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Using Android Mobile as a Universal Remote Control

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Abstract— All common household devices are infrared compatible and have separate remote to control them. With the advancement of the society and smart home, the demand of home appliances are increasing resulting in the increase in remote controls for them. This paper proposes an approach to completely remove the remote and use our android mobile with infrared port facility to control the home appliances. This paper gives the design of infrared remote control system for decoding all the Infrared Remote Control Protocols (IRCP) and uses the decoded codes to control home appliances using android mobile.

Keywords*— Infrared Remote Control Protocol, Decoding, Serial IR Transceiver, Home Appliances Remote Control*

I. INTRODUCTION

The infrared remote control has the performance of the high signal to noise ratio, strong anti-interference, reliable transmission of information, and untouchable, low power and cost, therefore it is widely used in home appliances more or less, even as the highlight on sale. In addition to utilizing in home appliances, it has been brought into the industrial control, the aerospace, the security and so on. But the formats of infrared remote control protocol used are different between the different companies' production, the consequence from this is that an infrared remote control device must be fit for the home appliances. Because of that, the paper presents a system for decoding based on the infrared coding format in now infrared remote control devices [1], which can replace the existing infrared remote control devices and control more home appliances remotely. The decoded codes are written in a file called as a config file. This config file is unique in the sense that it is different for different manufacturer as well as different products from the same manufacturer.

II. IRCP

IR remotes operate by modulating an infra red (IR) light source. When the IR light source is "on" it is actually turning itself on and off thousands of times per second, too fast for the human eye to follow. The rate at which this occurs is called the carrier frequency. This is done to provide a better transmission system and allow the overall IR system (transmitter and receiver) to operate in noisy (with respect to light) environments. It is important to understand that the IR receiver for a given remote is tuned to IR "carrier" frequency for that remote and will effectively not see IR signals sent on a different carrier frequency such as from other remotes. The human eye can never see an infrared transmission, so the concept of on and off is not with regards to visible light. Some equipment has a "telltale", a little red light that visibly flashes when the equipment receives IR signals. That is what we can see.

The "information" is placed on the "carrier" using several different techniques. The most common technique is Pulse Width Modulation. In Pulse Width Modulation the duration of the ON (carrier present, light flashing thousands of times per second), or off (no light at all coming out of the IR emitter) periods is made to vary. We first need to simplify the problem so that we don't have deal with too many "Pulse widths". We can easily do this by representing the number in base 2, or binary. Therefore we only need to have two distinct "pulse widths".

Each manufacture decides the length of bit patterns he wishes to send to his equipment, and the meaning given to that number (or numbers) when they are received. The environment through which the IR signals are passing (the air) is noisy in a light sense. Bright sunlight, Fluorescent lights, all contributes to the noise. Some manufacturers add additional "redundant" information such as sending the numbers twice to ensure that they get to the equipment correctly. Infrared Codes uses two modulation techniques: Pulse Width Modulation and Phase Modulation.

III. DESIGN

In order to control the home appliances one has to send the same Infrared code that is being sent through the remote. Our approach is to decode these codes and save them in a config file. Once the config file is prepared, this can be saved in the mobile's SDRAM memory and can be internally called through the connection manager when the device is to be controlled.

A. Decoding Infrared Waves

In order to decode the IR codes of household devices we used an Universal Remote Control, URC22B-15 or one can use remotes of the device he is having. The Infrared codes are decoded with the help of Iguana's Serial IR Transceiver which is connected to the PC serial port and Linux Infrared Remote Control(LIRC) software and are saved in a config file in .txt format. Figure 1(a) and 1(b) shows the Iguana's Serial IR transceiver device connected to serial port and the snapshot of the method to decode the infrared code respectively.

Figure 1(a): Iguana's Serial IR Transceiver

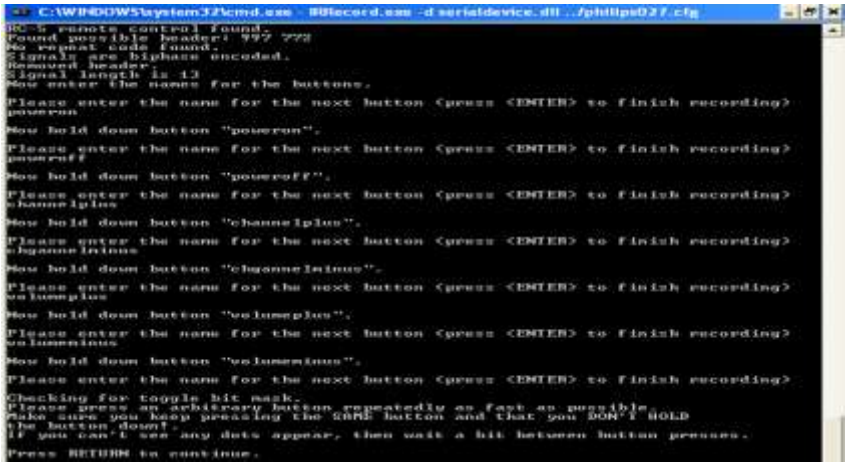

Figure 1(b): Philips RC5 decoding using LIRC

From figure 1(b), we can see that one can select any number of buttons he wishes to control. In Figure 1(b) the we have decoded the codes for power on/off, volume plus-minus and channel plus-minus.

One can purchase an Iguana's Serial IR transceiver from Iguana's website or can make his own Serial IR Transceiver with the help of schematic shown in figure 1©.

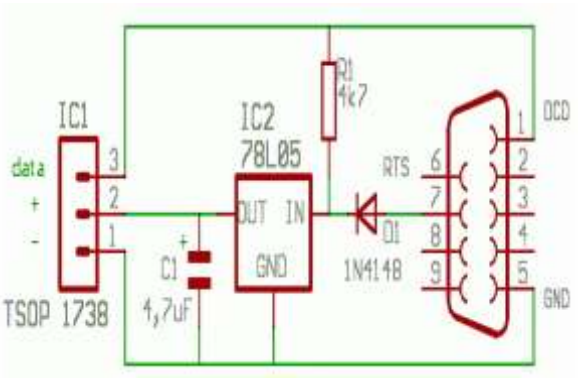

Figure 1©: Schematic Diagram of Iguana Serial IR Transceiver

B. Turning Mobile into Remote and Controlling Appliances

Once the Infrared codes are decoded for all the devices that are there in a specific home and config files are prepared. These config files can be stored in a SDRAM memory (memory card) of your android mobile. With the help of config files a complete Universal Remote Control (URC) Library can be implemented in an Android Mobile. The complete block diagram of the system is given below in Figure 2.

Android mobile touch screen feature can be used to control the home appliances. Software is written in Java using Eclipse IDE. Android application is developed to communicate with the LIRC module and send the IR codes through the Infrared port of the mobile to control the appliances.

Figure 2: Android Emulator Screen to control TV, VCD and AC

Figure 2 shows the screen of the android emulator with three tabs for TV, AC and VCD respectively with different options of control for each of them like tab TV has the options to turn ON/OFF, volume UP/DOWN, channel UP/DOWN and AC has the options to turn ON/OFF, temperature UP/DOWN.

IV. BLOCK DIAGRAM OF THE SYSTEM

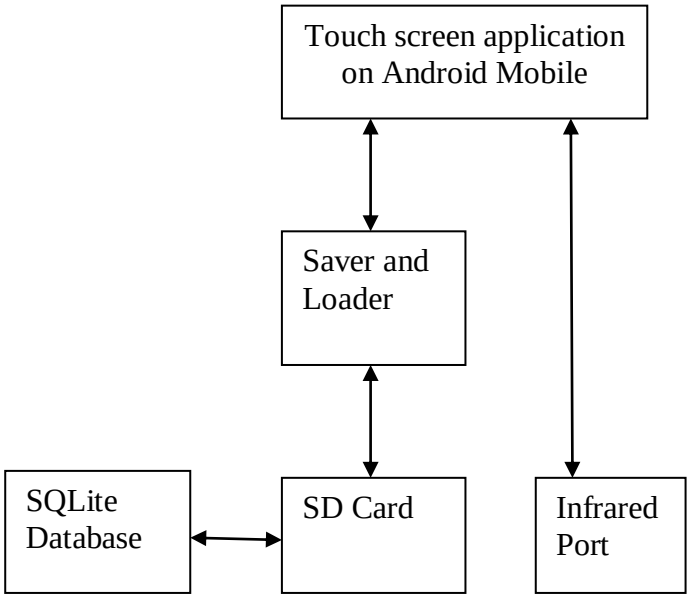

Figure 3: Block Diagram of the system

The application is developed to control the appliances using mobile through infrared port. The application will interact with the config files stored in the SDRAM for various appliances using Saver and Loader module. Once a particular button in android is pressed the corresponding device is turned ON if it is in Line of Sight. This system is tested with the help of Iguana's Serial IR Transceiver and Android SDK (Software Development Kit).

V. CONCLUSION

With the help of LIRC you can decode any infrared remote control codes and any Android phone can be converted into a remote control with the help of this paper so totally removing the need of remote controls. The only limitation with this approach is that the android phone should have a infrared port with it.

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