

The Design and Implementation of Home Automation System

Tony Tsang¹, Chiu Ka Fai²

^{1&2}Department Centre of International Education, Hong Kong College of Technology, Hong Kong.

Corresponding Author: Tony Tsang

ABSTRACT: Home automation is becoming popular because it has a lot of advantages, and these advantages are good for customer, society, economy and environment. Home automation system is system that controls the home appliances by using remote controller. Hence, those home appliances may stop operating when not in use. The project deals with discussion about different functioning and pros & cons of the home automation system. It also focuses on design concept, the development and the efficiency of this system, to observe the changes of power consumption after selecting home automation system. However, it still has loopholes hardly to fix. So, the new Home Automation are created and deigned in this paper. This system can replenish the existing one to be more efficiency, more economical save the money and energy.

KEYWORDS: Home Automation System, Home Appliances, Power Consumption, Save Energy.

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I. INTRODUCTION

The main purpose of Home Automation is to change our attitude of life and save the electricity. In daily life, the sufficient use of electricity is very important. Many surveys are showed that home automation is effectively to improve the energy saving. That indicate using home automation system is more economic than who did not use the system. In fact, home automation can reduce the power consumption. For instance, when leaving home or the equipment is not in used, the system will run the program and schedule to turn off the device in a regular time. There is an intelligent performance. On the other hands, Home Automation system can build up an indoor constant temperature. This action may avoid the power loss and to protect customers to waste the unnecessary resources. This behavior can achieve the impact of reduce load.

Home automation system provides a variety of conveniences with the public. This brings a lot contribution for the society. Anyone can remotely control the home or office appliances automatically. Home Automation can solve most of the problems of life. The various technologies are reviewed throughout this paper. To increase the awareness, introduction of different wireless communication such as GSM, Bluetooth Wi-Fi will be discussing later [1,2,3].

Besides, the mentioned above of the wiring connection may cause pros and cons. In conclusion, it will present a design and prototype implementation of new Home Automation system. To figure out the above wiring communication's advantages and identify an optimized Home Automation system for ensure the power consumption and the energy efficiency.

Overall the project, it seems that this automation system that designed can improve over 40% for convention. It is because home automation can assist to help to solve some of troubles of everyday life. No need to bother with the indoor temperature, the brightness of the light, the curtains on or off, the security of communication etc. This way really decreases the unnecessary problems.

The main target on this captioned project is to save the energy. Since home automation is an Artificial Intelligence (AI) system, and wish can save about 15% electricity. Energy saving is an important issue that global concerns. Because of the energy shortage, energy saving would be the first priority and efficiency in relieving the stressful situation. So, home automation system in here may take the important role to defuse the problems. It appears can push a motivation for the energy saving. Moreover, saving energy means that can help the environment, to meet the requirement - minimize energy wastage.

II. METHODOLOGY

2.1 Methodology Investigation Content

First, to have a brief introduce of the home automation system that designed. The created Home Automation system by using HA Tablet (the photo can see as below).

In this project include four main systems, they are respectively light control system, videophone system, panic alarm and HVAC control system. The selected material areas below: HA & Videophone Server, 10 Port Switch, HA Tablet and other useful components.

Secondly, to grade the Home Automation, Videophone System and Fingerprint Reader System are added in this project, these are the component can protect the home safety and increase the multiple development on Home Automation.

Air-conditioning control system and lighting control system are the majority component system in home automation. It is because these two systems are easily to influence the environment or workplace. In addition, air-conditioning and lighting are the essential power for ordinary families. Each family may spend a lot of power on these two loads every day. So, with proper control and management, it can effectively reduce electricity, to save the energy. That's why the designer always put these two systems at home automation system.

Curtain control system is about to control the curtains open or close. There should be a control module inside the curtain to receive the signal and do the action from the HA Tablet.

Panic alarm system is a relatively rare system at home. Panic alarm is using to avoid the criminals happened. It just like a silence alarm to ensure user safety. In Hong Kong, perhaps only a few users would choose this system, because Hong Kong is a good public security city. It depends on the guardians' effort and the comprehensive security system.

Videophone call system is a communication system. It is different from the traditional phone call. They can see each other in video. The visitors can though the videophone to call the users. Because technology is more advanced, the conversation is not limited to sounds. The system can display their faces as images on the screen. This technology can improve the lifestyle.

Fingerprint system is a high protection security system. Everyone fingerprints are different, using this characteristic to build up this system to distinguish the identification. Besides, it can set the register' rights, allow to enter the access.

2.2 Home Automation Installation

Systems that use wireless communications can be implemented by connecting separate devices and integrations within a home or office to form a collaborative network. A combination of various technologies like Wi-Fi and Bluetooth are used to integrate the system. In this paper, the Zigbee network [4] is chosen for build the home automation installation. The structure of home automation that designed in this project will be extending detail.

Choosing Zigbee network because it has many advantage. First, it is very simple and easily to setup a network. It is simplicity to install and suitable for the new construction project. Secondly, it is easy to monitor and control home appliances from remote unit. Its input and output device module are applying with other home equipment. Then, it is easy to add/remote Zigbee end device to the network. That means there is a tight connection between Zigbee network and the home appliance. That's why Zigbee network has been chosen for this captioned project connection.

2.2.1 Drawing about System

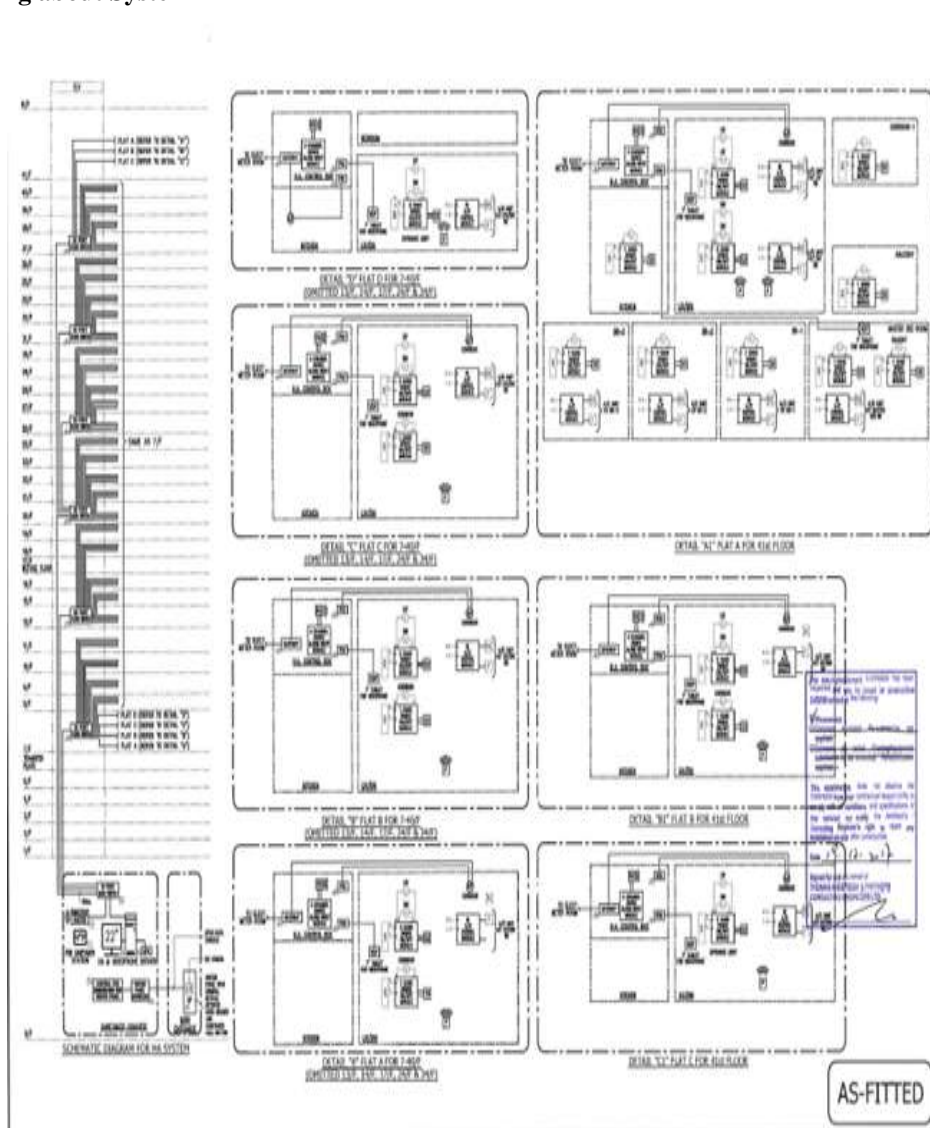


Figure 2.2.1 Schematic Diagram for Home Automation System

Here is the designed schematic diagram drawing. As shown above, the main HA system is held on caretaker counter. The 10-port main switch are connected with the HA & Videophone Server and a wireless router. And, it through the wire link to each floor. This is the major parts of Home Automation system.

Also, in kitchen area of the flat, there is a control box for HA System. This control box is the signal center of this system. It affords an important role in Home Automation system. It has an input/ output module in there. It will collect all the data, status and receive the large amount of data back to HA & Videophone Server. The caretaker can often check and monitor the status to confirm the home safety, and the home security.

2.2.2 Operation instruction for Home Automation

First of all, the function of the Home Automation is to control the home appliances in a portable device. There should be a HA Tablet to handle the system. This is the welcome page of the Home Automation system.



Figure 2.2.2 Welcome page

In the below figure can observe the home layout plan within the home appliances which can control. The location is distributed according to the field environment area.

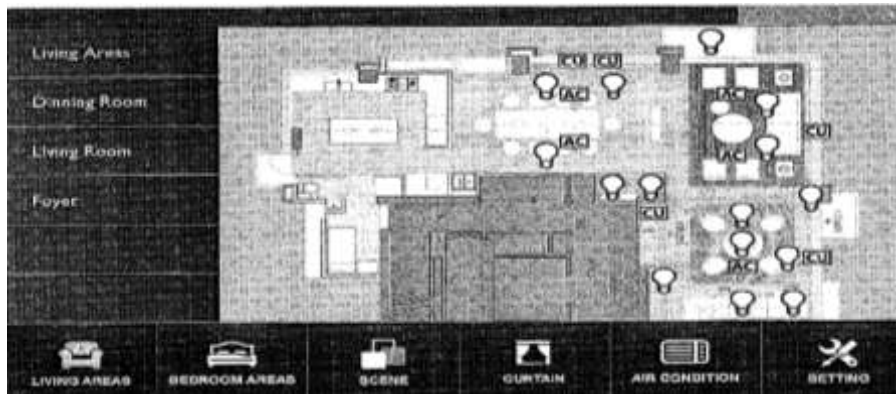


Figure 2.2.3 Home Layout with appliances

When login for the first time, find the setting page and click the 'connect' icon button to build up the connection for whole relevant appliances.

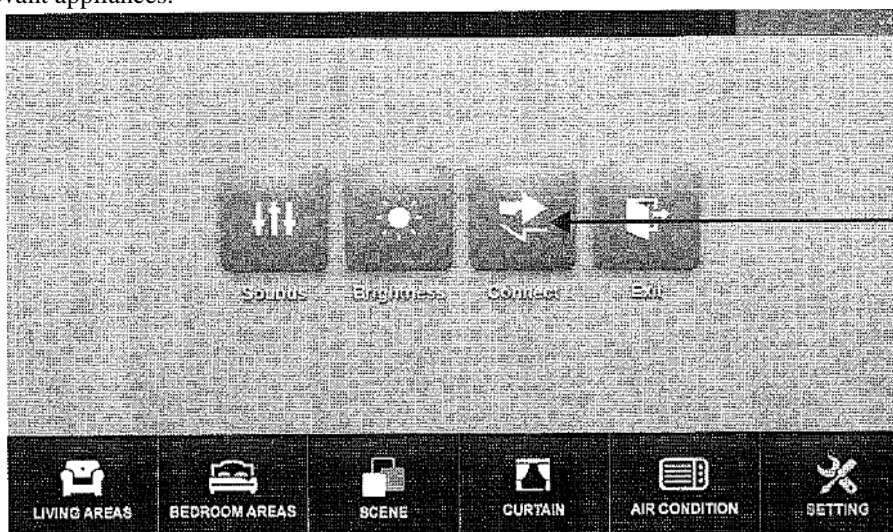


Figure 2.2.4 Setting page

After clicking into 'connect' button, the display will show whether connect the gateway.



Figure 2.2.5 Connecting Gateway

Afterwards, the system may be initializing. Wait a second for the loading moment. And then, press the light bulb icon to have a lighting control. The layout may show all the light bulb at house.



Figure 2.2.6 Light Control

The system may display the room name on the left-hand side. Select the room before choosing the light

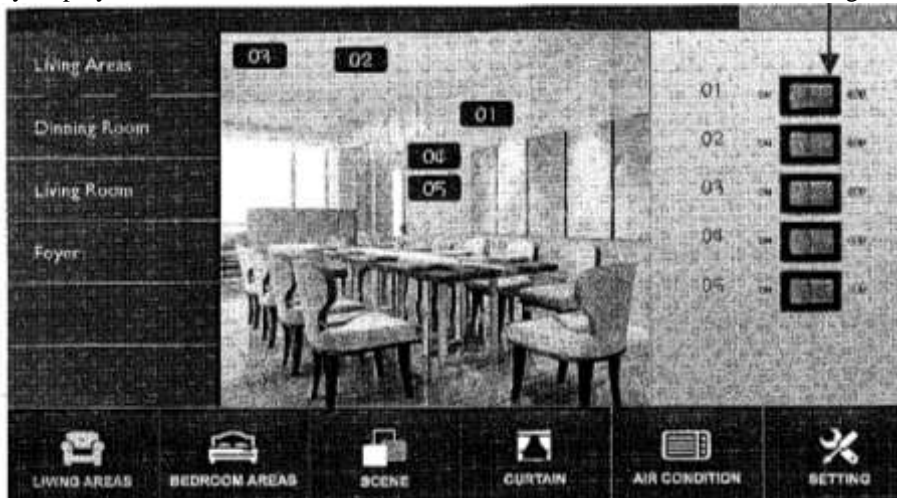


Figure 2.2.7 Light Control

Next, this is curtain control. Through the app can control the curtain open or close. Using the arrow key remotes the covering of the curtain.



Figure 2.2.8Curtain Control

On the other hands, this page is to control the air condition temperature. Turn up and down the temperature to tune an appropriate temperature. Moreover, it has an internal program too. It will autorun the dault temperature to keep the room in a stable ventilation.



Figure 2.2.9Air Condition Control

2.3.1 Field Equipment of the Home Automation System



Figure 2.3.1 Field Equipment

2.3.2 HA & Videophone Server



Figure 2.3.2 HA Tablet



Figure 2.3.3 Curtain



Figure 2.3.4 Lighting



Figure 2.3.5 Equipment Box for the home automation module

2.4 Operation

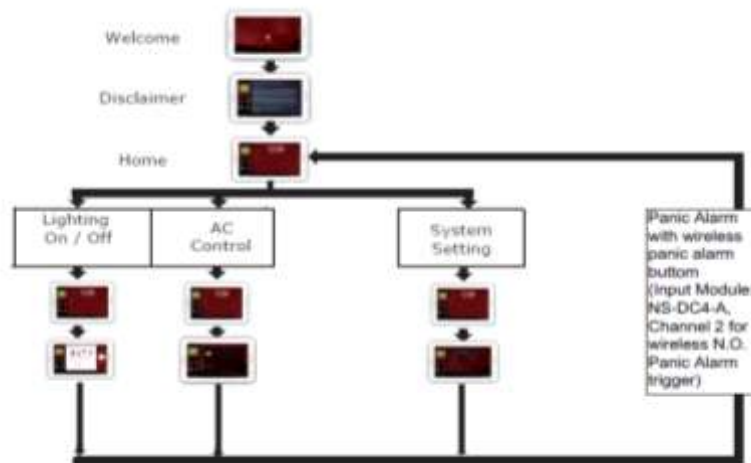


Figure 2.4 Operation cycle of Home Automation

Normally, the mode of operation is over here. When you first being in touch with the HA Tablet, you may see the welcome page. It is the front page of this system. After that, it is find the description of the disclaimer, which is the guideline of the user manual. After the loading, it will turn to the home page, which is platform that can control the home appliances. In this step, that means it can start the control randomly. In this figure we can see the system has prepared light controlling, air conditioning control and panic alarm. Each steps/signals may return to the HA Tablet. The user can check the status anytime they wanted. The above is Home Automation operation method.

2.4 Videophone System Installation

Videophone System is a novel technology. It is different from the traditional phone call communication. People can send and receive moving images so that users can see and hear each other. They can speak face to face. No longer limited to listen the sound, this can meet at anytime, anywhere.

2.5 Panic Alarm System

Panic alarm is an addition system to call the caretaker if any sudden accident in manual. This alarm is connected to the caretaker room via a silent alarm. This alert can be used to request help without others knowing it.

2.5.1 Operation Instruction

First, press the button the right bottom side (Panic Alarm).

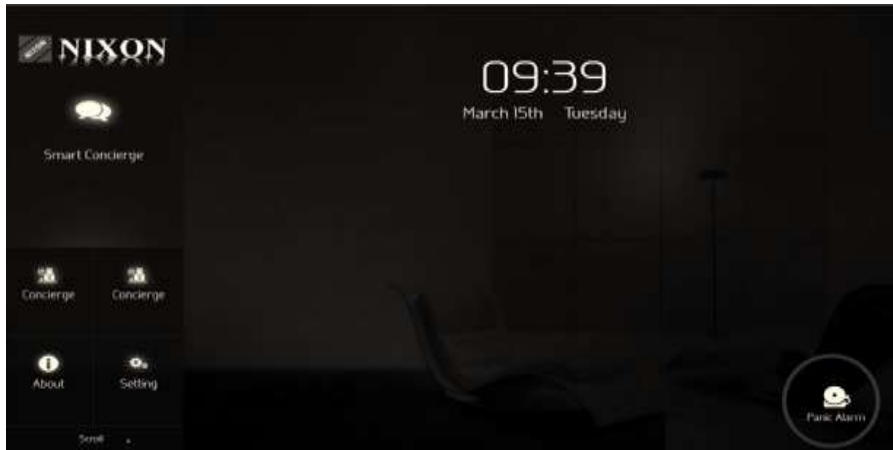


Figure 2.5.1 Panic alarm home page

Then, Press “Confirm” in order to send an alarm to caretaker counter. Otherwise, press “Cancel” and back to home page. Tenant can see the panic alarm by pressing “Alarm” in home page.



Figure 2.5.2 List of panic alarm call

On the other hands, caretaker can check the record for the panic alarm.

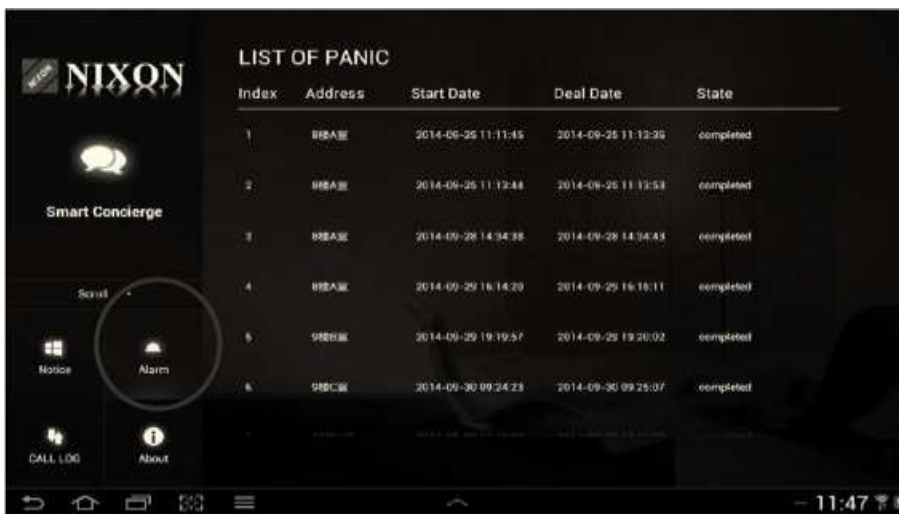


Figure 2.5.3 List of panic alarm call

2.6 Fingerprint Reader System Installation [5]

Fingerprint Reader System is a high security system. It may optically scan the fingerprint when the user touches the glowing window. People can pass it on to fingerprint software for biometric identification.

2.6.1 Operation Instruction

Fingerprint Reader divide with two parts. One is Master Fingerprint Reader, and other one is User Fingerprint Reader. The different between these two readers are Master is the critical part for Fingerprint. It is the high priority coverage & high-level rights for the security protection. Usually it will install on Security Room, Caretaker Room or other relevant important room.

The reader for user often protect for their own flat. Perhaps sometimes located in the lift.

2.6.1.1 Input Master Fingerprint Reader

This stage is talking about the fingerprint reader's function. First of all, there are two indicator light above the fingerprint scanner. One is red light represent 'standby' status and one is green light represent the 'passable' status. The picture that can see as below:

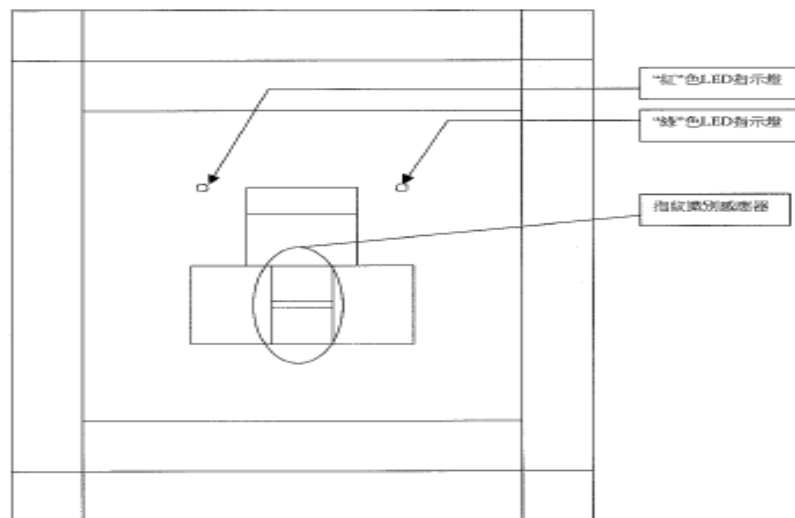


Figure 2.6.1.1 Fingerprint Reader

In this case, in order to register the user's rights, there should be input the master code first.

The first step, Power on the system, "Red" & "Green" indicator will flash around 15 seconds until "Red" indicator light up.

The second step is to make the "Master" code of the finger on the 'Fingerprint sensor' and pressed and moved in accordance with the direction of the arrow until the finger move out of the sensor.

If successful input, 'Red' indicator flashing light will turn off and change the "Green" color flashing light lit in several times. When the 'Green' color light flashing is reversed to complete the 'Red' color light, then successfully entered the "Master" code once.

After successfully entering the 'Master' code once, repeat the previous step until finish input the 'Master' code for three times.

Afterwards the three times setting, 'Green' color light will turn long lit up, it stands for 'Master' code is successfully to add into the fingerprint's database.

Thus, this can enter the 'User' code for abnormal operation.

2.6.1.2 Input User Fingerprint Reader

First Step is to enter the 'Master' code, 'Green' light will flash several times and converted to 'Red' light that has entered the programming status.

Second Step is when 'Red' light lit, add the 'User' code of the finger on the fingerprint sensor. At this moment, the 'Red' light will turn off and flashing the 'Green' light a few times. After reversal of 'Red' light, then it is successfully to enter 'User' code.

Third Step: If successful entering the 'User' fingerprint once, repeat the previous stage until finish inputting

'User' fingerprint for three times.

Afterwards the three times setting, "Green" light LED will lit and has been successfully added to "User" fingerprint.

2.6.1.3 Fingerprint Reader with lift panel

As spoken, sometimes this equipment will install in the lift, mainly is to recognize the resident's identity. Avoid some stranger to abuse, this set up can increase the awareness of security.

About the operation instruction, put the enrolled finger on the fingerprint reader first.

Secondly, finger gently pressed and move according to the direction of the arrow until move out of the sensor.

Thirdly, 'Green' light will flash, which means that the system can be used by a lift.

2.6.2 Field Equipment of the Fingerprint Reader System



Figure 2.6.2 Fingerprint reader finished product for house

III CONCLUSIONS

Since the length of the article limitation, we cannot record the whole project stuff on this manuscript. Based on surveyed study the comparison of home automation systems is presented. Microcontroller, user interface, a communication interface and their performance factor are compared. In this review explained different Home Automation system e.g. Bluetooth-based, mobile-based, SMS based, ZigBee-based.

Refer to the Ms. Pawar Pallavi Tatyasaheb, Mr. B.E. Shinde [6] said, Home Automation problems are high cost of ownership, inflexibility, different in achieving security.

First of all, it solves the high cost of ownership. Although set up a home automation need a large cost, however, for the long-term future, home automation can reduce the power load. In this case, the system can help to reduce 15% electricity. The electrical fee would be lower while more economical. The percentage of energy used will get lower per year. Besides, home automation does have the potential to consume more energy than they save, because they have sensors, control modules. It only just setting the program can let the home automation in energy saving mode.

Then, about the inflexibility, this designed home automation provided the light, air conditioner, curtain and panic alarm control for the home essential component. Also, there is a security system to protect the home safety. In this case, it should be a multiple function of the system.

Next, the different in achieving security, the fingerprint reader system is adding inside in this system. This system can improve the home security, and this will decrease the crime rate. This perhaps the benefit for installs the home automation system.

Finally, because there is a central server to monitor the whole system in security room & caretaker room, also it has a remote unit to check out the usage of the home devices for user. Properly control is managed by user. As a result, this can solve the poor management problem.

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Authors

Tony Tsang (MIEEE'2000) received the BEng degree in Electronics & Electrical Engineering with First Class Honours in U.K., in 1992. He studied the Master Degree in Computation from Oxford University (U.K.) in 1995. He received the Ph.D from the La Trobe University (Australia) in 2000. He was awarded the La Trobe University Post-graduation Scholarship in 1998. Prior to joining the Hong Kong Polytechnic University, Dr. Tsang earned several years of teaching and researching experience in the Department of Computer Science and Computer Engineering, La Trobe University. He works in Hong Kong Polytechnic University as Lecturer since 2001. He works in Hong Kong College of Technology in 2014. He has numerous publications (more than 110 articles) in international journals and conferences and is a technical reviewer for several international journals and conferences. His research interests include mobile computing, networking, protocol engineering and formal methods. Dr. Tsang is a member of the IET and the IEEE.



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