

Real Time Smart Door System for Home Security

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Abstract - This paper presents a real time smart door system for home security. Most of the proposed smart home systems try to bring solutions for this security problem, but many of those systems use numerous sensor devices. With the increasing security issues, it is necessary to use new technologies. Video based smart home security systems have recently become an efficient approach with the development of video technology and Raspberry Pi is a strong and reliable embedded system device for the complex and challenging tasks. Using these technologies in the proposed system will bring several advantages in providing safety and security in terms of visualizing and identifying people who visit the home. In the overall proposed system, there will be two different significant techniques to provide home security. One is to use video technology to see the front door in real time even if the home is empty and another is to provide communication between the door system and smart phone device. By connecting the smart door system with the mobile phone through the cellular network, the owner of the house may have several opportunities such as controlling the house, getting instant video streaming, receiving and sending message, talking to the visitor and starting the alarm system. The experimental results indicate that the proposed system may provide a consistent support and assistance for safe and secure life.

Keywords – Multimedia Communication, Security and Safety, Smart Door System.

1. INTRODUCTION

Over the world, IOT (Internet of Things) and M2M (Machine Interpersonal Communication) technologies which were developed for smart home system are becoming well known. The system is developed by using Supported Mobile Communication and Safety Powered Multifunctional Smart Door System. The proposed system will allow to communicate between visitors and owners of the house. Video camera system (the photo of visitors will be sent to the owner of the house), instant message notification, SMS / MMS notification and dual audio / single sided process will be provided with videophone. In addition, cloud storage of image data with a high resolution will be provided using the system.

With increasing safety and security issues, the use of smart door system increased consistently with the advent of security-related electronics, such as digital door locks, advanced video conversation devices, and wireless home security networks [1]. There are many smart systems proposed to provide safety and security at home and offices. Facial and voice recognition and positioning detection techniques are presented in [2]. The system is integrated to the gate for recognition people.

This process uses the FPGA device. Further details of a smart door system required are summarized in [3]. Smart home automation system for a digital door lock is provided in [4]. In this work, intelligent door systems with confidential information contained in the digital code and the person's fingerprint is working, depending on the definition of identity. Recommended door lock system for detecting user ID RFID reader, LCD touch sensor module to determine the condition inside of house is used and finally includes communication module. In this study, using handwriting recognition technology to authenticate the user and the security door system has been proposed. This system uses two stages. First and foremost is smart system by using phone management and the second one is foreign individual identification which performs detection of people. It is an intelligent door system with camera-based anti-trap protection. In another research, both faces of both sound localization determination method using efficient and accurate recognition of the identity of visitors from the door phone is presented [5]. It describes the emergence of new problems which is recommended to analyze various abnormal behaviour. This paper describes how to determine the indoor environment development of standards and methods that can be used. In this research, the Android operating system ibeaco detection of mobile devices is used.

The proposed smart door system pro-

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vides security, early warning, communication and other applications. Intelligent motion sensor on the door and people / goods placed on Bluetooth v4.0 low energy (BLE) devices using the technology can be implemented using Beacon to prevent unwanted situations. Over the Beacon devices placed persons (children, Alzheimer's disease, etc.) are used to detect the people if they try to leave or leave the region of the house. If this happens then a warning signal will be delivered to the owner of the house for emergency. Thus preventing potential security problems. Our system will be developed with new features that will be added which will distinguish the proposed system from other systems.

The aim of the overall systems is as follows:

- Using the rapidly growing M2M and IoT technologies that offer intelligent cloud solution to develop a mobile-assisted doors.
- The ability to communicate via video chat or pre-defined messages are provided to incoming visitors to the home
- Ibeaco (BLE) integrated with an early warning system will be developed to provide safety of both people and home
- For the incoming image data will be transmitted for storing in the cloud
- Notification of the activity detected by the mobile client with built-in motion sensors
- Smart home systems brings a different perspective to outdoor space in addition to the internal management system management.

The rest of the paper is organised as follows. In section 2, overview of the smart door systems is presented. The proposed system is described and explained in Section 3. In section 4, the video and sound communication technique between smart door system and mobile device is described. In the last section, the paper is concluded.

2. OVERVIEW OF THE SMART DOOR SYSTEMS

Today, investment in IoT devices and security issues at the international level is increasing rapidly [6]. Especially, the intelligent automation system which shows a rapid increase in interest in many developed countries. Smart Door system will have new ap-

plications and it will be developed from the existing smart door systems. The proposed system includes the following key features; - Imaging and visitors flood conversations using remote access, working image recording system with sensor -Mobile -Data Storage in the cloud. Similar products in this area are Chui, Skybell i-Bell and Doorbot.

3. PROPOSED SYSTEM

The project is developed to bring a new solution in the intelligent door systems for several security and communication issues. The system will have the following applications and specifications:

- Providing a system including hardware, software, mobile communications and cloud computing makes the integration of complex architectural structures,
- Unlike the existing systems, the system has Ibeaco feature to identify the person who tries to go out from the range of the house and alert be transmitted to the owner of the house if the person leaves the range.
- The smart door system is planned to be installed through the door of the mobile communication located away from home video and voice communication
- Text to speech feature are innovative feature added to the system, we plan to have a project in advanced intelligent door security systems
- Images and videos will be recorded in the cloud for the later use. Thus, the important data will be held in the cloud for checking the data in the future if it is necessary.
- Another important issue is to provide security in the system that other people cannot access the system. Therefore, encryption will be used between mobile device and smart door system, cloud and smart door system vice versa. Thus, the data will be protected.

The system will be integrated on an embedded system device which is called Raspberry Pi. The device will have iBeacon, Camera, Sensors and microphone as shown in Figure 1. In order to provide communication between smart door system and mobile device we used APNS&GCM technology. Besides this, the system will provide SMS&MMS

data transmission between smart door system and mobile device if a visitor cannot reach the owner of the house and vice versa. Thus, visitor can communicate to the owner of the house in two different communication ways.

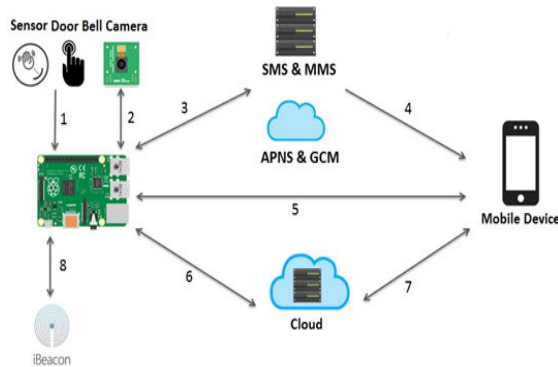


Figure 1. Diagram of the overall system.

4. VIDEO AND SOUND COMMUNICATION TECHNIQUE

The algorithm uses the input images from a camera for communication. The image of home visitor is delivered to the owner of the house via wireless communication. Figure 2 shows the diagram of the video and sound communication system which will be provided between the Raspberry PI and Mobile device. The client may also send voice data to the smart door system to talk to the visitor. Thus, there will be a communication between visitor and client. As a result, client may know the visitor and inform the visitor for her/his current location. On the other hand, the client may call the security if the visitor is unknown. Besides this, obtained images via a camera is stored in the cloud for important issue in the future.



Figure 2. Image and video communication between smart door system and Mobile phone.

5. CONCLUSION

We proposed a system of real time smart door to provide communication between clients and home security. In order to provide effective system, we used Raspberry Pi embedded system which is integrated on the door of a house. The system is based on video technology which is a very popular technology for providing security and safety in urban areas. We used Raspberry Pi because it is a strong and reliable embedded system device for solving complex and challenging tasks. Using both technologies in the system provide various benefits to increase the efficiency in terms of communication between visitor and owner of the house and providing safety of home. In the proposed system, two different important techniques have been used for home security. First is the use of video technology to watch the outdoor and the second is to offer communication between the visitor and owner of the house via door system.

6. REFERENCES

- [1] Ching-Lung Chang and Han-Yu Tsai, "The design of Video Door Phone and Control System for Home Secure Applications," IEEE International Conference. Innovative Mobile and Internet Services in Ubiquitous Computing, Vol. 5, pp. 1-5, 2011.
- [2] Kai-Tai Song and Jian-Liang Chen, "Sound direction recognition using a condenser microphone array," IEEE International Symposium. Computational Intelligence in Robotics and Automation, Vol. 3, pp. 1445, Istanbul TURKEY, July 2003.
- [3] Jindong Chen, Jacob Benesty, and Yiteng Huang, "Time Delay Estimation in Room Acoustic Environments: An Overview," EURASIP J. Appl. Signal Processing, Vol. 2006, pp. 19, 2006.
- [4] Charles H. Knapp, "The Generalized Correlation Method for Estimation of Time Delay," IEEE Transactions on Acoustic, Speech, and Signal Processing, Vol. ASSP-24, No. 4, pp. 320-327, 1976.
- [5] Y. Freund, and R. E. Schapire, "A Decision-Theoretic Generalization of On-Line Learning and an Application to Boosting", Journal of Computer and System Sciences, 1997, Vol. 55, pp. 119- 139.
- [6] Maenpaa and Topi, "Local binary pattern approach to texture analysis extensions and applications", Univ. Oulu, 2003.

