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A Perspective of Home Security Using Wireless Communication

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Abstract: Home security is security system to applied at home or at one building. A function of home security is to provide comfort, some level of protection for the inhabitants of the house and can also be implemented into the system for crime prevention. The research will be conducted using wireless communication as the communication module used in security systems. The diversity of application, technology, methods, sensors that used and many more ways can increase the level of security at home. This study aims to review and compare some paper of home security likes methods, used tools, advantages and disadvantages of a security system. At the end, the final duty is to know which system is suitable for home by using the parameters to be compared.

Key words: Home security system, technology, wireless communication, tools, system and duty, function

INTRODUCTION

The smart home is a residence that uses home-based information and networking tools to connect household appliances to each other, so, it is created, remote networks, convenience, security, entertainment and response needs (Yiqi *et al*., 2014). Many tools or applications can be used to create smart home systems that aim to control and protect our homes such as doors, windows, refrigerators, courtyards and rooms, irrigation systems, multimedia distributions, etc (Garcia *et al*., 2017). Systems built in addition to securing, protecting and monitoring assets also provide services to homeowners to observe the state of the environment and the arrival of someone in their neighborhood without fearing that their identity will be disturbed because everything is done in secret (Saeed *et al*., 2010). Increasing the crime that ensues makes the inhabitants of the house must prepare a security system to protect their homes. But not everyone builds a security system in their homes because long ago the resident community keeps each other's environment together by watching the area with their eyes but that way is no longer effective. Especially when the end of the year when the residents of vacation homes and homes in a state of empty many crimes that occurred. Slowly awareness of the importance of building home security systems increase (Kijudomsin *et al*., 2011).

Implementation home security system that can be applied such as fire alarm (Kumar *et al*., 2017) access control mechanism (Seo and Cho, 2012) smart home monitoring, smart video analysis for home security (Zhang *et al*., 2015), sensor monitoring system at electrical appliances in the home (Munir and Stankovic, 2014) camera system, door automation system, etc.

This study will review using a wireless communication module that will connect home appliances with built-in security systems (Elkhorchani Gray, 2016). The wireless system uses a freely transmitted signal transmission and is affected by distance and obstructions, resulting in lower transmission quality levels compared to cable systems. However in the industry today, some applications require the use of wireless communications rather than cables such as in the agricultural, military, or ecological industries. We can conclude that in buildings, houses, trails, neighborhoods, suitable use of wireless communication systems (Dong *et al.,* 2016). The most commonly used wireless modules today are WSN, GSM module, radio frequency module, ZigBee (Kantor *et al.,* 2018).

MATERIALS AND METHODS

WSN: WSN technology is a wireless technology that has a wide range so that the distance is further than other modules, high precision, fast and easy network formation and the cost is quite cheap (Kijudomsin *et al.,* 2011).

GSM: GSM technology is a network that has the advantages of mature technology and widely used today, wide coverage area, long-range communication range and the effects of voice communications and so on. Latitude, longitude, speed and direction of moving targets can be

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calculated and transmitted with the GSM network messaging platform and can be modified as needed (Hu *et al*., 2012).

Bluetooth: Bluetooth technology is a technology licensed in the 2.4 GHz frequency and distance range below 10 meters, so that, it can be said wireless short-range radio, Bluetooth transmission rate is still low compared to wifi and other wireless modules. Bluetooth technology uses low power usage, low cost and simple tools (Dar *et al*., 2010).

IR: Infrared technology is wireless directional communication has no limits on the bandwidth allocation used. IR coverage cannot be blocked by wall barriers, so, communication can only be done in the same room. Infrared is the most common way to control one device with other devices (Dar *et al*., 2010).

WiFi: WiFi technology is a technology that is widely used today. WiFi is a wireless connection, easy to use and can be implemented into systems or projects from various industries, affordable cost requirements and few used tools. WiFi has a wide diversity of broadband speeds, its speed can be tailored to the needs (Raman and Chebrolu, 2007).

By Huang *et al*. (2010) built a home security system that combines two wireless communication modules, namely WSN and GSM. The systems to be built include monitoring and detecting the theft of household appliances with tools used as case studies are gas and fire, electronic goods and others. Then the alarm message is sent to the user's mobile phone (Huang *et al*., 2010). The wireless sensor network in the home of this system is composed of one center node module and several data collecting node modules, operating in a point-to-multipoint communication mode as illustrated in Fig. 1.

All the tools that will be entered into the security system will be paired with a sensor and a WSN communications device, called data collecting node module. In one security system, there are many data collecting node modules, data exchange occurs between data collecting node module with WSN center node module where WSN center node module has a very big responsibility. WSN center node module will receive any data received from data nodes, data is processed and summed up into processed data values. Furthermore, WSN center node module sends processed data to MCU-based indoor, MCU will assess whether there are

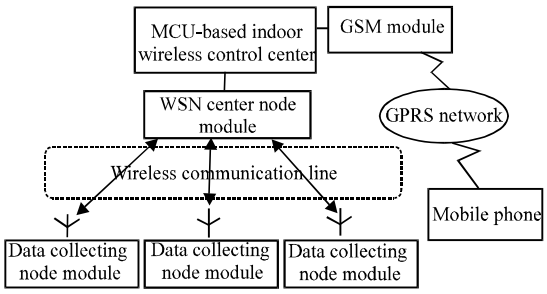

Fig. 1: System structural diagram (Huang *et al*., 2010)

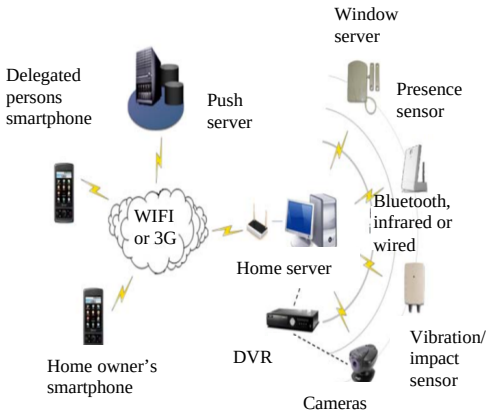

Fig. 2: Configuration system diagram (Seo and Cho, 2012)

abnormal value and worry or not. If not then the MCU will wait for further data from the WSN center, if yes then MCU will start the process of sending a short message to the user's mobile phone using GSM module.

Seo and Cho (2012) describe that the increasing use of smartphonesandthe easy modification of smartphones can be a consideration for building wireless network infrastructure (Zhuge and Yao, 2003; Al-Qutayri *et al*., 2008). By combining several wireless modules such as Bluetooth, infrared, WiFi and others, applications on smartphones can be developed. This system creates an application for controlling and performing device functions such as security cameras, motion sensors, light sensors and other devices can also provide the rights and powers that users can use within certain limits. The access rights of the residents of the house and the guest will differ according to his rank in the house (Seo and Cho, 2012). The system configuration used in this system can be seen in Fig. 2.

In this system if, we want to access the security system in the user's house we only need to connect the smartphone with WiFi or 3G GSM network, if already connected automatically will also connect to Push Server (PS) located inside the house. Home Server (HS) is a control center for monitoring of security systems and user interface applications between users with existing HS

Table 1: Service requirements of system (Seo and Cho, 2012)

Services	Descriptions
Monitoring	Switch statuses (on/off) or the alarm statuses of devices are mentioned at the home server and the smart phone appliction
Controlling	Switch statuses (on/off) or the alarm statuses of devices are mentioned at the home server and the smart phone appliction
Reporting	When the abnormmal statuses of device occurs, this is a reported immediately to the home server and smartphone application, therefore, users can recognize it
Authenticating	Login and authentication process are performed for usersto control their system access
Authorizing	Users and system functions are divided to some groups and access rights of users for the functions are controlled according to the groups of users and functions
Manageing	User addiction/deletion and change of passwords and other systems parameters (port number and cycle of logging) are provided
Logging	User logging and device control/monitoring, user addiction/deletion and chane of password and system parameters should be
logged	in files in terms of occurance time, subject and descriptions of the event. Captured images from cameras are stored in files

Table 2: Comparison of some methods in home security

Study title	Researchers name	Discussion
"Home security system system based on wireles network system GSM technology"	Huang *et al.* (2010)	In the process of testing the sensors used are temperature sensors,temperature sensors that are already connected to the hardware, the configuration is done then the temperature sensor placed in the room. Testing is done by setting this specified temperature threshold, the control center will trigger theand GSM module to send alarm messages to the user's mobile phone if the room threshold. From this testing process, the prototype system successfully runs in accordance with the plan and the communication used does not experience significant problems
An access control mechanism of home security system baesd on Bluetooth, infrared wired and WiFi	Seo and Cho (2012)	In this test, the system runs and functions according to plan. Users who want to access the app will be verified by HS whether the app user goes into the homeowner or temporary user access. If the user is temporary then there is a ticket to access the security system, access that can be done will be limited. Homeowners may remove temporary user access by sending a request to HS to stop granting ticket access. So that home security system is maintained. This system is suitable to provide delegates to temporary users such as friends, maids, security guards, to keep the house replacing homeowners
"A ZigBee-based smart home monitoring system"	Yiqi *et al.* (2014)	In this system, there are three small systems, namely: the hardware functions of the gateway,the gateway function as a coordinator and the remote access and control functions through the web server. With the assisted application interface, the user performs login authentication after successful remote users can monitor and control ZigBee sensors and home devices Experiments have shown that it is low consumption, low cost, high reliability and stability
"Wireless home Alarm system based on CC1110 and SimplicTi"	Tang and Shuai (2011)	In this system use CC1110 radio wireless communication with basic command that have been made made in accordance with its function. There is RX as the receiver and TX as the sender associated with the interrupt. Before the data transfer process occurs the process of variable initialization whether the data is appropriate or not. Radio systems have some reliability such as low cost, a distance that can cover the area of the house you want to monitor and the configuration can be done quite easily

security systems, applications built with Apple or Android platforms that users can use to monitor, control and grant app access. To prevent any user from accessing the application a security authentication is created before the user can access the application, the authentication being done is using the IP address of the home server, port number and security system password. HS is also, connected with tools that will be monitored devices such as sensors, cameras, devices, using Bluetooth media, infrared and cable. HS connected with PS, then any HS change notification will be received by PS then forwarded back to user's phone. Users can configure HS such as requesting alarm status, enabling or disabling tool functions, reset tool or sensor composition, etc. When HS receives a request or command from a user, HS will run and execute and then return the result to the user. If HS wishes to notify the situation of the hazard to the user then HS will send an alarm to the user's device, if there is an alarm it can be interpreted as an emergency is happening.

You can create two kinds of access inbuilt security systems, ie homeowners and temporary users. Access that can be done by fixed users and temporary users is, of course, different because the privacy in the home is very confidential. If the homeowner wants to remove the temporary user access and temporary user permissions authorization to the system security device will be removed, then the homeowner can remove it. Because the system management access must be done strictly for the security of the house is maintained. The functions and classification services provided by the system can be seen in Table 1 and 2.

The construction of a home security system does not have a definite literature review. Making the system is done freely tailored to the needs and desires of the homeowner what kind of system to be applied at home. Possible things to do during the home security system creation process are as follows:

Identify user requirements. Each user has different needs. So, first need to identify user desires like what. Use of tools and methods used. After identifying it will look for communication modules, sensors and methods that are suitable to be applied to the security system. The more complicated the system will be built then the use of tools and methods used will be more complicated.

System development. The system will be built in accordance with the planning that has been prepared. When completed it will be installed on the user's home.

The purpose of a home security system is to provide security, protection and monitoring of ownership assets as well as providing services to owners in order to observe the circumstances and arrival of a person in the home environment (Saeed *et al*., 2010).

RESULTS AND DISCUSSION

In this study we can review and discussion about papers that have topic of home security system based on wireless network. In Table 2, there are several comparison papers on the tools used and the results of the experimental tool.

CONCLUSION

In this study, we have reviewed a home security system. Home security to give securing, protecting and monitoring assets also provide services to homeowners to observe the state of the environment and the arrival of someone in their neighborhood without fearing that their identity will be disturbed because everything is done in secret.

From very simple methods to complex methods can be used as a reference for building security systems. Tools used also vary such as motion sensors, light sensors, other sensors, actuators, communication modules and others. The use of the tool will be tailored to the specification of the system to be built and the method to be used. With the current technological developments then the tools used in the manufacture of home security systems will increasingly vary.

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