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Remote Controlled Home Automation Using Android application via Wi-Fi Connectivity

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***Abstract*— In recent years, the home environment has seen a rapid introduction of network enabled digital technology. This technology offers new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation. Mobile devices are ideal in providing a user interface in a home automation system, due to their portability and their wide range of capabilities. They can communicate with a home automation network through an Internet gateway, but cannot directly communicate with devices in the network, as these devices usually implement low power communication protocols, such as ZigBee, WiFi etc. In this project we aims at controlling Home appliances via Android device using Wifi as communication protocol and 8051 via DTMF and also provide security against intrusion when the home host is not at home. We create a user friendly interface for the android device that allows the user to communicate with the Micro. The server will be interfaced with relay circuit board that controls the appliances such as lights and fans running in Home. The communication with server allows the user to select the appropriate device. The server communicates with the corresponding relay. By this we offers a scalable and cost effective Home automation system.**

***Keywords*—Wi-Fi, Android, Microcontroller, Relays, ucFlash+.**

I. INTRODUCTION

The home automation refers to domestic environment that improves the quality of the resident's life by facilitating a flexible, comfortable, healthy, and safe environment. Internet based home automation systems become the most popular home automation system in international markets [1] . The remote controlling and monitoring of a house using internet requires computer, which is large in size and heavy to carry around. The most available home automation systems use different wireless communication standard to exchange data and signaling between their components, like Bluetooth, Zigbee, Wi-Fi, and finally the Global System for Mobile Communication (GSM) . Wireless based home automation systems decrease installation cost and effort, and enhance system flexibility and scalability [2] .

In Home automation systems there are collections of interconnected devices for controlling various functions within a house[3] . Mobile devices are ideal in providing a user interface in a home automation system, due to their portability and their wide range of capabilities[4] . Within the house, the user might not want to go to a central control panel, or not even to the laptop, but use the phone that is usually placed in closer proximity to the user. When far from the house, the user might want to check its current status or even schedule actions for his return[5] .

In concept of android based home automation system we can provide end users with simple secure and easily configurable home automation system[6] .Also the concept can overcome the barriers facing home automation systems and will enable a home technology ecosystem that allows people to easily adopt the subset of home automation technology that appeals to their household[7] . Home Automation is becoming an inevitable thing in our fast developing environment and current life style[8] . New trends in lifestyle have enhanced the installation of automated home appliances in many places[9] .

II. RELATED WORK

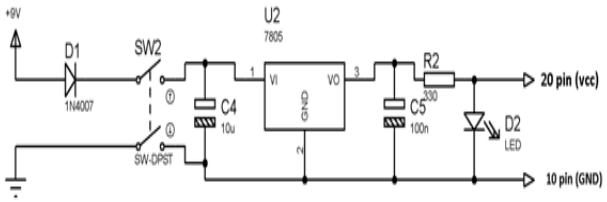
Earlier, we looked into the face of future when we talked about automated devices, which could do anything on instigation of a controller, but today it has become a reality.
a) An automated device can replace good amount of human working force, moreover humans are more prone to errors and in intensive conditions the probability of error increases whereas,
an automated device can work with diligence, versatility and with almost zero error. Replacing human operators in tasks that involve hard physical or monotonous work[10] .
Replacing humans in tasks done in dangerous environments (i.e. fire, space, volcanoes, nuclear facilities, underwater, etc) Performing tasks that are beyond human capabilities of size, weight, speed, endurance, etc.

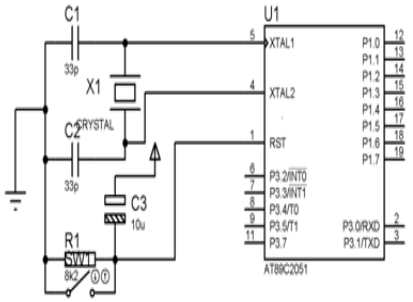
Features:
- 8051
- One android mobile user side and another at Rx side
- router by students and android mobile also by students
- 4 devices control through android app
- 8 devices options in android phone just for decoration.

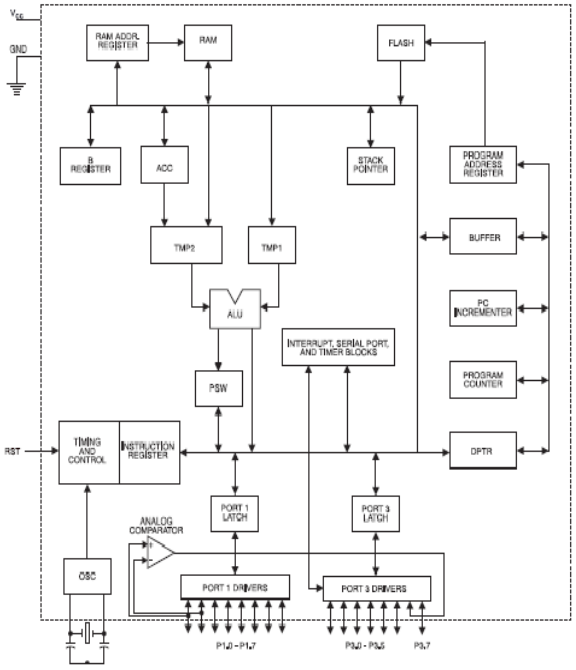
III. PROPOSED SYSTEM

The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2K bytes of Flash programmable and erasable read-only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C2051 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89C2051 provides the following standard features: 2K bytes of Flash, 128 bytes of RAM, 15 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, a precision analog comparator, on-chip oscillator and clock circuitry. In addition, the AT89C2051 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The power-down mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset.







Port 1: The Port 1 is an 8-bit bi-directional I/O port. Port pins P1.2 to P1.7 provide internal pull-ups. P1.0 and P1.1 require external pull-ups. P1.0 and P1.1 also serve as the positive input (AIN0) and the negative input (AIN1), respectively, of the on-chip precision analog comparator. The Port 1 output buffers can sink 20mA and can drive LED displays directly. When 1s are written to Port 1 pins, they can be used as inputs. When pins P1.2 to P1.7 are used as inputs and are externally pulled low, they will source current (IIL) because of the internal pull-ups. Port 1 also receives code data during Flash programming and verification.

Port 3: Port 3 pins P3.0 to P3.5, P3.7 are seven bi-directional I/O pins with internal pull-ups. P3.6 is hard-wired as an input to the output of the on-chip comparator and is not accessible as a general-purpose I/O pin. The Port 3 output buffers can sink 20mA. When 1s are written to Port 3 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (IIL) because of the pull-ups. Port 3 also serves the functions of various special features of the AT89C2051 as listed below:
Port 3 also receives some control signals for Flash programming and verification.

RST: Reset input. All I/O pins are reset to 1s as soon as RST goes high. Holding the RST pin high for two machine cycles while the oscillator is running resets the device. Each machine cycle takes 12 oscillator or clock cycles.

XTAL1: Input to the inverting oscillator amplifier and input to the internal clock operating circuit.
XTAL2: Output from the inverting oscillator amplifier.

Oscillator Characteristics:
The XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier which can be configured for use as an on-chip oscillator, as shown in Figure below. Either a quartz crystal or ceramic resonator may be used. To drive the device from an external clock source, XTAL2 should be left unconnected while XTAL1 is driven as shown in Figure. There are no requirements on the duty cycle of the external clock signal, since the input to the internal clocking circuitry is through a divide-by-two flip-flop, but minimum and maximum voltage high and low time specifications must be observed.

IV. WORKING

The operation of DTMF method are as follows:

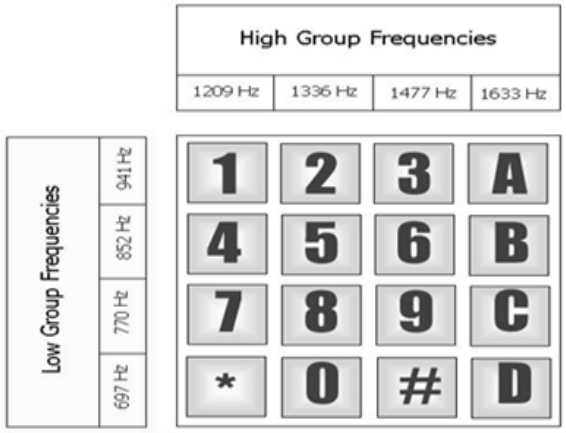
Caller generates a dial tone consisting of two frequencies. It is transmitted via the telephone line (communication media). Telephone exchange consists of a DTMF decoder, which decodes the frequencies in to digital code. These codes are the address of destination subscriber; it is read and processed by a computer which connects caller to the destination subscriber.

A. Working of DTMF decoder circuit

DTMF keypads are employed in almost all landline and mobile handsets. Thus this technology is used in the telephone switching centers to identify the number dialed by the caller. The decoder distinguishes the DTMF tones and produces the binary sequence equivalent to key pressed in a DTMF (Dual Tone Multi Frequency) keypad. The circuit uses M-8870 DTMF decoder IC which decodes tone generated by the keypad of cell phone. DTMF signals can be tapped directly from the microphone pin of cell phone device. Cut the microphone wire and you will get two wires red and green. The red wire is the DTMF input to the circuit. The signals from the microphone wire are processed by the DTMF decoder IC which generates an equivalent binary sequence as a parallel output like Q1, Q2, Q3, and Q4.

B. Working of MT8870 DTMF DECODER

DTMF is stands as dual-tone multi-frequency, used for telecommunication signaling; signaling is based on encoding keypad digits using two sinusoidal of different frequencies. It encodes and decodes the key strokes in a telephone and it can perform an essential data transfer operation. Each digit is represented by low and high frequencies, is shown in figure below.



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CONCLUSION

This project proposes a low cost, secure, ubiquitously accessible, auto-configurable, remotely controlled solution. The approach discussed in the project is novel and has achieved the target to control home appliances remotely using the WiFi technology to connects system parts, satisfying user needs and requirements. WiFi technology capable solution has proved to be controlled remotely, provide home security and is cost-effective as compared to the previously existing systems. Hence we can conclude that the required goals and objectives of home automation system have been achieved.

The system design and architecture were discussed, and prototype presents the basic level of home appliance control and remote monitoring has been implemented. Finally, the proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.

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