Optical Wireless Home Automation System

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Abstract- Home Automation increases safety, time- saving and right resources utilization and deploys software engineering holistic view through achieving high quality and cost effectiveness. This article presents an Optical Wireless Home Automation System that allows the user to control home appliances by using Android application, mobile phones and optical hardware. The implementation of this project is achieved by using combination of Android platform, internet network and new technology for home Automation (optical hardware development). The results of the system are shown sequentially. The demonstration of the system is able to execute accurately and efficiently based on the real-time information. In nutshell, this project is feasible and suitable to further develop with the increasing needs on home automation system.

Keywords: android, network, mobile phone, optical, safety and wireless.

GJCST-C Classification : C.2.1 K.4.3

OPTICALWIRELESSHOMEAUTOMATIONSYSTEM

Strictly as per the compliance and regulations of:

Optical Wireless Home Automation System

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I. Introduction

Safety, assistance of disability, time saving, comfort, speed, prestige, right resources utilization and other deserts are achieved by using *Optical Wireless Home Automation System* (OWHAS). Through this research paper OWHAS is presented in detailed moreover importance and usability of OWHAS is shown.

Importance of Home Automation is discussed since 1898 by Tesla who invites remote control [1] then Tesla's idea is developed to be used in different fields; such as Home automation by Faris who originated modern home automation in Chicago and New York in 1934. In 1966 Jim Sutherland developed a home automation system called "ECHO IV" [2].

Recently, many systems had been developed by utilizing available facilities and technologies for Home Automation industry; such as:

1. Home Automation System (HAS) which is synthesized by Panth and Jivani for mobile phones having Android. HAS system uses an 8 bit Bluetooth interfaced microcomputer to control many home appliances [3].

2. Bluetooth Remote Home Automation System Using Android Application which is structured by Ramlee and his team to help an elderly and disabled in home; they implement wireless Bluetooth technology for providing remote access from mobile phone or laptop [4].

3. Singh, Pal and Ria developed a GSM Based Home Automation, Safety and Security System Using Android Mobile Phone; their system controls home appliances by using combination of five parts: mobile device as controller, mobile device as receiver, microcontroller as signal detector, relay model to connect with home appliances and sensors. All complicated five parts are integrated to control home appliances [5].

4. Yuan and his Colleagues designs family security system platform which including indoor monitoring platform, android mobile phone monitoring and web server monitoring. The system can monitor the real-time security situation in the house and the system has the ability to view real-time data, the historical data can be recalled at any time for system and user to determine if any warning happened [6].

OWHAS is combination of three parts; firstly, Andriod platform on mobile phone secondly internet network to connect two mobile phones one as controller with the user and second phone as receiver at home thirdly

OWHAS controls home appliances, based on user instructions, by using new uncoupled and maintainable technology; optical hardware.

OWHAS framework will be explained in next section, then results of real OWHAS prototype will be illustrated and discussed in section three, finally, OWHAS will be concluded with researchers future work.

II. Owhas Framework

The Architecture of OWHAS as illustrated in Fig.1, OWHAS based on two mobile devices; controller with user and receiver at home. The controller device sends commands based on Android program through internet to the receiver device that processes the command by another Android program and converts it to light signal that detected by optical hardware to control triggered home appliance; therefore, OWHAS based on three subsystems:

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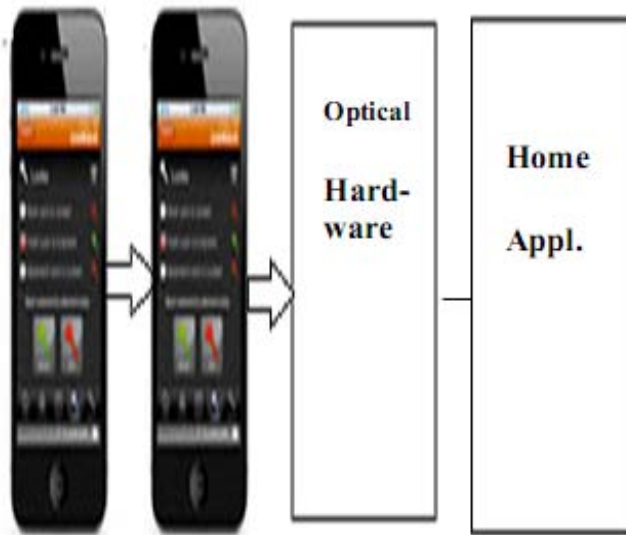*malksasbeh@gmail.com, ahmad.k.saidan@gmail.com*

Fig.1 : Owhas framework consists of transmitter mobile, receiver mobile and optical hardware

a) Android mobile platform

The Controller of OWHAS is programmed on an Android platform. The choosing of Android platform is based on the portability and mobility of Android; which is installed in many mobile phones. Also programs of Android are written based on Java programming languages so they do not have high complexity. In Addition, Android are compatible with many communication networks (Wireless, Bluetooth, internet, GSM and others) [7]. These reasons support and structure the suitability of Android Platform as a controller of OWHAS.

OWHAS controller consists of: firstly, Transmitter mobile, that is used by a remote user, has Android program which presents a user interface screen as shown in Fig. 2 a.

As illustrated on "Remote user interface screen"; there is a list of home appliances in the right side and a list of "Turn on" buttons. In addition, when specified appliance is turned on by remote user the "Turn on" button is disabled on the "Remote user interface screen", then the "Turn on" button is enabled when a user refresh the "Remote user interface " screen.

The second part of OWHAS controller is a receiver mobile; which has Android program that presents a black, white screen with white part, where the photo sensor of that specified appliance is connected on the optical hardware, as shown in Fig. 2 b; which will be explained in optical hardware part.
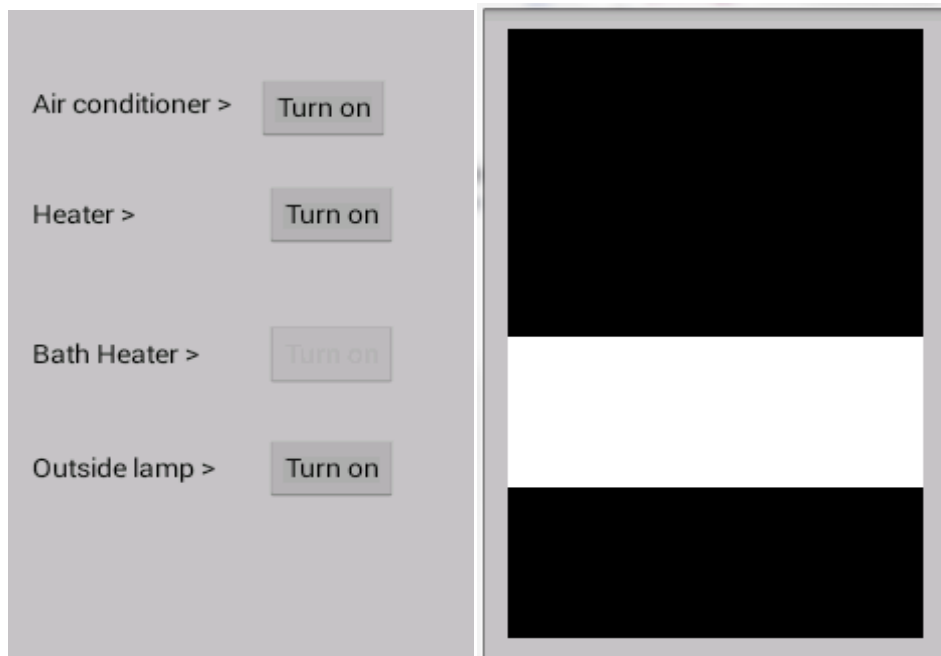

Fig.2 : a. "Remote user interface" screen (transmitter), b. "Light interface" screen (receiver)

b) Internet network

The transmitter mobile and receiver mobile is connected by internet network. Internet connection is preferred for availability, distance flexibility, efficiency and usability for different purposes [8].

Fundamentally, Internet connection is available in almost mobile phones, and no need for new hardware or software to be installed in mobile phone to access internet, moreover Internet network cancels the distance between transmitter and receiver and it also produces wireless advantage for different applications. Likewise, the user may use internet for other technologies besides this technology (OWHAS).

c) Optical Hardware

The receiver mobile is not connected directly to home appliances to remove the coupling problems and

to increase system maintainability and usability. This facility can be achieved by using new technology for n\Home Automation industry; optical hardware as trigger for controlled appliances. Fig. 3 shows a prototype of optical hardware [9].
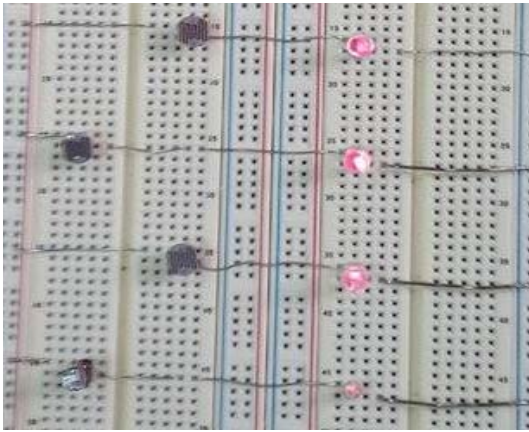

Fig. 3 : Prototype of optical hardware

Optical hardware consists of ordinary photo sensor; which detects light and become as short circuit. Therefore, the photo sensor triggers specific home appliance. Moreover, as prototyping, each controlled home appliance is represented by Light Emitting Diode (LED) as illustrated in Fig. 3.

The interaction between these three parts will be discussed and explained in next section.

III. OWHAS IMPLEMENTATION

OWHAS Sub-models that are presented in section II are integrated to construct executable OWHAS. Procedural steps of utilizing OWHAS are illustrated as prototype on Fig. 4.
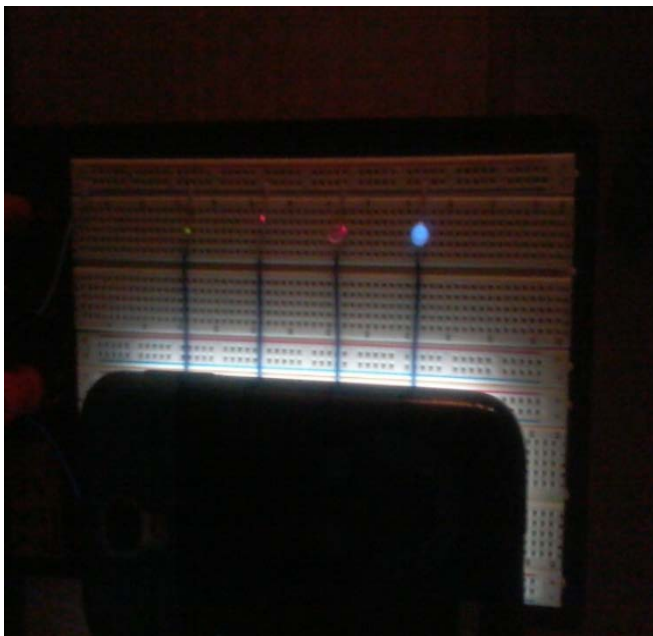

Fig.4: Implementation of OWHAS

OWHAS user turns on any of controlled home appliances by pressing the "turn on" button on the "Remote user interface screen"; that illustrated on Fig.2 then a specified message will be sent to receiver mobile through Internet network, this message converts part of black screen to white part on the receiver mobile. The generated light of white part screen will be detected by photo sensor to trigger the specified home appliance; which is represented by a Light Emitting Diode (LED).

IV. CONCLUSION AND FUTURE WORK

In conclusion, The clarification of Optical Wireless Home Appliances System has been presented. This system controls home appliances from any place that has Global System for Mobile (GSM) coverage and the maintainability of adding or removing as much appliances as customer expect is very simple.

OWHAS prototype, as shown in Fig. 4, is only for demonstration and testing but for future work OWHAS will be developed to reach high user expectations by converting prototype as shown in Fig. 3 to printed board, using colored screen for Receiver mobile instead of black-white screen so the ordinary photo sensors will be replaced by colored photo sensors to allow user to control home appliances' numbers and adopting any practical suggestion of customers.

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