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# Android Wi-Fi based Home Automation system

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***Abstract*: An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result.The project Android Wi-Fi based Home Automation system using PIC16F877A Microcontroller is an exclusive project that can control the devices according to the instructions given by android phone using Wi-Fi wireless technology.**

***Key Words:* Wireless sensor networks (WSN),WIFI, and PIC16F877A.**

## I. INTRODUCTION

The project aims at designing an advanced home automation system using Wi-Fi technology. The devices can be switched ON/OFF using text commands in android phone.

Wi-Fi (Short for Wireless Fidelity) is a wireless technology that uses radio frequency to transmit data through the air. Wi-Fi has initial speeds of 1mbps to 2mbps. Wi-Fi transmits data in the frequency band of 2.4 GHz. It implements the concept of frequency division multiplexing technology. Range of Wi-Fi technology is 40-300 feet.The controlling device for the automation in the project is a PIC16F877A board. The data sent from Android phone over Wi-Fi will be received by Wi-Fi module connected to PIC16F877A board. PIC16F877A board reads the data and decides the switching action of electrical devices connected to it through Relay switches. Also user gets status of each device on the android application. The PIC16F877A board is programmed used embedded 'C' language.This project is included to display the status of backend device.

**Features:**

1. Wi-Fi based user-friendly interfacing.
2. Usage of android phone's Wi-Fi
3. Low power consumption.
4. Controls high and low voltage devices.
5. Long life.

## II. PROPOSED WORK

Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. These had greater importance than any other technologies due to its user-friendly nature. These can be used as a replacement of the existing switches in home which produces sparks and also results in fire accidents in few situations. Considering the advantages of Wi-Fi an advanced automation system was developed to control the appliances in the house.

**BlockDiagram:**

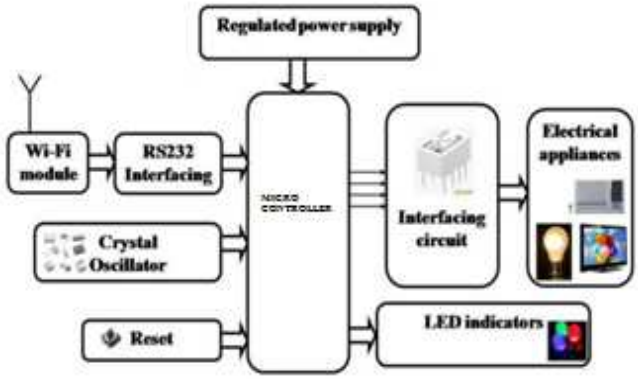


Fig1: Block Diagram of Project.

**Monitoring Section:**

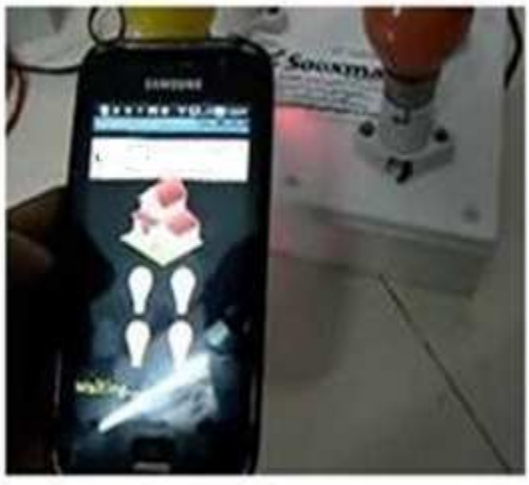

Fig2: Monitoring Section.

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**2.1 Description and working of Wi- Fi module:**

There are three most important items which makes Wi-Fi working in your laptop or desktop. These are:

- Radio Signals
- Wi-Fi Card which fits in your laptop or computer.
- Hotspots which create Wi-Fi Network.

**2.1.1Radio Signals:**

Radio Signals are the keys which make WiFi networking possible. These radio signals transmitted from Wi-Fi antennas are picked up by WiFi receivers such as computers and cell phones that are equipped with WiFi cards. Whenever a computer receives any of the signals within the range of a WiFi network which is usually 300 - 500 feet for antennas, the WiFi card will read the signals and thus create an internet connection between the user and the network without the use of a cord.

Access points which consist of antennas and routers are the main source which transmit and receive radio waves. Antennas work stronger and have a longer radio transmission with a radius of 300-500 feet which are used in public areas while the weaker yet effective router is more suitable for homes with a radio transmission of 100-150 feet.

**2.1.2 Wi-Fi Cards:**

You can think WiFi card as being an invisible cord that connects your computer to the antenna for a direct connection to the internet.WiFi cards can be external or internal, meaning that if a WiFi card is not installed in your computer, you may purchase a USB antenna attachment and have it externally connect to your USB port, or have an antenna-equipped expansion card installed directly to the computer. For laptops, this card will be a PCMCIA card in which you insert to the PCMCIA slot on the laptop.

**2.1.3 Wi-Fi Hotspots:**

A Wi-Fi hotspot is created by installing an access point to an internet connection. The access point transmits a wireless signal over a short distance typically covering around 300 feet. When a Wi-Fi .enabled device, such as a Pocket PC, encounters a hotspot, the device can then connect to that network wirelessly.Most hotspots are located in places that are readily accessible to the public, like airports, coffee shops, hotels, book stores and campus environments. 802.11b is the most common specification for hotspots worldwide. The 802.11g standard is backwards compatible with .11b but .11a uses a different frequency range and requires separate hardware such as an a, a/g, or a/b/g adapter. The largest public Wi-Fi networks are provided by private internet service providers (ISPs) that charge a fee for users to connect to the internet.

Hotspots are increasingly developing around the world. In fact, T-mobile USA controls more than 4,100 hotspots located in public locations such as Starbucks, Borders, Kinko.s, and the airline clubs of Delta, United, and US Airways. Even select McDonald.s restaurants now feature Wi-Fi hotspot access.Any notebook computer with integrated wireless, a wireless adapter attached to the motherboard by the manufacturer, or a wireless adapter such as a PCMCIA card can access a wireless network. Furthermore, all Pocket PCs or Palm units with Compact Flash, SD I/O support, or built-in Wi-Fi, can access hotspots.

Some Hotspots require WEP key to connect that is the connection is considered to be private or secure. As for open connections, anyone with a WiFi card can gain access to that hotspot. So in order for a user to gain access to the internet under WEP, the user must input the WEP key code.

**2.2 PROJECT DESCRIPTION**

In this chapter, schematic diagram and interfacing of PIC16F877A microcontrollers with each module is considered**.**

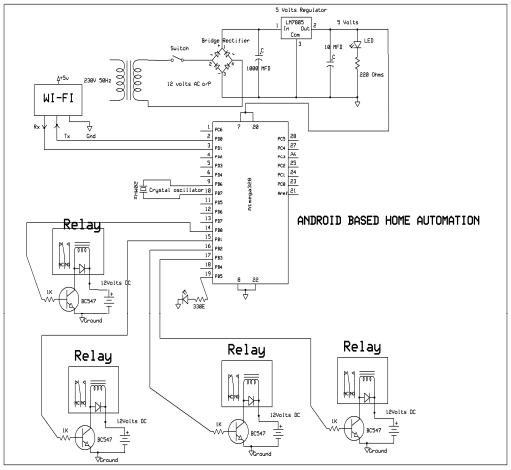


Fig 3: schematic diagram of Android and Wi-Fi automation system

**2.3 Embedded Processor:**

**PIC** is a family of Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1640 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "**Programmable Interface Controller**", but shortly thereafter was renamed "**Programmable Intelligent Computer**".

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PICs are popular with developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability.

Microchip recently announced the shipment of its six billionth PIC processor.

**2.3.1 Core Architecture:**

The PIC architecture is distinctively minimalist. It is characterized by the following features:

- separate code and data spaces (Harvard architecture)
- a small number of fixed length instructions
- most instructions are single cycle execution (4 clock cycles), with single delay cycles upon branches and skips
- a single accumulator (W), the use of which (as source operand) is implied (ie is not encoded in the opcode)
- All RAM locations function as registers as both source and/or destination of math and other functions.
- a hardware stack for storing return addresses
- a fairly small amount of addressable data space (typically 256 bytes), extended through banking
- data space mapped CPU, port, and peripheral registers
- the program counter is also mapped into the data space and writable (this is used to implement indirect jumps)

Unlike most other CPUs, there is no distinction between "memory" and "register" space because the RAM serves the job of both memory and registers, and the RAM is usually just referred to as the register file or simply as the registers.

**2.3.2 Baseline Core Devices:**

These devices feature a 12-bit wide code memory, a 32-byte register file, and a tiny two level deep call stack. They are represented by PIC10 series, as well as some PIC12 and PIC16 devices. Baseline devices are available in 6-pin to 40-pin packages.

Generally the first 7 to 9 bytes of the register file are special-purpose registers, and the remaining bytes are general purpose RAM. If banked RAM is implemented, the bank number is selected by the high 3 bits of the FSR. This affects register numbers 16–31; registers 0–15 are global and not affected by the bank select bits.

The ROM address space is 512 words (12 bits each), which may be extended to 2048 words by banking. CALL and GOTO instructions specify the low 9 bits of the new code location; additional high-order bits are taken from the status register. Note that a CALL instruction only includes 8 bits of address, and may only specify addresses in the first half of each 512-word page.

The instruction set is as follows. Register numbers are referred to as "f", while constants are referred to as "k". Bit numbers (0–7) are selected by "b". The "d" bit selects the destination: 0 indicates W, while 1 indicates the result is written back to source register f.

**2.3.3 History:**

The original PIC was built to be used with General Instruments' new 16-bit CPU, the CP1600. While generally a good CPU, the CP1600 had poor I/O performance, and the 8-bit PIC was developed in 1975 to improve performance of the overall system by offloading I/O tasks from the CPU. The PIC used simple microcode stored in ROM to perform its tasks, and although the term wasn't used at the time, it shares some common features with RISC designs.

In 1985 General Instruments spun off their microelectronics division, and the new ownership cancelled almost everything which by this time was mostly out-of-date. The PIC, however, was upgraded with internal EPROM to produce a programmable channel controller, and today a huge variety of PICs are available with various on-board peripherals (serial communication modules, UARTs, motor control kernels, etc.) and program memory from 256 words to 64k words and more (a "word" is one assembly language instruction, varying from 12, 14 or 16 bits depending on the specific PIC micro family).

Microchip Technology does not use PIC as an acronym in fact the brand name is PICmicro. It is generally regarded that PIC stands for Peripheral Interface Controller, although General Instruments' original acronym for the initial PIC1640 and PIC1650 devices was "Programmable Interface Controller". The acronym was quickly replaced with "Programmable Intelligent Computer".

Fig4: Various older (EPROM) PIC microcontrollers

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The Microchip 16C84 (PIC16x84), introduced in 1993was the first CPU with on-board EEPROM memory. This electrically-erasable memory made it cost less than CPUs that required quartz "erase window" for erasing EPROM.

## III. EXPERIMENTAL RESULTS

**PIC COMPILING:**

**Step 1** sets the project type.

From MPLAB X IDE, choose *File>New Project....* In the window that opens (as shownin Figure 4), select the "Microchip Embedded" category, and a "Standalone Project"from the Projects field.

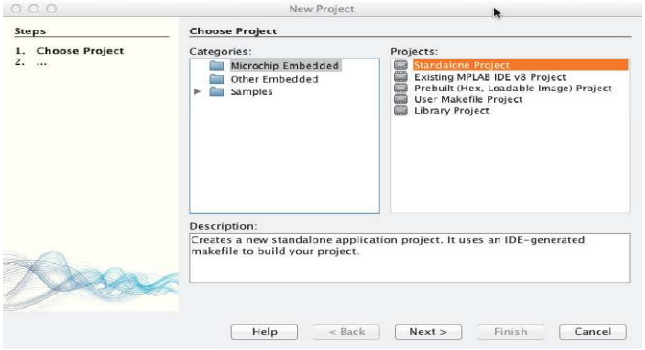


Figure 5: New Project Window

**Step 2** selects the target device.

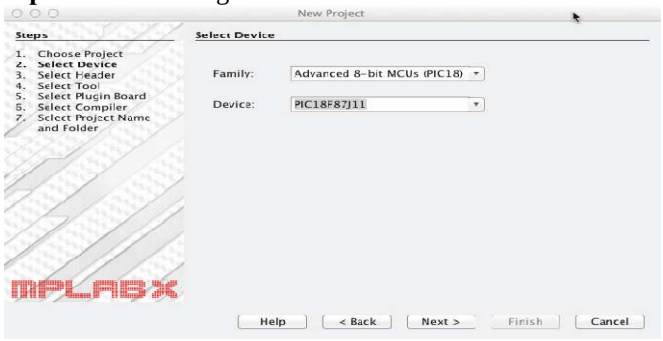


Figure 6: Device Selection Dialog

**Step 3**Compiling.

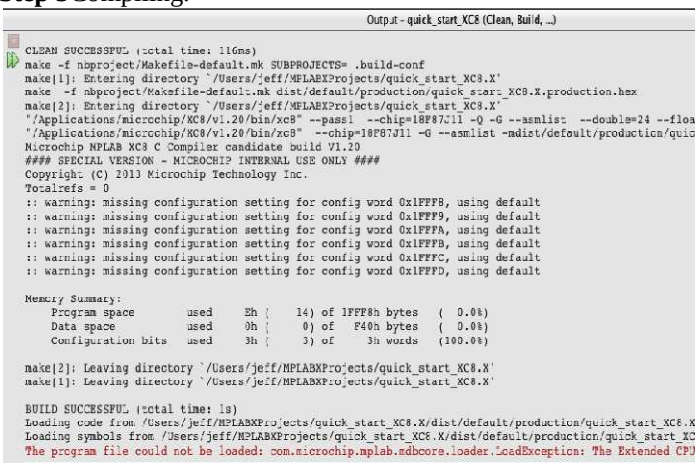


Figure 7: The Output Window

## IV. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

## V. FUTURE SCOPE

Our project "**Android Wi-Fi based Home Automation system**" is mainly intended to control devices using android mobile through Wi-Fi module.The controlling device for the automation in the project is a Microcontroller. The data sent from Android phone over Wi-Fi will be received by Wi-Fi module connected to Microcontroller. Microcontroller reads the data and decides the switching action of electrical devices connected to it through Relay switches. The Microcontroller is programmed used embedded 'C' language.

By connecting temperature, gas, sensors to the system we can get the temperature of dangerous zones in personal computer itself instead of sending human to there and facing problems at field. The project can be extended by using robot to there and sensor will detect the temperature and it gives information to the micro controller and micro controller gives the information to the transceiver from that we can get the data at pc side. By connecting smoke sensor to the robot we can get the information related concentration of smoke or gases in respective field's i.e. (coal mines, dangerous zones, etc). Sensor sense the information and it give to the micro controller and it gives to the transceiver and from that we get the information in personal computer.

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