DEVELOPMENT OF SMART HOUSE MODEL TO CONTROL LIGHTING, TEMPERATURE, AND GAS LEAKAGE DETECTION SYSTEM

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Abstract - Smart houses one of Internet of things application. It is difficult to manage the energy loss due to inefficient control of electrical devices running inside the houses. Also fire due to gas leaking could cause a huge damage in the house. This paper is evaluating people awareness about smart houses in Kuala Lumpur and Sydney, and to propose a system to control light, temperature and to detect gas leaking. LabVIEW used to design lighting, temperature and gas leakage detection system. Arduino used to interface between software system and sensors and actuators of hardware system. The result showed that 88.7% and 90.2 % of people in Kuala Lumpur and Sydney respectively heard about smart houses, the offered system is able to control lighting and monitor house environment for humidity, temperature and gas leaking. In conclusion, the smart house model is potential to reduce the losses in the energy, and decrease the danger of fire disasters.

Keywords - Smart houses; LabVIEW; Arduino ONU, sensors.

I. INTRODUCTION

Internet of Things (IoT) is a significant topic in this era. This technology is embodied in a wide-ranging of networked products, systems, and sensors, electronics miniaturization, and network interconnections to offer new capabilities not previously possible. Currently, there are objects connected to the Internet than there are people in the world this gap will continue to grow. One of the most important application of IoT areas are smart houses [1]. The term "smart house" is usually used to describe a modern house which affords electronically controlled security and conveniences. Smart house technology is defined as the combination of house technology and services to improve quality of lifestyle [2]. It is not obvious how smart house technologies and applications will actually be accepted as part of our everyday lives. In recent years demands are focused on energy management and serving disabled and elderly people, as they need automated control of all the electrical aspects of their home, including light, temperature. Fire due to gas leaking could cause a huge damage in the houses compared to earlier notice of fire. Regular lights account for 30% of the energy consumption that a house has, but smart lights that are completely automated light greatly reduces the energy consumption [3]. This paper evaluate people awareness about smart house technology in Kuala Lumpur and Sydney, and to present smart house model that control light, temperature and to detect gas leaking, the three system are connected to the LabVIEW that control the main system.

House that having interconnected components is called smart house [4]. The components could be things to control inside the house, for example lights or heating. They could also be things to get information from, for example the current temperature inside the house, or if windows and doors are opened or closed. A Smart house uses these components to improve the quality of life for its users. However, a high tech-equipped house does not have to be a smart house distinguished smart homes from high tech-equipped residence by the network through which each of the technological components and information about them is connected and coordinated [5]. Richard Harper, who examined the field of smart technologies for private homes, wrote that the way a house was built or the environment friendly features it contains will not make it a smart house. But what makes it smart, is the interactive technologies that it contains which could help to realize. Facilities of smart house has been categorized into three categories, security, lifestyle support and energy consumption and management. Most of smart house projects that have been conducted can be categorized into one or more of these categorized with respect to the user needs [1].

II. MATERIALS AND METHODS

All the data regarding smart house awareness was collected during August-November 2016. 203 answers were collected from different age, of both gender, and of different education background. An online questionnaire was disturbed among people throughout E-mails and social media. There were 116 from Kuala Lumpur and 87 from Sydney. LabVIEW has been used as main controller, Arduino UNO used as microcontroller and android mobile application used to control the proposed systems, the system block diagram is shown in figure 1.

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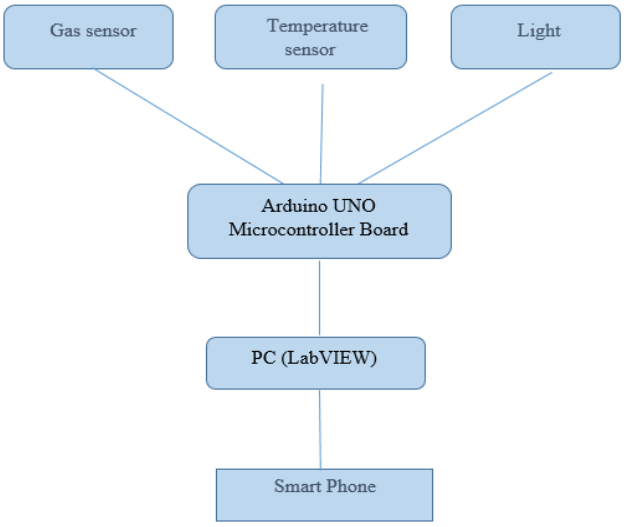


Fig. 1: System block diagram

Software

In the proposed designed LabVIEW which is a highly productive development environment system used to design and deploy measurement and control systems, Arduino software used to upload the code to the Arduino UNO, and Android Studio used to design the mobile application.

LabVIEW

LabVIEW design to be able to control light and to read all the value of Temperature, humidity and gas in the air from the sensor in house through A/B USB cable, this data will be manipulated and shown in front panel, then will be separated, so that each data sent to its designed code to be process then correspondingly giving output from the A/B USB cable. Collection of data and information that is coming from the Arduino. Figure 2 shows front panel of LabVIEW that reading humidity, temperature and gas in the air. Figure 3 shows the front panel of lighting system in LabVIEW.

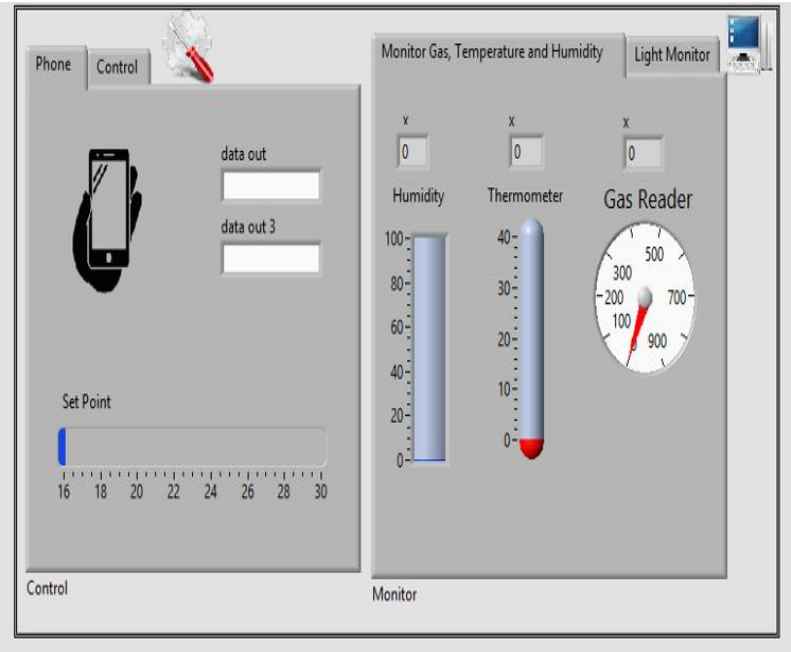


Fig. 2: LabVIEW front panel of Temperature and Gas System

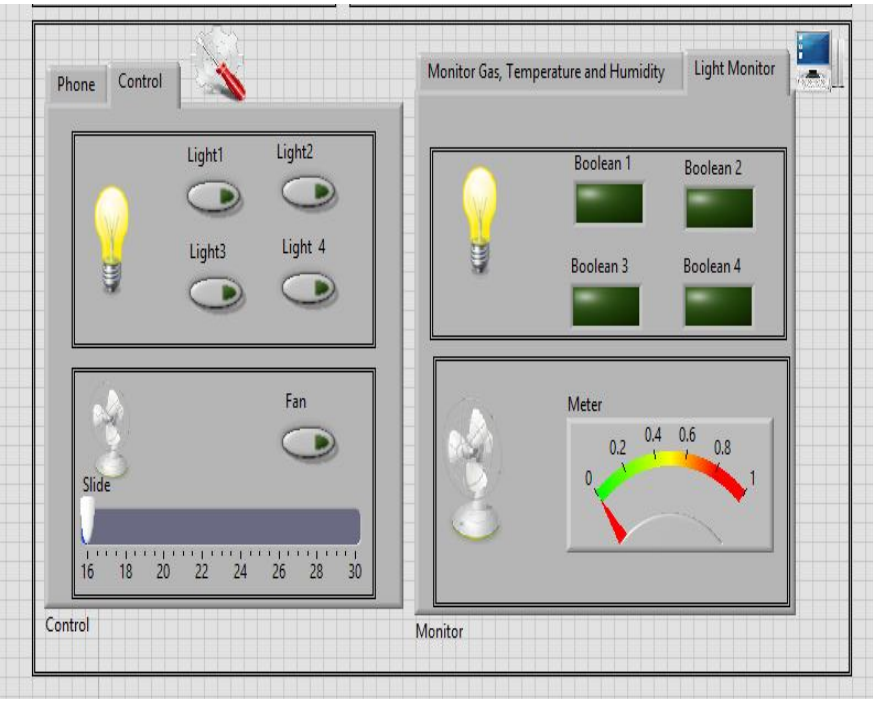


Fig. 3: LabVIEW front panel of lighting system

Arduino software and Android Studio

The open-source Arduino software makes it easy to write code and upload it to the Arduino board. The environment is written in Java and based on processing and other open-source software. This software can be used with any Arduino board [7]. And Android studio provides the fastest tools for building apps, it offers comprehensive functionality to perform many types of functions needed in one place, provides functionality for the development of a number of platforms that include Android, Java, C / C + + and web development [8].

Hardware

The smart house model hardware consisted of input sensors, DHT11 module humidity and temperature and MQ5 gas sensors, the signal that coming from the sensor it being converted to a suitable form of voltage or current that can be read using the Arduino UNO USB. The output of the Arduino is converted back to suitable level of voltage which is capable of turning on the fan, and LED.

RESULTS AND DISCUSSIONS

People awareness about smart houses

Most of participants were between the age of 18-30 years and 31-40 years, this reflects a good result of the young people who always interested with the new technology.

Table 1 shows that most of people in Kuala Lumpur and Sydney are familiar with smart houses. It also have been found that most of people is willing to adapt with the new technology with 92.2% and 94.9 % in Kuala Lumpur and Sydney respectively.

Have you ever heard about smart house?	Kuala Lumpur		Sydney	
	Frequently	Percent	Frequently	Percent
Yes	103	88.7%	79	90.2%
No	13	11.3%	8	9.8%
Total	116	100%	87	100%

Table 1: Knowledge about smart house

Smart house model and mobile application

The prototype of the proposed smart house model shown in figure 4. Table 2 indicates how sensors and actuators are connected to the Arduino UNO.

Sensors / actuators	Input / Output
Gas sensors (MQ5)	Analog input 1
Temperature and humidity (DHT11)	Digital Input 8
LED (Room 1)	Digital output 1
LED (Room 2)	Digital output 2
LED (Living room 1)	Digital output 3
LED (Living room)	Digital output 4
Fan	Digital output 5

Table 2: Arduino input and output

The proposed Android mobile application for the smart house model shown in figure 5, it can control

the lighting system for the home, the slider uses to get the desired temperature, and it gives alarm once there is a leaking in the gas. Home modem used to communicate between phone and labVIEW by using UDP.

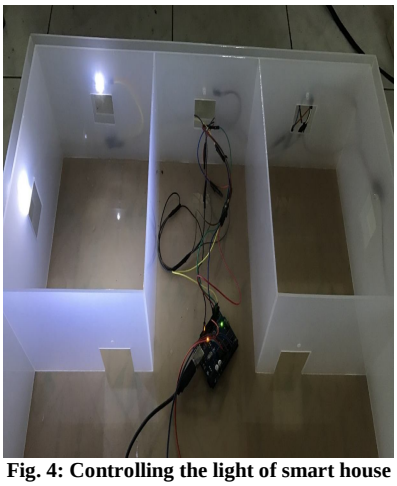


Fig. 4: Controlling the light of smart house



Fig. 5: Smart phone Application for smart house

Gas leakage detection system used MQ5, in the presence of clean air, the resistance across the heating coil in MQ5 does not vary, but when a gas is present, the resistance of the sensor drops, which results in a corresponding rise in output voltage, and this output voltage can be measured to indicate the concentration of any gas that is present, value appeared in the mobile application and LabVIEW. Temperature system used DHT11, sensor changed from the low-power-consumption mode by signal that sent from LabVIEW to the running-mode, waiting for Arduino completing the start signal. Once it is completed, DHT11 sends a response signal of 40-bit data that include the relative humidity and temperature information to Arduino. Once data is collected, DHT11 will change to the low power consumption mode until it receives a start signal from Arduino again. Figure 6 shows the reading of the humidity, temperature and gas that presence in the air. Fan is used to reduce the temperature level as shown in figure 7.

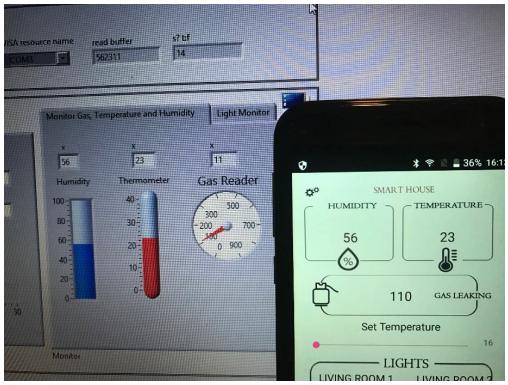


Fig. 6: Reading of humidity, temperature and gas

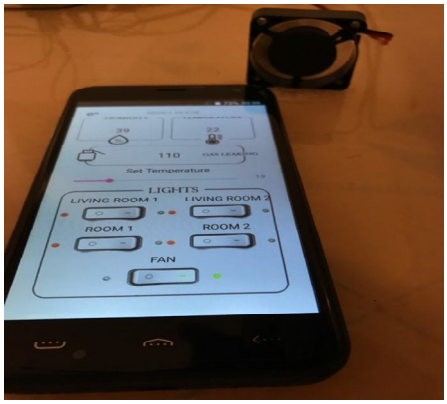


Fig. 7: Temperature system on

CONCLUSION

Smart house has become more familiar among people, in this paper smart house model that control lighting, temperature and have gas leakage detection system has been proposed. LabVIEW used as main controller. Arduino UNO was the microcontroller, sensor were connecting to the Arduino to read the data and transfer it to the LabVIEW. Android mobile application built to control lighting and temperature system, and it has alarm to warn in case of gas leaking.

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