"IOT Based Indoor Localization with LiFi in Smart Homes"

Huma Khan[1], O P Singh[2]

Departments of Electronics and Communication Engineering
Amity School of Engineering and Technology, Amity University Uttar Pradesh, Lucknow Campus

Abstract: *In present era, the information technology is increasing day by day across the world. There are various applications of the information technologies especially in the smart homes. Smart home technology means home automation. The smart home is a well connected internet based devices to empower the remote monitoring & management of appliances such as lighting and heating etc. Smart buildings to know the location of each resident and provide secure internet facility through LiFi technology. It is thousand times faster than WiFi and provides high security as visible light cannot penetrate through the walls of the home, which leads to a new generation of optical wireless communication. These locations are aware indoor services such as path finding, IoT and location based advertising etc. The LiFi receives visible light communication through LED to realise fully automated secure network for smart homes. This paper presents the IoT based indoor localization to improve the accuracy with LiFi technology.*

Keywords: *Smart home, WiFi, IoT, LiFi, Accuracy*

I.   Introduction

Today Smart homes are most pleasant application of IoT that develop the quality of human life and introduce savings, comfort and peace of mind. Smart homes utilize the LiFi Technology. LiFi technology as a medium of communication during all connected devices and uses audio/video surveillance system based on sensor visual wireless network [1].

LiFi is a technology for short range wireless communication system in which light is utilize like a carrier signal and it also used a LED to transmit the data. LiFi uses a bidirectional and the communication using light through wireless mode. The data rate of LiFi speedier than WiFi. LiFi has many advantages such as security, low power consumption, data transmission speed is high [2].

Smart homes are referred as ehome is among interesting based on IoT application that make human life is more comfortable and convience. It supply connectivity and control of every digital devices in home like as heating, lighting, air conditioning & security system and control things   regardless time and place. IoT based every objects are connected with internet [3]. As the outcome, India has becoming digital India and smart cities will be soon transforming which is highly depends upon internet. Smart homes has facing some challenges which has required to overcome like as interference issues get over WiFi that interfere with electronic devices in smart home . Most of these standards of communication like as Bluetooth, Z-wave and WiFi has transmit collect data from smart homes environment through base station known home hub. Various users implemented tablet or smart phones it is based upon indoor localization technology of LiFi. For example in smart homes IoT technology is connected all the devices through LiFi [4].
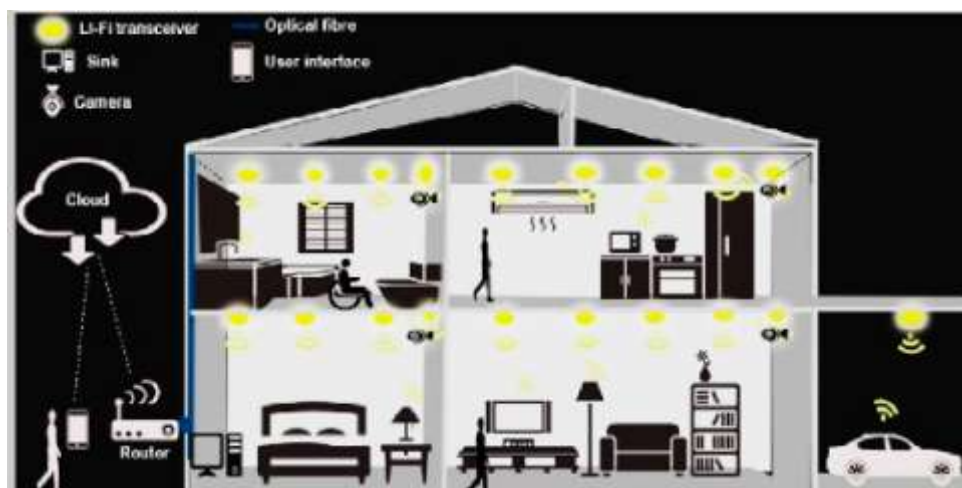

Fig: 1   Architecture of smart homes based on LiFi Technology

In this figure 1 shows all gadgets are connected with one another and to the internet through LiFi and controlled by a user interface from anyplace and whenever utilizing cloud computing .LiFi cannot travel transparent material such as walls so it confer secure data transmission and limited data transmitted to one area and remove interference issues [5] . LiFi makes more suitable IoT based indoor application.
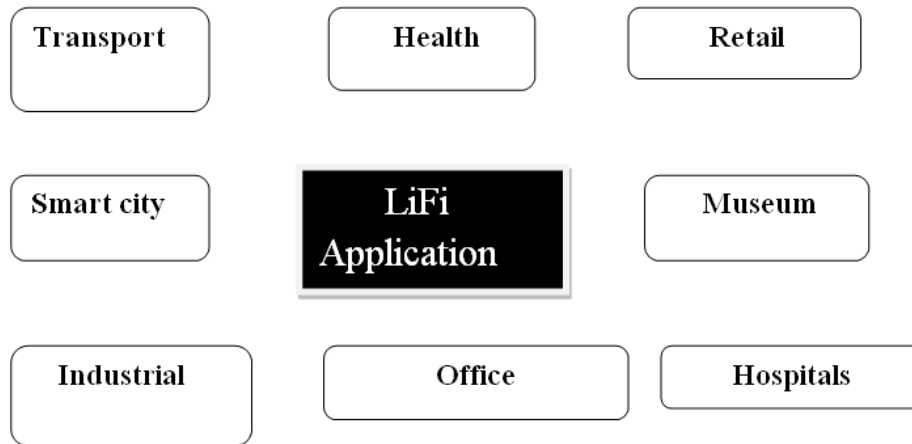

Fig: 2 Application of LiFi

II. Advantages of Smart Homes

➢ Smart homes monitoring from somewhere at any time and setting exclusive required for home devices like as heating , adapting and air conditioner to the choices of persons according to climate changes.

➢ The availability of smart homes empowering individuals with inabilities, or then again uncommon requirements to live more freely by utilizing assistive or versatile technologies , for example, an individual who can't see can utilize voice enacted interface to control his connected devices.

➢ Smart homes are connecting gadgets, appliances and sensors in network they ready to communicate with one another, furthermore, can be controlled remotely [7].

➢ Smart homes are giving the flexibility of controlling electricity consumption to users furthermore, allowing the system to turn on or off appliances when they are not required to save electricity. Something else, by utilizing sustainable power source to produce its own energy like as photovoltaic system on the home rooftop.

➢ Smart homes providing more security in our homes such as installing cameras, fire detectors, motion detectors, locks etc. The user can control and view regardless of where he is and, can be informed immediately if something is out of the conventional in regards to the home's condition [8].

➢ As a security system in our proposed brilliant home, we recommend the utilization of a WVSN that comprise of a huge number of minor visual sensor hubs called camera hubs, which incorporate a picture sensor, an inserted processor, and are mote transceiver. These nodes can collect picture/ video information from a region of interest process it collaboratively, and transmit the useful data to the base station.

➢ Smart home technology could be an alternative to minimize danger resulting from old aging or disabilities persons provide old people independence and activity. In our purposed system camera hubs will most likely recognize and control older people activity and collect other information of older people like as walking speed, posture and balance and send gathered information to repository in the base station which will be stored in the cloud [9].

III. Result

Despite the fact that essential propagation mechanism of WiFi signal has been all around examined by wireless communication scientists, yet, because of the complicated signal reflection, multipath and interference with indoor obstacles. As an outcome indoor position expectation dependent on Wi-Fi's RSSI isn't accurate with an estimation error of few meters high quality of localization based services is difficult to get. Wi-Fi positioning algorithm with LiFi assisted coefficient calibration is proposed to dealing with the estimate accuracy challenge. The combinations of LiFi lighting system into indoor Wi-Fi based positioning expand the location accuracy by 80% with no system implementation overhead.

IV. Conclusion

LiFi Technology based   Smart home is very secure, less expensive, fast and energy efficient. Smart homes required accurate indoor localization technique. Smart home has best for elderly old people. Wi-Fi positioning algorithm with LiFi assisted coefficient calibration is proposed to dealing with the estimate accuracy challenge.

References

[1]. A. Bhati, M. Hansen, and C. M. Chan, "Energy conservation through smart homes in a smart city: A lesson for Singapore households," Energy Policy, vol. 104, no. February, pp. 230–239, 2017.

[2]. I. Meena and D. Kumar, "A Review Paper on LiFi," in National Conference on Innovations in Micro-electronics, Signal Processing and Communication Technologies, 2016, no. February, pp. 9–11.

[3]. A. Jovicic, J. Li, and T. Richardson, "Visible light communication: opportunities, challenges and the path to market," IEEE Commun. Mag., vol. 51, no. 12, pp. 26–32, Dec. 2013.

[4]. P. Mishra, J. Poddar, and S. Priya, "A Review On LiFi : The Green WiFi," Int. Res. J. Eng. Technol., vol. 3, no. 3, pp. 99–103, 2016.

[5]. S. Wu, H. Wang, and C. Youn, "Visible Light Communications for 5G Wireless Networking Systems: From Fixed to Mobile Communications," IEEE Netw., vol. 28, no. 6, pp. 41–45, 2014.

[6]. Bahl, P. (2015). Indoor localization: are we there yet? Get Mobile: Mobile Computing and Communications, 19(1), 2015.

[7]. J. P. J. Peixoto and D. G. Costa, "Wireless visual sensor networks for smart city applications: A relevance-based approach for multiple sinks mobility," Future. Gener. Computer. Syst., vol. 76, pp. 51–62, 2017.

[8]. M. Skubic, G. Alexander, M. Popescu, M. Rantz, and J. Keller, "A smart home application to eldercare: Current status and lessons learned," Technol. Heal. Care, vol. 17, no. 3, pp. 183–201, 2009.

[9]. F. E. Persons and S. H. Technologies, Rehabilitation Medicine for Elderly Patients. Cham: Springer International Publishing, 2018.