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ADVANCED DYNAMIC REMOTE CONTROL USING SMART PHONE

J PRAMEELA

Assistant Professor, Department of Electronics and Communication Engineering, Siddhartha Institute of Technology and Sciences, Narapally, Hyderabad, Telangana, India

ABSTRACT

The smart phone is one of the representative field of Internet of Things (IoT).In recent years, the rapid development of IoT makes the intelligent home system. The intelligent home system creates the more comfortable, safer and intelligent living environment. With numerous connected devices and appliances increase, numerous buttons (sometimes dozens) are designed on the remote controller in home spaces even if several of them are seldom used. A user may be confused with the remote controller even if he or she only intends to perform a simple operation. This confusion also leads to a higher probability of mal-operations. In addition, conventional methods of communication between remote controllers and connected devices, such as eXtensible Markup Language (XML) messages, are usually bandwidth-consumptive. To address these problems, an intelligent universal remote control system for home appliances named Point-n-Press is proposed. Point-n-Press addresses the directionality feature, which enables easy and intuitive control by pointing to the target device to display the target's control interface on the screen of the android remote controller. By leveraging the state dependencies of home device/appliance operations, only functional buttons that are relevant to the current context are utilized.

1. INTRODUCTION

Internet Of Things(IOT) is a technology that connects all things and the Internet in smart spaces. By implementation of intelligence with sensing devices, IOT has been widely applied to different fields, such as smart homes. The need for comfort and a convenient life are especially important in smart homes[5]. The

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home automation is one of the essential and critical component for the IoT-based smart home technology[2][4]. Home automation systems are used to control home devices in smart home and provide automatic remote control inside or outside. And the remote control provides convenience and ease of use, some major problems require consideration and improvement.

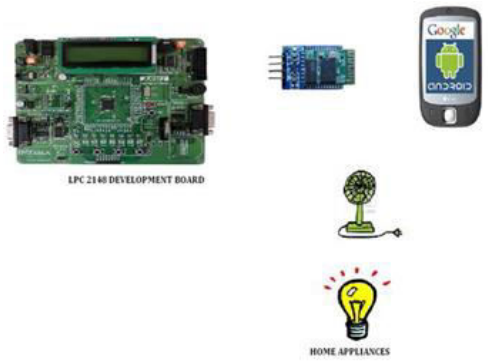

Fig 1.1 Home appliances control using mobile

Fig 1.2 Remote controls for different home appliances

The goal of this project is to develop an intelligent universal remote control system for home applications and it automatically detects the device when a user points the controller at it[1]. A user interface for controlling this device is immediately displayed on the screen of the controller. UI‟s , which enables users to simply enable and control the target device among the among the complex functionality of home devices in a shared space for IoT based smart homes. The FSM is used to model all operational status of a device and dependencies among these states. Multiple bit-string formatted control codes, which represent the control operations, are also applied in the proposed scheme to decrease the bandwidth consumption.

2. RELATED WORK

Currently, the majority of devices and appliances in smart homes are equipped with a remote controller, which includes a number of buttons and wireless transceivers. This setup provides higher operational complexity around the space with numerous devices or appliances. Thus, the idea of the universal remote controller (URC)[9] is introduced to integrate

multiple functions of home devices or appliances into one single remote controller. Nevertheless, various functions and buttons of a URC results in more complicated operations, the problems of in tuition and user-friendliness remain. Numerous solutions are proposed to develop URCs with a liquid crystal display(LCD) screen, networking capability, and several techniques. Typical techniques for these types of URCs include universal plug and play(UPnP) and universal remote console specification of the alternate interface access protocol (AIAP-URC).2 Built in with these techniques, the device or appliance can be automatically detected via a network, and a UI is dynamically generated from descriptions and properties of the device or appliance. Because these techniques facilitate control setting and increase the ease of control, intuition and user-friendliness can be improved. Although the UPnP technique discovers devices. Around a specific space, multiple instances of the same type of devices or appliances are frequently located in this specific area, e.g., lights/lamps. Therefore, these lights/lamps are displayed on the screen of the controller; the mapping and correspondence between the device's UI and the actual device may confuse users. The kind of control systems is not sufficiently intuitive and user-friendly to users. Several efforts thus have been made to achieve intuitive control. For instance, an intuitive and user-friendly telehealth service for the and long-term patients has been discussed in previous studies. Although a user-friendly and zero configuration design is utilized in this service, both the directionality of infrared (IR) and the state dependencies of the device operations have not been considered. In addition, a brain machine interface system is proposed to achieve automation for solving the problem of mental fatigue. Although user preferences and error perception feedback are considered, the machine is too expensive for implementation in smart homes, and the state dependencies of the device operations is not monitored or considered. Furthermore, the directionality of IR has been considered in previous studies. The control system requires a specific and

customized remote controller with a special striped pattern. Nevertheless, the usage of this system is limited to televisions. Recently, some interaction approaches are proposed to control appliances in smart homes, including the use of voice commands and figure gestures. Nevertheless, the voice control may not work well when the environment is noisy. Additionally, with gesture sensing techniques, users may have to guess or learn the control gestures of the appliances that are probably not natural and intuitive. Besides, an interactive television with a beyond-screen interface is introduced provide intuitive interactions for controlling TVs. The system focuses on interacting with TVs and does not consider the directionality of IR and the state dependencies of the device operations. All icons for the control features, which are displayed on the screen of the controller, may confuse users. Many problems regarding intelligent and user-friendly UIs have been proposed in numerous fields. For instance, a three-dimensional view interface is introduced in a previous study .With the 3-Duser-friendly interface, users can easily control the target device. However, the features of the directionality of the IR characteristic and the state dependencies of the device operations are not considered. Similar to previous studies, an easy-to-control interface is presented with interface for customer electronic devices, in which a predefined menu needs to be prepared and the UIs need to be arranged prior to set up of the control system. Thus, the control system lacks flexibility. On the other hand, with unnecessary, non functional, and even useless functions or buttons appear on the screen of the controller, a higher probability of incorrect operations may be generated when controlling appliances. Hence, the state dependencies of the device operations are introduced so that in active buttons (that are unrelated to the current state) are not displayed. For example, when an air conditioner is powered off, the only necessary (or functional) but to n is the “Power-on” button. When the air conditioner operates in dehumidification mode, the buttons “Temperature Set” and “Air Volume” are inactive.

3. PROPOSED SYSTEM

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This work presents an intelligent universal remote control systems for home appliances. A smart phone equipped with infrared (IR) capabilities is easier to realize functions of PPRC. Otherwise some IR USB dongles that can provide support for android operation systems. And several open source universal plug and play (UPnP) libraries are useful to help us to reduce the development time. Finally, for implementation of the PPCB, the design of the small and narrow hole is trick for the IR mechanism. The comprehensive system architecture and its primary components as shown below.

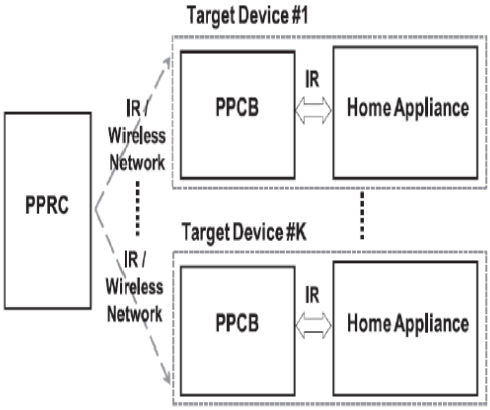

Fig3.1 architecture of the proposed system

3.1PROPOSED SYSTEM ARCHITECTURE

The system architecture consists of two parts:1)the Point-n-Press remote controller(PPRC) and 2) a number of target devices, which embed in the Point-n-Press Control Box(PPCB) for interfacing with the PPRC, as shown in Fig 3.2 and Fig 3.3 .The detail block diagram of the PPCB is as shown in Fig 3.2.

3.2 BLOCK DIAGRAM

Remote Controller:

Fig. 3.1 : Block diagram of Remote Control

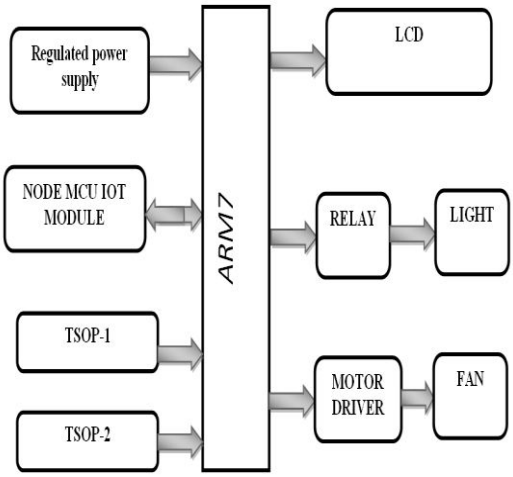

Fig. 3.2 : Block diagram of Control box

The block diagram of "Smart and Dynamic Remote control using Smart phone" as shown in above, it consists of

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1. NODEMCU IoT Module
2. Relay
3. IR transmitter
4. IR receiver
5. Motor Driver
6. ARM7
7. Regulated Power supply

3.3 SYSTEM IMPLEMENTATION

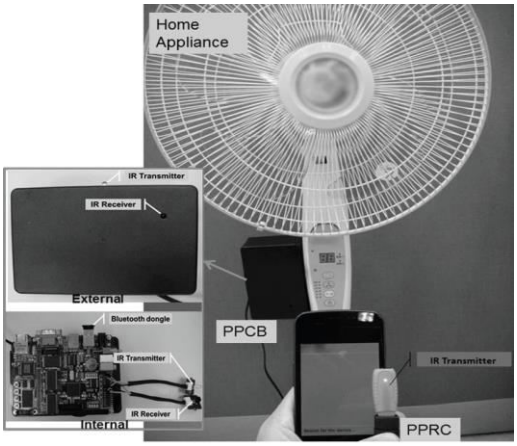

Fig.3.3 Search for appliances (not yet pointing to the PPCB of the fan and nothing is displayed on the screen).

Fig.3.4 Pointing to the PPCB of the fan (at this point, the state of the fan is powered off).

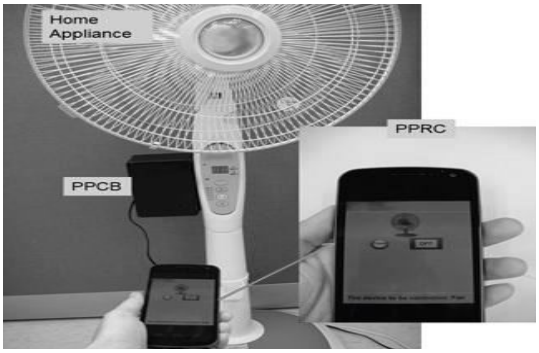

Fig.3.5 Pointing to the PPCB of the fan and pressing the "Power" button (the state of the fan is powered on in normal mode and a moderate wind speed).

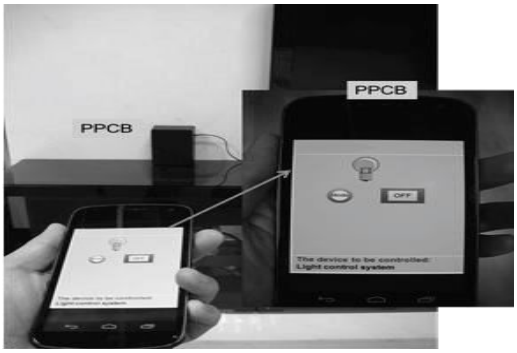

Fig.3.6 Pointing to the PPCB of the lighting control system (at this point, the states of all lights are powered off).

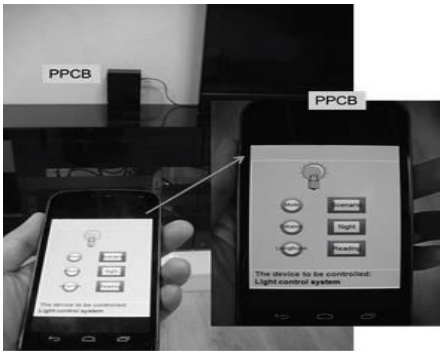

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Fig.3.7 Pointing to the PPCB of the lighting control system and pressing the "Mode" button (at this point, the state of the lighting control system is powered on in scenario control mode with no single lighting control available).

Fig.3.8 Pointing to the PPCB of the lighting control system and pressing the "Mode" button again.

3.4 GENERAL WORKING

IR Transmitter is continuously transmitting signal when given power supply. When this signal is received by receiver at any control box the control unit at that control box is activated and the Node MCU microcontroller is activated and sent the signal to relay based the signals that we are transmitting from the mobile using some external application. Based on the commands we sent to the control box through the the wifi and hotspot connection between mobile and microcontroller at the control box. NODE MCU is used as microcontroller for controlling the operations of WI-FI

IR RECEIVER is used to receive signals from remote control and send to microcontroller.

WI-FI is used to receive commands from remote control and to perform operations using microcontroller.

RELAY and MOTOR DRIVER are used as switch to regulate the target device.

4. SOFTWARE REQUIREMENT

In this project the implementation is done by using different software's like:

- Keil µVision IDE
  - Editor
  - Compiler
  - Debugger
  - Converter
- Proteus
  - Schematic design
  - Simulation
  - Layout design
- Flash magic
  -Used for dumping purpose
- Arduino IDE

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-Used for Node mcu code development

5. RESULT

The proposed system was fully developed and tested to demonstrate its feasibility and effectiveness. The proposed system is more user friendly than existing system. And it also gives greater performance. The screenshots of the smart home app developed has been presented in Figure bellow.

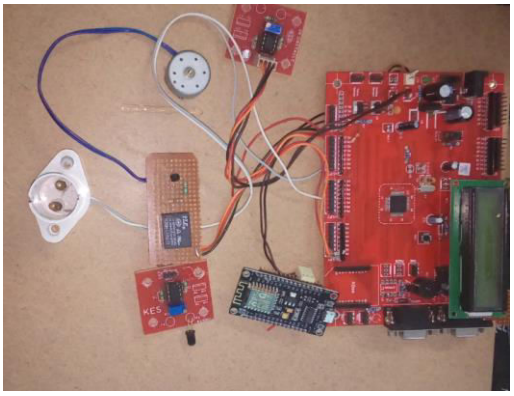

Fig5.1 Screenshot of Proposed system

6. CONCLUSION AND FUTURE SCOPE

An intuitive control system with a set of user-friendly operations, called Point-n-Press, is proposed for controlling connected devices/appliances in IOT-based smart homes. The proposed scheme leverages the directionality characteristic of IR to enable easy and intuitive control of devices (i.e., controlling an appliance in smart homes by pointing to it). A user-friendly UI is designed by considering the state dependence between each control operation. This design disables buttons that are irrelevant to the current context to prevent users from performing mal-operations. With the demonstration of two real prototypes with controlling appliances in smart homes, the feasibility of an intelligent universal remote control system for home appliances with intuitive and user-friendly features is verified. In the designs of the FSM and bit-string formatted control codes, the communication between remote controllers and appliances requires less bandwidth consumption. Consequently, the proposed Point-n-Press control system not only enhances the features of intuition and user-friendliness but also establishes a less bandwidth-consumptive control system. Nevertheless, the implementation of the proposed control system is currently limited to IR sensors. Moreover state

dependencies of devices/appliances must be manually identified.

Further the system will implemented to monitoring the sensitive parameters through IoT, along with control of the devices.

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