PERFORMANCE ANALYSIS OF AN AUTOMATED SYSTEM BASED ON WIFI AND INFARED

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Abstract

Today, proprietary home automation targets very specific applications which operate mostly on a cable based infrastructure. In contrast to that, our analysis is based on a wireless platform for the automatic control of house hold appliances. The nodes gather sensor readings in a home and transmit them to a central server. There, the readings are matched against a list of script statements. In case of a match, a specific action is performed. In this project we analyze the functional nodes of the project (day and night mode) by using sensory circuits (infrared counter and light dependent resistor). An important part that will be analyses in this project is also that the control of all home using WIFI technology which is used to connect the automated network.

I INTRODUCTION

The essence of home automated system in all ramifications of life cannot be over emphasized as it finds its application in all fields of human endeavor. Automated System applications are assuming an increasingly important role in the developing world; it makes use of physical hardware and simulation through 'higher-level' technical computing language. Among the advantages of automated systems for control is the increased flexibility of the automated programs and the decision-making or logic capability of automated systems. In addition, one hardware design can be used with many different software variations on a broad range of products, thus simplifying and reducing the design time. For purposes of experimental research, an economical, reliable, and flexible system for acquiring and manipulating data is invaluable. With the advent of Personal Computer (PC) and its compatibles, many data manipulation and/or control systems have been introduced that interface with the PC to perform various tasks.

Definition of automation system

An automation system is a precisely planned change in a physical or administrative task utilizing a new process, method, or machine that increases productivity, quality, and profit while providing methodological control and analysis. The value of system automation is in its ability to improve efficiency; reduce wasted resources associated with rejects or errors; increase consistency, quality, and customer satisfaction; and maximize profit.

II ANALYSING THE SYSTEM

To analyze this design each component role in the circuit will be looked into. The circuitry system is divided mainly into two which are the sensory system which consist of the **sensor** (charging system, infrared sensors, microcontroller 1, seven segment display, digital signal transmitter, etc.) and the switching system(charging system, digital signal receiver, microcontroller 2 etc.).

The wireless connectivity enables control signals to be transferred between the sensory and switching system which makes use of WI-FI. The WI-FI connectivity uses Amplitude Shift Key (ASK) as its modulation scheme.

Sensor: This is also called the LDR this detector is incorporated in the (AUTOMATED SYSTEM BASED ON INFRARED AND WIFI) so as to be able to detect day and night via the intensity of the sun. The application of the day and night mode is introduced in the project so as to enable the microcontroller make more complex decision as to what fixtures should be powered. The sensory circuit constitutes mainly of infrared transmitter and receiver (infrared Light emitting diode (LED) and Light Detecting diode (LDD)) and a light dependent resistor (LDR).

The infrared transmitter (IR) which is implemented by the use of two IR light emitting diodes is connected to the IR PORT CONN-H2.ThePIC16F84A microcontroller works with a 5V DC which is fed into the MCR pin and also the R26-1K resistor is used as a pull up resistor i.e. it keeps the pic16f84Amicrocontroller at 5V which is represented as a logic one. The X1-crystalis used to set the frequency of operation of the microcontroller which is 4MHZ.

The Q1 and Q2 BC547 NPN transistors are used to amplify the signal coming out from the RB0/INT pin

of the pic16f84A microcontroller which is used to drive the IR Transmitters.

Seven segment display and digital transmitter

DC which is collected from the output of the 7805 VOLTAGE REGULATOR .The quartz crystal is used to set the frequency of the microcontroller via PIN 13/14 (OSC1/CLKIN & OSC2/CLKOUT) which is a frequency of 4MHZ. C1 & C2 22pF ceramic capacitors are used to stabilize the frequency of the quartz (this is based on the damping effect of capacitors). The R1 1Kohms resistor is acting as a pull up resistor i.e. it pulls the microcontroller to logic one which is obtained by a 5V dc which is read by the PIN 1(MCLR/VPP/THV). When the reset switch is activated a voltage of 0V dc (logic 0) will be read into pin 1. Therefore the microcontroller checks at very short intervals for the voltage in pin 1. For a 0v dc input, the microcontroller has been programmed to reset (restart), but if the voltage in pin one is still 5V dc (logic 1) the microcontroller continues its normal pre-programmed operation.

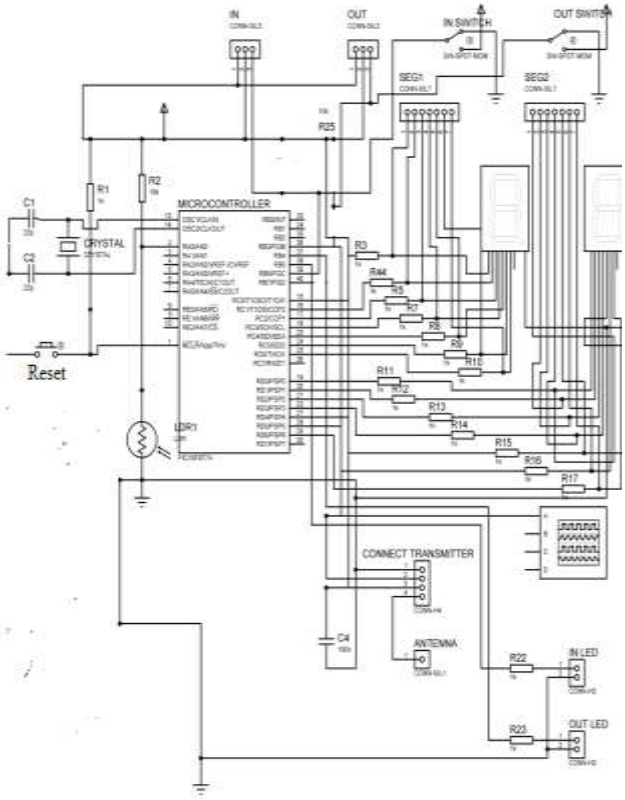


FIG 1: PIC 16F8778A microcontroller, seven segment display and Digital Transmitter

Amplitude Shift Key (ASK)

The modulation scheme adopted between the digital signal transmitter/receiver modules is ASK. Amplitude-shift keying (ASK) is a form of modulation that represents digital data as variations in the amplitude of a carrier wave. The amplitude of an analog carrier signal varies in accordance with the bit stream (modulating signal), keeping frequency and phase constant. The level of amplitude can be used to represent binary logic 0s and 1s. We can think of a carrier signal as an ON or OFF switch. In the modulated signal, logic 0 is represented by the absence of a carrier, thus giving OFF/ON keying operation and hence the name given. Like Amplitude Modulation (AM), ASK is also linear and sensitive to atmospheric noise, distortions, propagation conditions etc. Both ASK modulation and demodulation processes are relatively inexpensive. The ASK technique is also commonly used to transmit digital data over optical fiber. For LED transmitters, binary 1 is represented by a short pulse of light and binary 0 by the absence of light. Laser transmitters normally have a fixed "bias" current that causes the device to emit a low light level. This low level represents binary 0, while a higher-amplitude light wave represents binary 1.

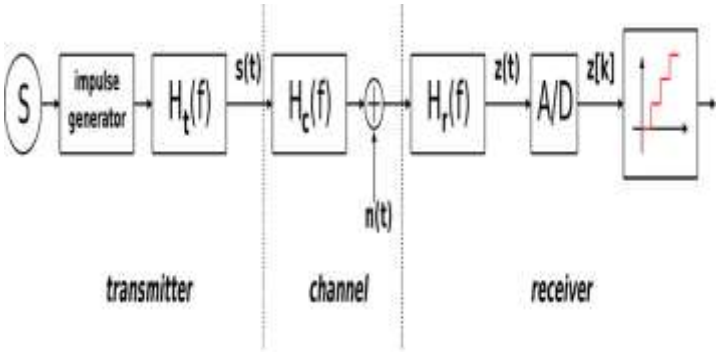


FIG 2: Ideal model for a transmission system using an ASK modulation

Wireless connectivity using WI-FI: This is to send control signals from the microprocessor receiving the interrupt signal to the relay for the switching and then powering of the appropriate fixtures.

This **WI-FI** connectivity will be achieved by using amplitude shift key (**ASK**) modulation schemes according to the most appropriate one.

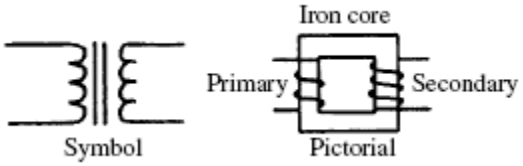
III REQUIREMENT ANALYSIS FOR THE PROJECT

For the project to work the following will be required to make it work properly

Transformers

Transformers are devices using electromagnetic induction to transfer electrical energy from one circuit to another (i.e., without direct connection between them). There are two basic types of transformers:

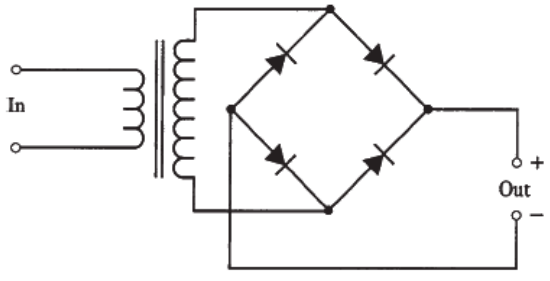
- Step up Transformers
- Step down transformers



FIGIII: Schematic diagram of a Transformer

Rectifiers

A rectifier is an electrical device that converts alternating current to direct current, via a process known as rectification. Simply defined, rectification is the conversion of alternating current (AC) to direct current (DC).

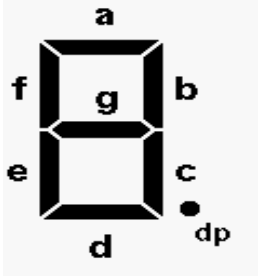


Capacitors

A capacitor is a passive electronic component consisting of a pair of conductors separated by a dielectric (insulator). A capacitor functions much like a battery, but charges and discharges much more efficiently (batteries can however store much more charge).

7-SEGMENT DISPLAY

One common requirement for many different digital devices is a visual numeric display. A seven segment LED display is used to display decimal numbers clearly without any requirement of translating binary to decimal or any other format. A seven segment LED is made up of a shaped piece of translucent plastic, which operates as a specialized optical fiber, to distribute the light from the LED evenly over a fixed bar shape.



Microcontrollers

A microcontroller is an integrated circuit chip, which is usually mounted on a mini PCB, which includes other components in circuit that interface the microcontroller to your computer, motors or switches.

It is a device that integrates a number of the components of a microprocessor system onto a single microchip. They are often low-power devices.

The microcontroller contains the same main elements as any computer system, all combined on a single chip. These elements include:

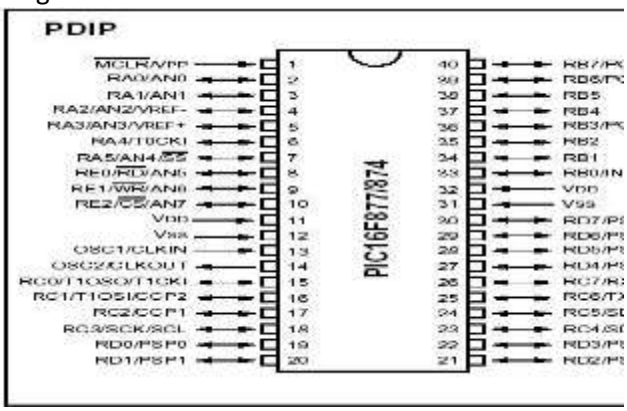
- Processor**:** This is responsible for the coordination of the activities of the microcontroller and also the fetching and execution of instructions.
- Memory**:** The microcontroller stores the program that it will execute in a non-volatile memory.
- Input/output**:** These connections also called I/O ports on the microcontroller provide information that allows the chip to communicate with other components around it, in order to control other devices like lights, motors, relays or even other microcontrollers.

In a microcontroller, a single processor block is in charge of all input, output, calculations and control.

All of these cannot operate without a program, which is a set of instructions held in memory.

Programmable Intelligent Computer (PIC) microcontroller

PIC is a family of Harvard architecture microcontrollers, made by Microchip Technology. PICs are popular, 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 reprogramming (with flash memory) capability.
For the purpose of this project, the **PIC16F877** and **PIC16F834** microcontrollers were used out of the vast array of PIC microcontrollers available.
The PIC16F877 has 5 digital I/O ports (A-E) each between 3 and 8 bits wide. Each port is mapped into the register space, and may be read or written to like any other register. The circuitry is such that it is not possible to physically input to and output from a particular pin simultaneously. The pin out diagram of a PIC16F877 is shown below



FIGIV: Diagram of a pic16f877

IV SYSTEM SIMULATION AND TESTING

This entails the implementation and testing (Hardware and Software modules) of the Automatic Electrical Appliances Control Panel based on Infrared and Wi-Fi.
The implementation and testing at these levels will be extensively described

- Hardware Implementation and Testing

The hardware implementation basically consists of its circuitry and interrelation of components. The hardware module is divided into the transmitting circuit and the receiving circuit

- The Transmitting Circuit

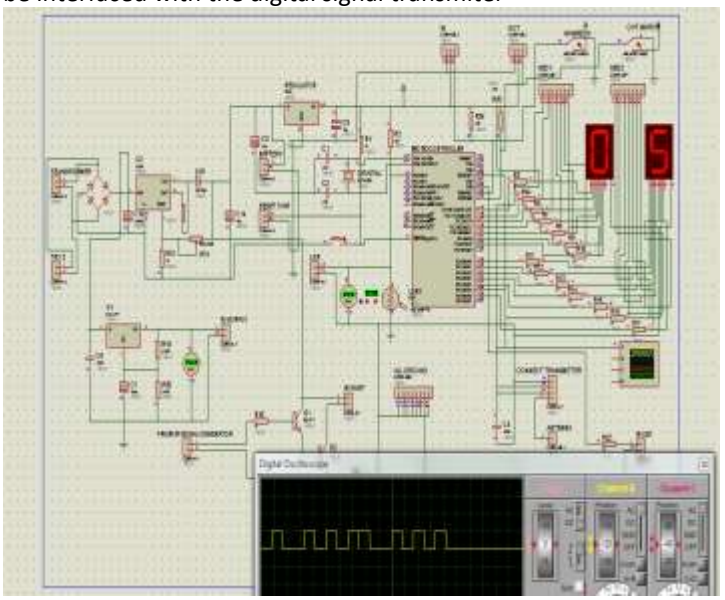
The transmitting circuit transmits the control information to be executed with respect to events occurring per time and it majorly consists of the following; the power section, the sensors, the microcontroller and the transmitter.

- The Receiving circuit

The receiving circuit executes the instructions contained in the transmitted information and it majorly consists of the following; the receiver, the power supply section, the microcontroller and the switching section.
The receiver receives the information sent through the transmitter from the transmitting circuit and this information which contains instructions on appropriate actions to be carried out is collected from the receiver by the microcontroller in the receiving circuit.

- Software Implementation and Testing

The simulation software used for the testing of this project is protieus.
The signal output from the oscilloscope signifies that the microcontroller has sent a trigger signal this will be interfaced with the digital signal transmiter



FIGV: Diagram of software implementation and testing

V CONCLUSION

The Automatic Electrical Appliances Control Panel based on Infrared and Wi-Fi has existing technologies that are related to it on diverse levels the aim of this analysis was to show the optimal use and conservation of power through an automation system based on infrared and Wi-Fi technology.

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