Bluetooth Remote Home Automation System using Android Application

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Abstract: This system is designed to assist and provide support in order to fulfill the needs of elderly and disabled in home. Automation of the surrounding environment of a modern human being allows increasing his work efficiency and comfort. There has been a significant development in the area of an individual’s routine tasks and those can be automated. In the present times, we can find most of the people clinging to their mobile phones and smart devices throughout the day. Hence with the help of his companion – a mobile phone, some daily household tasks can be accomplished by personifying the use of the mobile phone. Analyzing the current smart phone market, novice mobile users are opting for Android based phones. It has become a second name for a mobile phone in layman terms. Home Automation System (HAS) has been designed for mobile phones having Android platform to automate an 8 bit Bluetooth interfaced micro-controller which controls a number of home appliances like lights, fans, bulbs and many more using on/off relay. This paper presents the automated approach of controlling the devices in a household that could ease the tasks of using the traditional method of the switch. The most famous and efficient technology for short range wireless communication - Bluetooth is used here to automate the system. The HAS system for Android users is a step towards the ease of the tasks by controlling one to twenty four different appliances in any home environment.

Keywords: Home automation, Smart home, home appliances, Bluetooth, Android

I. INTRODUCTION

With the continuous growth of mobile devices in its popularity and functionality the demand for advanced ubiquitous mobile applications in people’s daily lives is continuously increasing. Utilizing web services is the most open and interoperable way of providing remote service access or enabling applications to communicate with each other. An attractive market for home automation and networking is represented by busy families and individuals with physical limitations. A lot of research has been going on for more than a decade now in order to increase the power efficiency at the consumer level of the power management systems. Smart Home is the term commonly used to define a residence that integrates technology and services through home networking to enhance power efficiency and improve the quality of living. Smart house is not a new term for science society but is still far more away from people’s vision and audition. This is because although recent various works has been done in designing the general overview of the possible remote access approaches for controlling devices or in cases simulating the smart house itself and designing the main server the design and implementation of an off-the-shelf smart house remote control application has been limited to simply the computer applications and just in cases mobile and web applications development.

![Block diagram of Smart Home Automation System using Android Application.](image-url)

Fig1. Block diagram of Smart Home Automation System using Android Application.

The "smart house" technology is one realization of home automation ideals using a specific set of technologies. It's a house that has highly advanced automatic systems for lighting, temperature control, security, appliances, and many other functions. Coded signals are sent through the home's wiring to switches and outlets that are programmed to operate appliances and electronic devices in every part of the house. Smart home appears "intelligent" because its computer systems can monitor many aspects of daily living. Smart house can also provide a remote interface to home appliances or the automation system itself, via telephone line, wireless transmission or the internet and android application, to
provide control and monitoring via a smart phone or web browser. It consists of Power supply unit, Bluetooth, LCD, Relay and etc... When we operate the loads on App in the mobile that information will be passed to the microcontroller via Bluetooth module and appropriate load will be activated by using Relay. Smart home appliance is an interface between the remote control with its mobile or remote control and a home reliever. For each device, in order to accomplish this interface design process was taken using the micro controller and arduino for controlling some application in the home manually by using a remote control and automatically through different sensors. Each system application will be discussed. The block diagram of complete SHS is shown in figure-1. We use a different types of micro controllers which are (PIC30f4013-PIC 16f627APIC12f652- PIC18f, arduino), secondary connectivity between remote or smut phone and micro controller is established through (RF wireless and Bluetooth) modules. The two previous modules can be connected either to micro controller or arduino. A specific android application has been designed such that different home electronic devices can be controlled using a smart phone remotely.

III. RELATED STUDY

A. ARM7 Family

ARM7 family includes the ARM7TDMI, ARM7TDMI-S, ARM720T, and ARM7EJ-S processors. The ARM7TDMI core is the industry’s most widely used 32-bit embedded RISC microprocessor solution. Optimized for cost and power-sensitive applications, the ARM7TDMI solution provides the low power consumption, small size, and high performance needed in portable, embedded applications. The ARM7TDMI-S core is the synthesizable version of the ARM7TDMI core, available in both VERILOG and VHDL, ready for compilation into processes supported by in-house or commercially available synthesis libraries. The ARM720T hard macro cell contains the ARM7TDMI core, 8kB unified cache, and a Memory Management Unit (MMU) that allows the use of protected execution spaces and virtual memory. This macro cell is compatible with leading operating systems including Windows CE, Linux, palm OS, and SYMBIAN OS.

B. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers; they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

Fig 2. Relay.

IV. HARDWARE RESOURCES

A. LPC2148 Microcontroller

LPC2148 microcontroller board based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontrollers with embedded high-speed flash memory ranging from 32 KB to 512 KB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30% with minimal performance penalty. The meaning of LPC is Low Power Low Cost microcontroller. This is 32 bit microcontroller manufactured by Philips semiconductors (NXP). Due to their tiny size and low power consumption, LPC2148 is ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale.

B. Power supply circuit

The main building block of any electronic system is the power supply to provide required power for their operation. For the microcontroller keyboard, LCD, GSM, +5V are required & for driving buzzer +12V is required. The power supply provides regulated output of +5V & non-regulated output of +12V. The hardware part consists of the components and the sensors used in the system. This part mainly collects the status of the sensors and stores it into the micro controller’s EEPROM.

C. LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred...
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over seven segments and other multi segment LEDs. The reasons being: CDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix

D. L293D Driver

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction.

1. Features
   - Wide Supply-Voltage Range: 4.5 V to 36 V
   - Output Current 1 A Per Channel (600 mA for L293D)
   - Peak Output Current 2 A Per Channel (1.2 A for L293D)

V. SOFTWARE IMPLEMENTATION

For the software implementation, we deploy two software packages. First one is the Keil µVision 4.0. Second one is the Flash magic simulator. The Keil µVision Debugger accurately simulates on-chip peripherals (PC, CAN, UART, SPI, Interrupts, I/O Ports, A/D Converter, D/A Converter, and PWM Modules) of ARM7 device. Simulation helps to understand hardware configurations and avoids time wasted on setup problems. With simulation, we can write and test applications before target hardware is available. The system program written in embedded C using KEIL IDE software will be stored in Microcontroller. Keil development tools for the Microcontroller Architecture support every level of software developer from the professional applications engineer to the student for learning about embedded software development.

The industry-standard Keil C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Single-board Computers, and Emulators support all ARM7 derivatives. The Keil Development Tools are designed to solve the complex problems facing embedded software developers. Flash magic is used to dump the code to microcontroller from PC. Flash Magic is a free, powerful, feature-rich Windows application that allows easy programming of Philips FLASH Microcontrollers. Build custom applications for Philips Microcontrollers on the Flash Magic platform! Use it to create custom end-user firmware programming applications, or generate an in-house production line programming tool. The Flash Memory In-System Programmer is a tool that runs under Windows 95/98/NT4/2K. It allows in-circuit programming of FLASH memories via a serial RS232 link. Computer side software called Flash Magic is executed that accepts the Intel HEX format file generated from compiler Keil to be sent to target microcontroller. It detects the hardware connected to the serial port.

VI. CONCLUSION

In this paper, an internet based smart home system that can be controlled remotely upon user authentication is proposed and implemented. The Android based smart home app communicates with the chip peripherals (I²C, CAN, UART, SPI, Interrupts, I/O Ports, A/D Converter, D/A Converter, and PWM Modules) of ARM7 device. New names, and

VII. FUTURE SCOPE

Advanced objectives such as secure delegation (O6) and policy-based access control (O7) require a secure user interface to handle security-sensitive user input. Particularly, token delegation relies on a password-based authentication of the delegated user U against the car owner O before the delegated token is issued. Without a secure user interface, the password can be intercepted by malware and redirected to a malicious device that can impersonate U and receive the delegated token TU. A Further, context-aware access control requires the car owner O to define access control policies during the delegation process. When entered via an untrusted user interface, the access policy can be manipulated by a malware without consent of the car owner.

VIII. REFERENCE