfy the communication requirements of smart home functional areas as a whole. However, ZigBee stands out as the best one for smart home network services with low to medium data rates and reliable data communication.

In order to mitigate the impact of wireless interference on smart home networks, eliminate the need for relay nodes and reduce unnecessary energy consumption, Li and Lin in combines the advantages of wireless sensor networks and power line communications. The architecture they proposed employs the power line communication as the network backbone and the wireless sensor network for data sensing and is scalable. Similarly, Ferreira et al. in investigate the use of ultra-wide band receivers for low bit-rate data communication transceivers for smart home applications. On the other hand, Tiwari et al. in propose the use of visible light time division duplex technique for bidirectional data transmission between multiple devices.

Although design and development of smart home systems for the elderly has gathered a lot of interest in both the academia and the industry, most of them focus of sensor technologies and communication requirements. However, the major problem here is

that most of the available sensors are unable to make the distinction in the monitored health and environment. In this respect, Charlon et al. in propose a system to monitor daily activities of the elderly in their living environment. The proposed system includes a set of motion sensors network deployed on different areas and an electronic patch worn by the monitored person to identify him/her and detect falls. The proposed system relies on a novel analysis algorithm to detect abnormal situations and alert the nursing staff in real time.

IV. BLOCK DIAGRAM
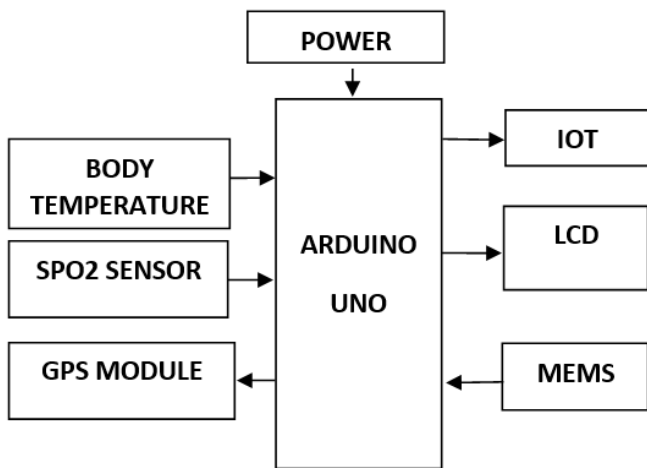
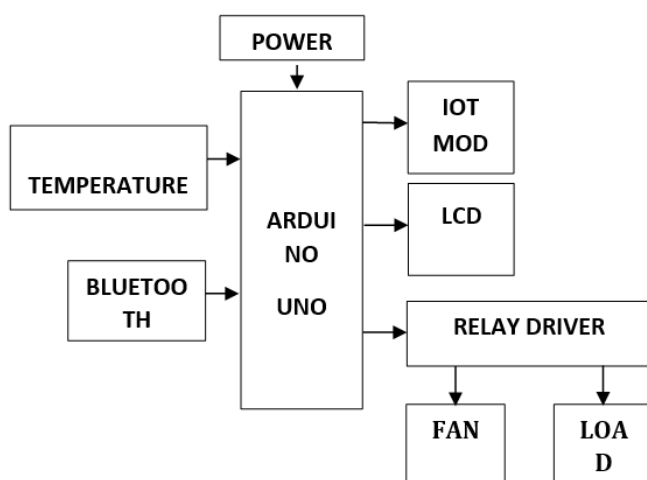

Figure 1 : Block diagram for Health Monitoring system

Figure 2 : Block diagram for Appliance Monitoring system

PROPOSED SMART OLD AGE HOME APPLICATION

As shown in Figure 1, similar to common smart home systems, a set of sensors and detectors are used to gather data and control health and action. The data gathered by the sensors are sent to the monitoring software running on the Arduino board shown at the center in Figure 1. The values in the gathered data are sent to the system's users and are compared with the previously set values to decide whether to trigger an alert/alarm or not. A prototype smart home was developed in this study to carry out a set of experiments. Before the installation, the system was designed and tested.
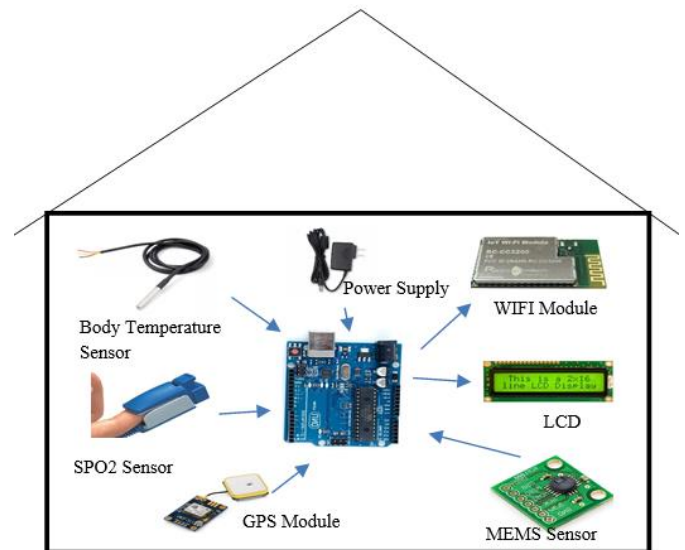

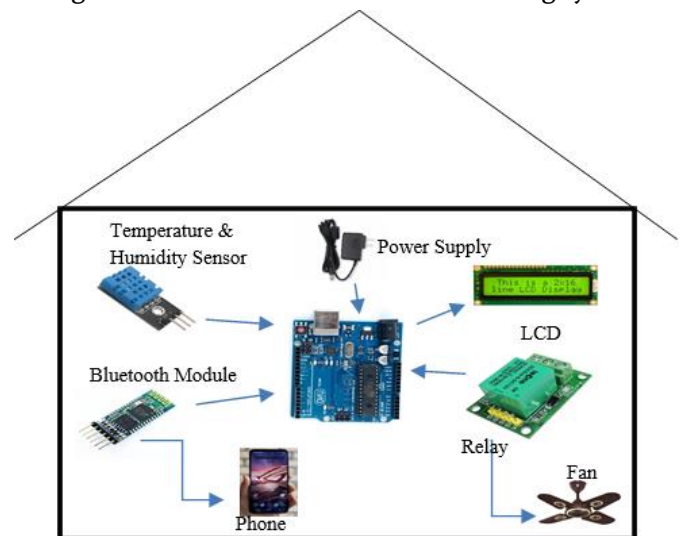Figure 3: Interface for Health Monitoring system

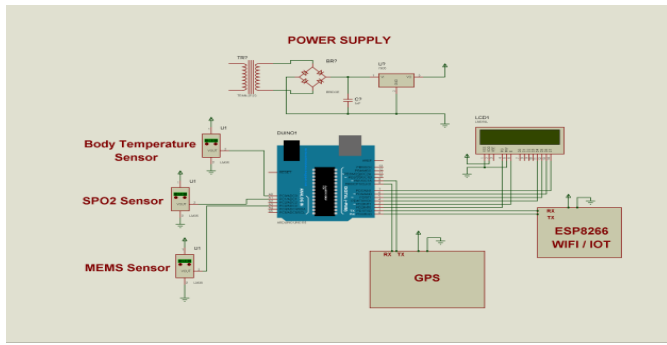Figure 4: Interface of Appliance Monitoring Unit

Figure 5 : Software Connections of Health Monitoring System

In prototype when the sensors are connected to elderly, it calculates the sensor levels and send to Arduino uno board. Then it transfers the data to web-based applications. The monitoring software has a web-based interface and hence is accessible by mobile devices such as smart phones. In the web-based interface, the user is able to manage some specific activities, see triggered alarms/alerts, and read current or logged sensor values. Whenever a user accesses the monitoring software, the user's identity, login and logout dates and times, and the user's activities on the monitoring software are recorded. The application presented in this paper is just a simple example of smart home applications and it is still under development.
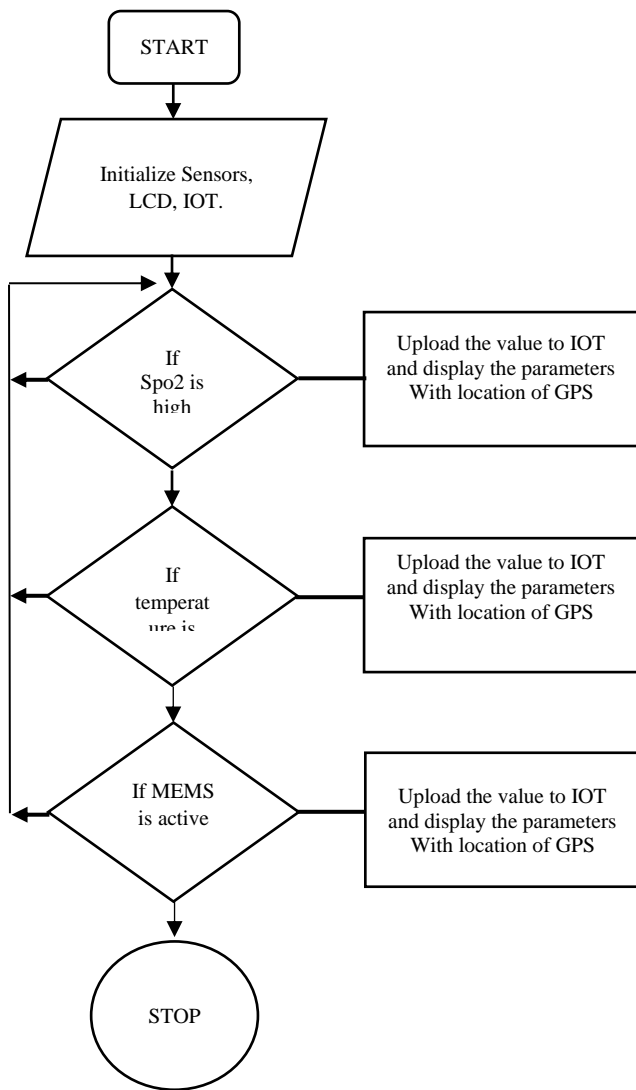
V. FLOW CHART

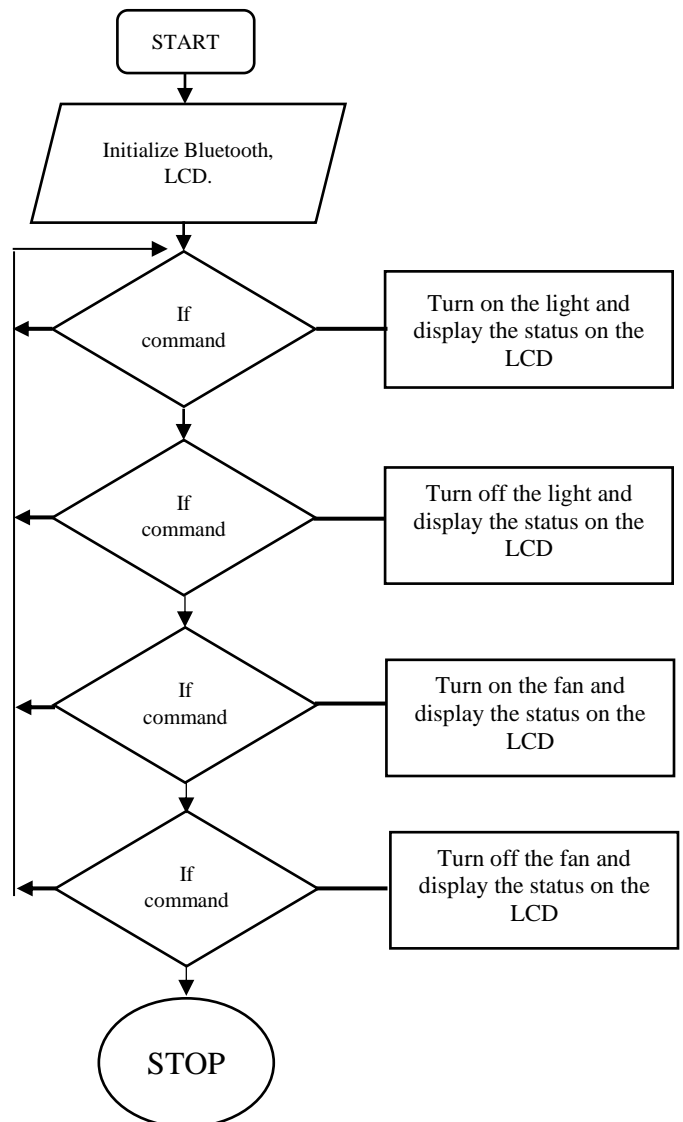Figure 9 : Flow chart of Health Monitoring System

Figure 10 : Flow chart of Appliance unit Monitoring system

VI. CONCLUSION

The project "DESIGN AND IMPLEMENTATION OF SMART OLD AGE HOME" been successfully designed and tested. It has been developed by integrating features of all the hardware components used. 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 and with the help of growing technology the project has been successfully implemented.

VII. REFERENCES

[1]. Le, Q., Nguyen H. B. and Barnett, T. (2012). "Smart Homes for Older People: Positive Aging in a Digital World", Future Internet, 4(2), 607-617.

[2]. Gaddam, A., Mukhopadhyay, S. C. and Gupta, G. S. (2010). "Towards the Development of a Cognitive Sensors Network Based Home for Elder Care", 6th International Conference on Wireless and Mobile Communications, 484-491.

[3]. Das, R., Tuna, G., (2015). "Machine-to-Machine Communications for Smart Homes", International Journal of Computer Networks and Applications (IJCNA), EverScience Publications, 2 (4), 196-202.

[4]. Moutacalli, M. T., Marmen, V., Bouzouane, A. and Bouchard, B., (2013). "Activity Pattern Mining using Temporal Relationships in a Smart Home", IEEE Symposium on Computational Intelligence in Healthcare and e-health (CICARE), 83-87.

[5]. Manley, E. D. and Deogun, J. S. (2007). "Location Learning for Smart Homes", 21st International Conference on Advanced Information Networking and Applications Workshops (AINAW'07).

[6]. Wang, J., Zhang, Z., Li, B., Lee, S. and Sherratt, R. S., (2014). "An Enhanced Fall Detection System for Elderly Person Monitoring", IEEE Transactions on Consumer Electronics, 60(1), 23-29. DOI: 10.1109/TCE.2014.6780921

[7]. Jalal, A., Uddin, M. Z. and Kim, T.-S., (2012). "Depth Video-based Human Activity Recognition System Using Translation and Scaling Invariant Features for Life Logging at Smart Home", IEEE Transactions on Consumer Electronics, 58(3), 863-871. DOI: 10.1109/TCE.2012.6311329

[8]. Jovanov, E., Lords, A., Raskovic, D., Cox, P., Adhami, R. and Andrasik, F. (2003). "Stress monitoring using a distributed wireless intelligent sensor system", IEEE Engineering in Medicine and Biology Magazine, 22(3), 49-55.

[9]. Jalal, A. and Kamal, S., (2014). "Real-Time Life Logging via a Depth Silhouette-based Human Activity Recognition System for Smart Home Services", In Proceedings of 11th IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS), 74-80.

[10]. Son, Y. -S., Jo, J., Park, J. -H. and Pulkkinen, T., (2013). "Diabetic Patient Care using Home User Activity Recognition", ICTC 2013, 191- 196.

[11]. Alemdar, H. and Ersoy, C., (2010). "Wireless sensor networks for healthcare: A survey, Computer Networks", 54(10), 2688-2710. DOI: 10.1016/j.comnet.2010.05.003

[12]. Istepanian, R. S. H., Jovanov, E. and Zhang, Y. T., (2004). Guest Editorial Introduction to the Special Section on M-Health: Beyond Seamless Mobility and Global Wireless Health-Care Connectivity. IEEE Transactions on Information Technology in Biomedicine, 8(4), 405-414. DOI: 10.1109/TITB.2004.840019

[13]. Akyildiz, I. F., Su, W., Sankarasubramaniam, Y. and Cayirci, E., (2002). "Wireless sensor networks: a survey", Computer Networks, Elsevier, 38, 393-422. DOI: 10.1016/S1389-1286(01) 00302-4.

[14]. Suryadevara, N. K. and Mukhopadhyay, S. C., (2011). "Wireless sensors network based safe home to care elderly people: A realistic

approach", 2011 IEEE Recent Advances in Intelligent Computational Systems (RAICS), 1-5.

[15]. Tuna, A., Das, R., and Tuna, G., (2015). "Integrated Smart Home Services and Smart Wearable Technology for the Disabled and Elderly," In Proceedings of 4th International Conference on Data Management Technologies and Applications, ISBN 978-989-758-103-8, pp. 173-177, DOI: 10.5220/0005552001730177.

[16]. Mendes, T. D. P., Godina, R., Rodrigues, E. M. G., Matias, J. C. O., Catalao, J. P. S., (2015). "Smart and energy-efficient home implementation: Wireless communication technologies role," 2015 IEEE 5th International Conference on Power Engineering, Energy and Electrical Drives (POWERENG), Riga, May 11-13, pp. 377-382.

[17]. F. Viani, F. Robol, A. Polo, P. Rocca, G. Oliveri and A. Massa, (2013). "Wireless Architectures for Heterogeneous Sensing in Smart Home Applications: Concepts and Real Implementation," In Proceedings of the IEEE, vol. 101, no. 11, pp. 2381-2396.

[18]. T. Li, N. B. Mandayam and A. Reznik, (2013). "A Framework for Distributed Resource Allocation and Admission Control in a Cognitive Digital Home," IEEE Transactions on Wireless Communications, vol. 12, no. 3, pp. 984-995, DOI: 10.1109/TWC.2012.011513.111495.

[19]. T. Li, J. Ren and X. Tang, "Secure wireless monitoring and control systems for smart grid and smart home," IEEE Wireless Communications, vol. 19, no. 3, pp. 66-73, 2012. DOI: 10.1109/MWC.2012.6231161.

[20]. P. Dawadi, D. Cook and M. Schmitter-Edgecombe, "Automated Cognitive Health Assessment Using Smart Home Monitoring of Complex Tasks," IEEE Transactions on Systems, Man, and Cybernetics: Systems, vol. 43, no. 3, pp. 1302-1313, 2013. DOI: 10.1109/TSMC.2013.225233

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