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IOT BASED SMART HOME SPECIALLY FOR MONITORING ELDERLY PEOPLE

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***Abstract*— in this busy life schedule everyone wants to get some comfort and secure life as well. Home Automation used to control home appliances remotely to reduce efforts. The environment or smart home is expected to meet the requirements, essentially for the aging people to provide take care and make sure reliable care and to ensure safety and proper diagnosis by keeping track of daily living activities, medical condition of the aged people and providing feedback to the caregiver. In order to meet these requirements, smart home of today should support a number of functionalities. One such functionality of a smart home environment is the location detection. Home security includes services like gas leakage and trace pass protection. This system is very beneficial for old ages and handicapped people as well for working people, it is a blessing as it alert the person if any nasty situation raised at home in their absence. we propose a voice based location detection system which can be integrated in a smart home environment. Our location detection system uses Amazon Echo as the voice interface and HC-SR04 ultrasonic sensor to detect location of specific patients. The proposed location detection will be suitable for large scale application where we may need to keep track of multiple patients. Moreover, the inclusion of voice enabled feature to this system will reduce the burden of learning curve of new technologies on family and caregivers, thereby improving the quality of life.**

Keywords: Smart Home, Location Detection, Amazon Echo, Quality of Life, Aging in Place

I. INTRODUCTION

By the use of different IoT modules like the Bluetooth, ZigBee, Wi-Fi etc. connectivity among various devices have increased making systems more autonomous and integrated.by benefits of these IoT has found its application in various domains like smart home, wearables, smart city which includes smart surveillance, automated transportation etc. IoT is indeed a key factor for economic growth and improving the quality of life of people. One such application of IoT: the smart home, is gaining popularity owing to the ongoing crisis of the aging people. People aged 65 and above are considered as the fastest growing people in present day world especially in the Americas, Europe and Asia. US Census Bureau has reported that the number of people over the age of 60 is expected to reach 1.2 billion by 2025. However, on the other side, aging people are prone to be a victim of chronic illness and as result increasing aging people are a burden for caregivers and families because of limited infrastructure available to meet the health needs of the fast growing aging people.

Smart home is a potential solution that can meet the requirements of the people. Smart home features are capable for providing extensive health care and monitoring continuously and even much more faster, reliable observation and results than human effort. Also, smart homes can reduce the burden on health care providers and also support the concept of *"aging in place"*. Various works have been done in the area of smart home to increase their functionality and to increase automation with a view to providing comprehensive health care and improve the quality of life. With smart home capabilities, residents of a house can control the light, fan, T.V and other appliances remotely or from a single device. With smart security surveillance system, security features of home is enhanced providing assurance of the safety of the resident to the caregiver and their families. Smart health monitoring system in the form of Personal Digital Assistant, smart bathrooms are capable of monitoring the health of the individual and send updates to the caregiver. Indoor location detection has gained much attention and much work has been done in the past decade which has focused on location-sensing technologies, location-aware application support, and location- based applications. Monitoring the location of an individual is important because this allows us to detect any abnormal behavior of the resident. Location detection also provides vital information about the pattern of living of the resident, their health and also their feelings. These information will help the caregiver to render better and intelligent services thereby providing better and safe living experience. In this article we propose a voice based indoor location detection system that can identify the location of a specific person which is important for large scale implementation like in hospitals etc. where location detection plays an important role.

II. RELATED WORK

Indoor Location Detection is an important feature of a smarthome environment. Various approaches has been made for location detection in smart home projects. For example in CASAS smart home architecture [4], infrared sensors were used. Gator Tech smart home [5] initially incorporated the use of ultrasonic sensors to detect motion by placing a set of ultrasonic transceiver pilots in the ceiling, The users wore vests attached with transceiver tags which responds to the chirp. However, the inconvenience associated with wearing a special clothing all time and the expense of requiring many such expensive pilots made them opt for using pressure sensors. Pressure sensors were embedded on the floor that is capable of detecting footsteps and hence the presence of anyone in the room. Microsoft Easy Living Project made use of video cameras to monitor people in a room [6]. Active Bats [7] used ultrasonic sensors for location detection. Work done in [8] made use of PIR sensors to detect the location of the individual. In [9], indoor location tracking and state estimation has been done by fusing environmental sensors and wearable sensors. The works discussed above can detect the location of a individual, however, none of the works can detect the location of specific patients. Use of video camera can identify the specific person, but use of video camera's compromises privacy of the individual. Our proposed method is capable of detecting the location as well the specific individual. Moreover, the incorporation of voice based search of patients is another novelty of our proposed method.

III. PROPOSED METHOD

The system components of our proposed model are:

- *Amazon Echo (Alexa)*
- *The server*
- *Location Detector*
- *Speaker*

Gas leakage monitor.

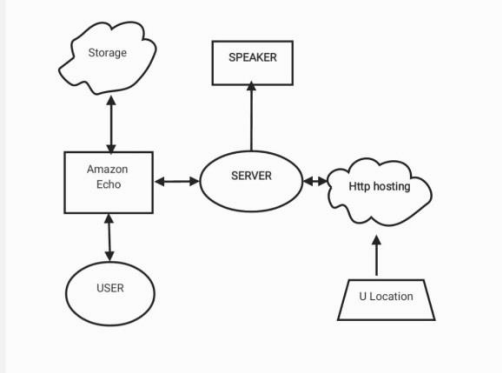

Figure 1 layout of the system components

Figure 1 shows the layout of the system components. The Amazon Echo provides the interaction module. Amazon Echo maintains a two way wireless communication to connect with Amazon Web Services and also with the server. A speaker is connected physically to the server. The Amazon Web Service (AWS) hosts the alexa skill for this system.We have used AWS lamba for computation and AWS Dynamo DB for storage. Amazon Echo also maintains communication with the server.

Figure 2 Amazon Echo

Figure 3 HC-SR04 ultrasonic sensor

The figure 2 shows amazon echo module and figure 3 shows HC-SR04 ultrasonic sensors module,The Location Detection devices communicates with the server via HTTP requests. Our location detection devices use HC-SR04 ultrasonic sensors to detect the location. HC-SR04 ultrasonic sensors have receiver and transmitter embedded in the same sensor.

The basic idea of HC-SR04 is that the time required by the reflected wave to come back is calculated and the distance is calculated. There are two sets of location detection devices: The first set U*location*=loc*i* are placed on the ceiling which

communicates the presence of an object via HTTP requests only when an object is detected within a specific range, d*range* where *i* represents the index of the locations of the smart home by patient's as a tag that also communicates the presence of an object via HTTP request. The work flow of the proposed method is illustrated. We have implemented the above concept using Raspberry Pi Model B+ as the server and Amazon Echo as the voice interface. The HC-SR04 is programmed using Arduino ESP8266 with WiFi module to speak to the server. In our implementation, we have fixed the error tolerance factor as 5 sec as it was found to be the optimum number to account for the delays and false response. The implemented system has been able to identify the person and the location in most of the request and no false response. This implementation is a proof of concept of the proposed system which shows its potential in its implementation in large scale capable of tracking multiple patients.

Different types of equipments are used for various purposes in our day to day life and most of them have the capability of emitting some kind of gases or some compounds in the air while in use. It is very important to keep a check on the concentration levels of the gases and other compounds as some of them, when exceed the safe concentration level, are flammable under the room temperature and humidity condition. Mixtures of dispersed combustible materials (such as gaseous or vaporized fuels, and some dusts) and air will burn only if the fuel concentration lies within well-defined lower and upper bounds determined experimentally, referred to as flammability limits or explosive limits. Combustion can range in violence from deflagration, through detonation, to explosion . A traditional gas detection system checks for the concentration levels and alerts people about the leakage through audio and visual alarms.

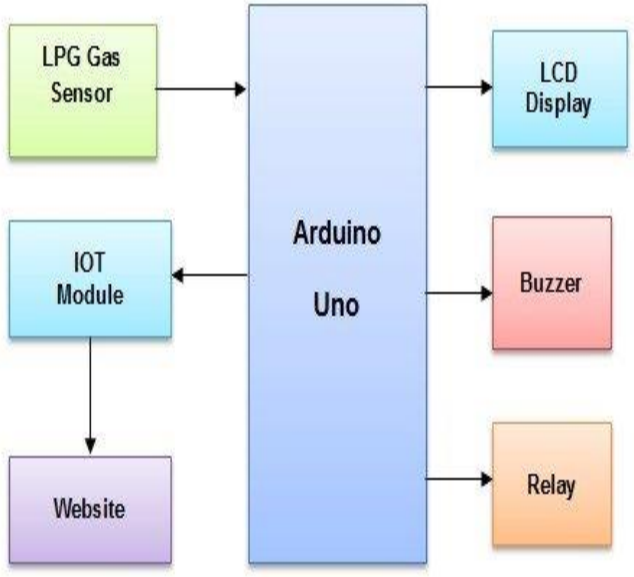

Figure 4 block diagram of gas detector

IV. FUTURE WORK AND CONCLUSION

The proposed Indoor location detection system is a work in progress. As a future work, we will be working on solving the challenges faced in the implementation of this system to increase the reliability of the proposed model to make it suitable for large scale implementation. One of the drawback of the proposed model in large scale implementation is that when many such patient tags and location sensors are used, the number of HTTP requests to the server increases which might lead to server crash. Also, in large scale implementation, the search process will be also slower. Moreover, when number of such device increases, the probability for false response also becomes higher. This problem can be solved by distributing the computation over several local servers instead of a single sever. This will reduce the HTTP requests on a particular server thereby preventing server crash and false response. Although the possibility of false response cannot be ruled out, with proper positioning of location detector is setting up.

REFERENCES

[1] "Senior resource for aging in place", 2011 [Online]. Available: http://www.seniorresource.com/ageinpl.htm

[2] M. Hazas, J. Scott, and J. Krumm, "Location-aware computing comes of age," IEEE Computer, Vol. 37, No. 2, pp. 95-97, Feb. 2004

[3] M.D. Rodriguez, J. Favela, E.A. Martinez, and M.A. Munoz, "Location- aware access to hospital information and services," IEEE Transactions on Information Technology in Biomedicine, Vol. 8, No. 4, pp. 448-455, Dec. 2004.

[4] D. J. Cook, M. Schmitter-Edgecombe, and P. Dawadi, Analyzing ac- tivity behavior and movement in a naturalistic environment using smart home techniques, IEEE Journal of Biomedical and Health Informatics, vol. 19, no. 6, pp. 18821892, Nov 2015.

[5] S. Helal, W. Mann, H. El-Zabadani, J. King, Y. Kaddoura, and E. Jansen, The gator tech smart house: a programmable pervasive space, Computer, vol. 38, no. 3, pp. 5060, March 2005.

[6] Brumitt, Barry and Meyers, Brian and Krumm, John and Kern, Amanda and Shafer, Steven, EasyLiving: Technologies for Intelligent Environments, 2000, [Online], Available: https://www.microsoft.com/en-us/research/publication/easyliving-technologies-intelligent-environments/

[7] A. Harter, A. Hopper, P. Steggles, A. Ward, and P.Webster, "The anatomy of a context-aware application," Proceedings of the 5th annual ACMIIEEE international conference on Mobile computing and networking, pp. 59-68, 1999.

[8] K. N. Ha, K. C. Lee and S. Lee, "Development of PIR sensor based indoor location detection system for smart home," 2006 SICE- ICASE International Joint Conference, Busan, 2006, pp. 2162-2167. doi: 10.1109/SICE.2006.315642 pages 12-29,

[9] Y. Li, M. Liu and W. Sheng, "Indoor human tracking and state estimation by fusing environmental sensors and wearable sensors," 2015 IEEE International Conference on Cyber Technology in Automation, Control, and Intelligent Systems (CYBER), Shenyang, 2015, pp. 1468-1473. doi: 10.1109/CYBER.2015.7288161

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