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Voice activated crib light / Amira Saryati Ahmad Dahalan.

VOICE ACTIVATED CRIB LIGHT

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VOICE ACTIVATED CRIB LIGHT

AMIRA SARAYATI AHMAD DAHALAN

This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electrical Engineering (Control, Instrumentation and Automation) With Honors

Faculty of Electrical Engineering
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MAY 2009

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' I hereby declare that I have read trough this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Control, Instrumentation & Automation)'

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"I hereby declare that this report is the result of my own effort and work except for quotes as citied in the reference."

Signature :

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Date : 07/05/2009

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Special dedicated to my beloved parents, family and my dearest friends, who had strongly encouraged and supported me along my journey of learning.

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ABSTRACT

This project's main objective is to develop a system to detect a sound and reject unnecessary sound. Talking about detecting something electronically, it means discussing about sensors. Sensors provide data input to the system so that it can react accordingly. In detecting sounds, microphone is the sensor. Microphone is a device that can detect the vibrations in the air (sounds) then convert it to electrical signals. This objective can be achieved by interface the signal to PIC Microcontroller to compare the signal. Microcontrollers are simply a computer on a chip. It is one of the most important developments in electronics since the invention of the microprocessor itself. It is essential for the operation of devices such as mobile phones, DVD players, video cameras, and most self-contained electronic system. The PIC 16F877A is used in this project. Since, the output from the sound sensor is analog, the PIC 16F877A is useable due to internal analog to digital converter pin.

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ABSTRAK

Objektif utama projek adalah bagi membangunkan satu sistem bagi mengesan satu bunyi dan menolak bunyi yang tidak perlu. Bercakap tentang mengesan sesuatu secara elektronik, ia bermakna berbincang tentang pengesan-pengesan. Pengesan-pengesan menyediakan input data untuk sistem itu supaya ia boleh bertindak balas Dalam mengesan bunyi-bunyi, mikrofon adalah penderia untuk bunyi. Mikrofon sebuah alat yang dapat mengesan getaran dalam udara (bunyi) kemudian menukar ia untuk isyarat-isyarat elektrik. Objektif ini boleh dicapai dengan menhubungkankan isyarat-isyarat ke PIC Microcontroller untuk dibandingkan isyarat. Mikropengawal adalah satu komputer di dalam satu cip. Ia satu daripada pembangunan penting dalam elektronik semenjak ciptaan mikropemproses sendiri. Ia penting untuk operasi alat-alat seperti telefon-telefon bimbit, pemain DVD, kamera video, dan paling sistem elektronik serba lengkap. PIC 16F877A adalah digunakan dalam projek ini. Disebabkan „ output daripada penderia yang baik adalah analog, PIC 16F877A boleh diguna kerana didalamnya mempunnyai penukar analog kepada digital.

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LIST OF ABBREVIATIONS

ADC	**Alternating Current**
CMOS	**Complementary Metal Oxide Semiconductor**
DC	**Direct Current**
DIP	**Dual In Line Package**
EEPROM	**Electrically Erasable Programmable Read-Only Memory**
GND	**Ground**
IC	**Integrated Circuit**
LDR	**Light Dependant Resistor**
MCLR	**Medium Capacity Long Range**
Op AMP	**Operational Amplifier**
PC	**Personal Computer**
PCB	**Printed Circuit Board**
PIC	**Peripheral Interface Controller**
PWM	**Pulse Width Modulation**
UART	**Universal Asynchronous Receiver/Transmitter**
UV	**Ultraviolet**
V	**Voltage**

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CHAPTER 1

INTRODUCTION

1.1 Background

Voice activated crib light is an alarming device used by parents to put in their baby crib. This device operates when the voice sensor as input, sense a baby cry, it will activate the crib light for and the light is just right brightness for nighttime checking or diaper changing. It is also activates the recorded wombs sound that will comfort baby back to sleep or activate buzzer to alarm the parents. This device used a simple operational circuit with a lot of components in its electronic circuit.

Microcontroller is one of the most important developments in electronics device. Since the application of the microcontroller widely used in electronic device such as DVD players and cameras, then there came's the idea in develop the voice activated crib light using microcontroller.

This project is about to apply PIC Microcontroller to program and control the overall operation of the device. The PIC used is PIC16F877A. The PIC 16F877A is a good choice for learning about microcontrollers, because the programming language is relatively simple, as compared with a microprocessor such as the Intel Pentium, which is used in the PC [8].The sound sensor circuit is used for baby crying detection which is the input of this project. This sound sensor applied operational amplifier circuit in order to differentiate the baby crying and everyday sound. As additional, the LDR circuit implements to activate the light. While, the output of the project is represented by LED and buzzer.

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1.2 Problem Statement

As stated in the project background, the voice activated crib light used the complex and used a lot of electronic components in circuit. This will bring more potential of parts of the electronic were burn or short circuit. Besides, from testing of the existing device in market, the operations of the device were not well functioning. Therefore, the circuit need to upgrade and some development need to be apply.

1.3 Project Objective

The main objective of this project is to develop a microphone circuit that can differentiate a sound of a baby crying to be the input of the microcontroller.
To sum up the objectives of the project are:

1) To apply and develop a microphone circuit that can detect t sounds and differentiate the baby sound.
2) To produce a microcontroller circuit that has two outputs
3) To design a voice activated crib light system.

1.4 Scope of Work

In order to achieve the objective of the project, there are several scope had been outlined. The scope of this project includes 3 main stages. Those stages are:

- Signal detection by microphone circuit
- PIC 16F877A controller circuit
- Software development.

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CHAPTER 2

LITERATURE RIVIEW

This chapter consists of research while doing this project. The discussions in this chapter are towards the construction and design the project in brief. Components selection, theories and software will be discussed.

2.1 The Microcontroller PIC 16F877A Review

The main part of this project would be the microcontroller. The signal input will be sent into the microcontroller to be processed. Hence, the microcontroller can determine the next process.

There are several criteria in choosing a microcontroller ranging from speed, price, processing power, and memory and programming language. But, since the PIC 16F877A and the downloader is already bought by supervisor, there's no need to choose another one. Besides, the PIC 16F877A has an internal analog to Digital Converter, although there are many output and input pin are unused.

PIC microcontroller has flash memory and more easy to use compare to the others microcontroller [8]. Furthermore, PIC is gaining popularity now. For PIC microcontroller, its only has 35 instructions set. The PIC 16F877A comes with low power CMOS 8-bit, 40 pins, DIP. Pins 2 to 10 are the analog to digital converter and are used as the input. Pins 33 to 40 would be the output. It uses an external 20MHz crystal for clock and requires low power consumption. Below are some of the features of PIC 16F877A microcontroller [17]:

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- 368 Bytes Data Memory
- 8K Words of FLASH Program Memory
- 256 Bytes Data EEPROM
- 200nS Instruction Cycle
- 33 General Purpose IO Port
- Two 8-bit and one 16-bit Timer
- Two 10-bit PWM output
- One UART
- Eight 10-bit ADC
- 35 Instructions Set
- Self-programmable (Bootloader Support)

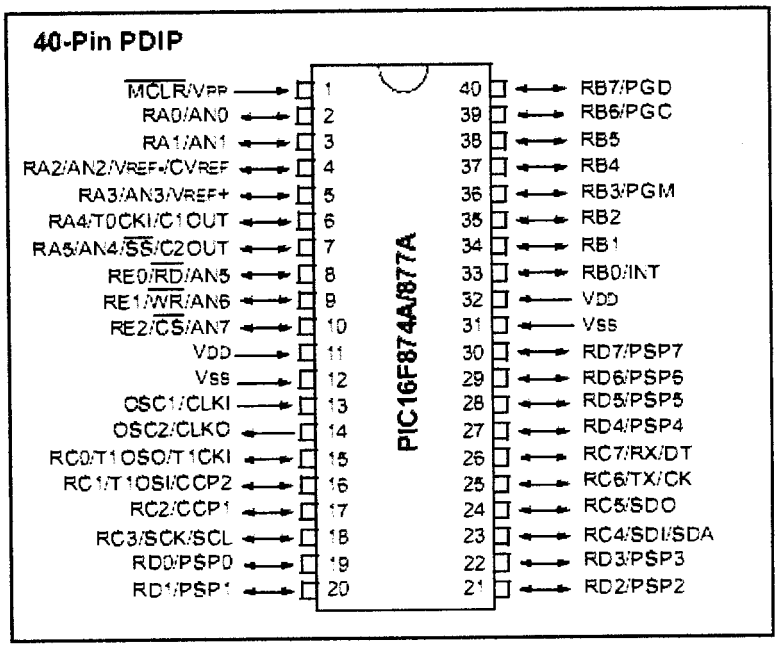

Figure 2.1: PIC 16F877A Schematic [18]

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2.1.1 Basic circuit design for microcontroller PIC16F877A

PIC 16F 877A microcontroller is used to control the output and input of the overall. In order to activate a microcontroller, an external clock input is needed to connect into the microcontroller. Oscillator 20MHz is used to provide signal clock to microcontroller and two 22pF capacitors act as a filter to filter out external noise from interfering with the crystal frequency. Besides that, the Vcc pin of microcontroller is connected to 5 Volt and Vss pin is connected to ground. This circuit is getting from the cytron as PIC microcontroller startup kit where the entire item describe above is include in this circuit. Figure 2.2 shows the basic circuit for microcontroller [22].

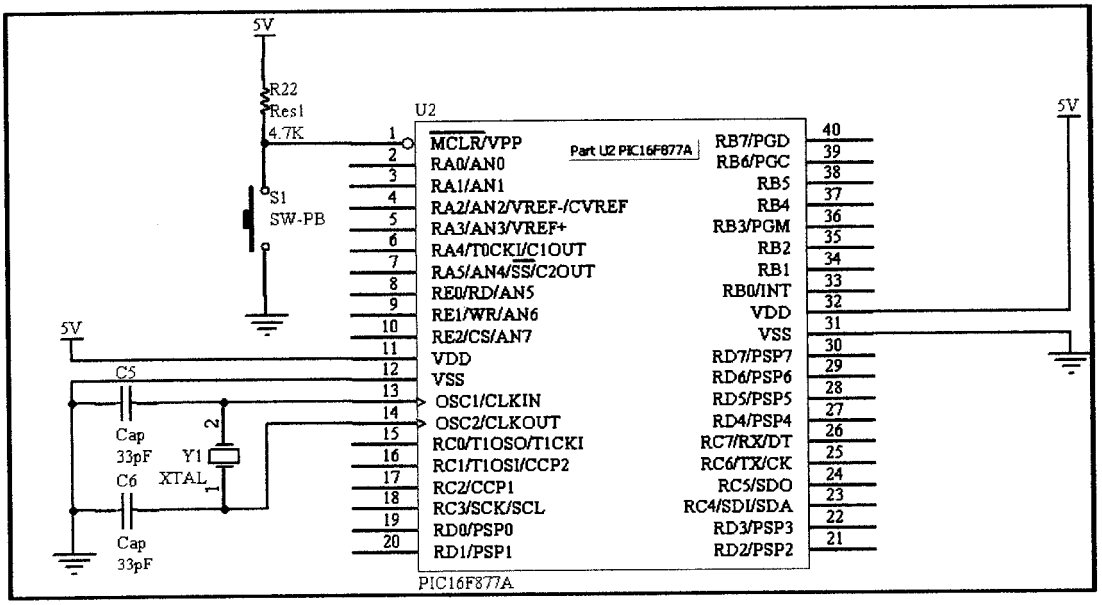

Figure 2.2: Basic Design of PIC16F877A

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2.1.2 Voltage Regulator

The purpose of voltage regulator circuit is to converts varying input voltage and produces a constant regulated output voltage. Here, the circuit used to provide a constant 5 Volt to the circuit. Voltage regulator LM7805 is implemented in the voltage regulator circuit. The voltage regulator LM7505 has three terminal pin for connection which are input, ground and output pin.

As mentioned above, the component has three legs that is input leg which can hold up to 35VDC Common leg (GND) or and an output leg with the regulator's voltage that is 5 Volt with output current 100 mA.

All electronics system in this projects needs a DC supply to power it up. Here, the adapter is the supply for the whole circuit. A power supply is needed to supply the circuits with stable 12 volts DC. Important note here is that if the 78 series needs a higher input voltage than the output regulation for it to work. For instance to use the 7812 regulator to obtain a 12V output the input must be at least above 14.3 Volts.

The Op Am UA741 is used as the amplifiers for the circuits need both positive and negative power supply to power it up. The KA 7912 is a -12V regulators can be used to produce the negative DC voltage output. The power supply for this system is designed to produce both positive and negative 12V DC output.

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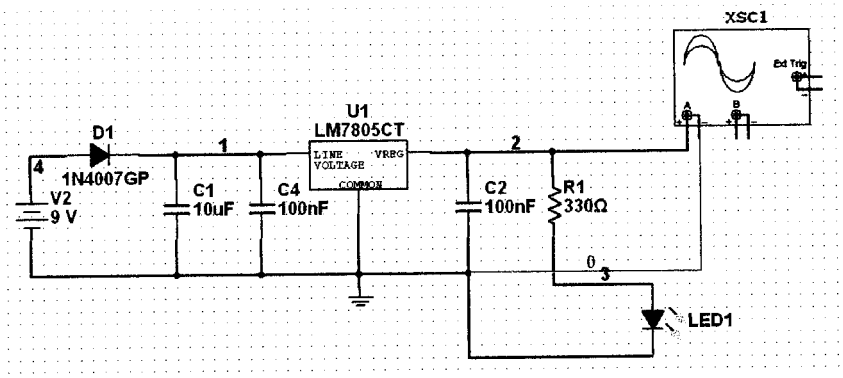

Figure 2.3: Basic Voltage Regulator Circuit

Since the power supply for the circuit is from adapter, capacitor is used to protect the voltage regulator when the power supply is connected in wrong terminal condition and also the purpose to filter out the noise. Adding capacitors into the voltage regulator circuit can minimize the noise to produce more stable and constant output voltage.

2.1.3 Reset Circuit

A manual reset is included, so that programs can be restarted when the board is running independently. If the program appears to be malfunctioning, a hardware reset is usually the first remedy. [4] The reset circuit operation detailed are when the button is not press, the signal for MCLR is 5 Volt. Then the microcontroller will not reset. When the button is press, the signal for MCLR is 0 Volt then, the microcontroller will be in RESET condition.

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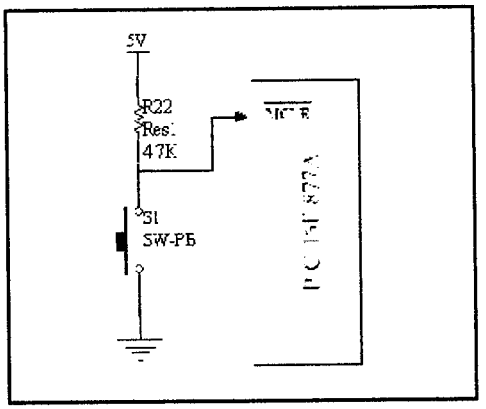

Figure 2.4 Schematic for RESET circuit

2.1.4 Clock Generator Circuit (Crystal)

The crystal oscillator act as a self-contained resonant circuit, where the quartz or ceramic crystal vibrates at a precise frequency when subject to electrical stimulation [3]. The generator on this circuit is using 20-MHZ resonator. There is not directly relation but it is related with the taking-in period with control voltage. Crystal function to responsible for timing operations in the PIC microcontroller.

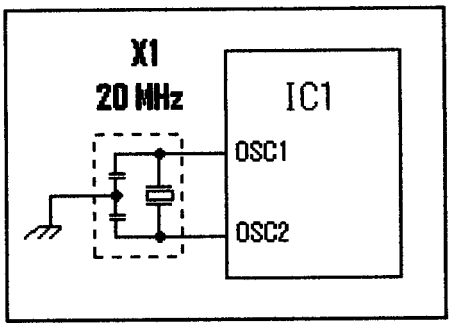

Figure 2.5: Clock Generator Circuit Using Crystal

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2.2 Sound Sensor Circuit Review

Talking about detecting something electronically, it means discussing about sensors. Sensors provide data input to the system so that it can react accordingly. In detecting sounds, microphone is the sensor. Hence the review of the sound sensor circuit concepts were more focused.

2.2.1 Microphone Circuit

The research for microphone circuit widely more far reaching search and various to look and get the clear idea how and what is the sound sensor circuit components and the operational of the circuit.

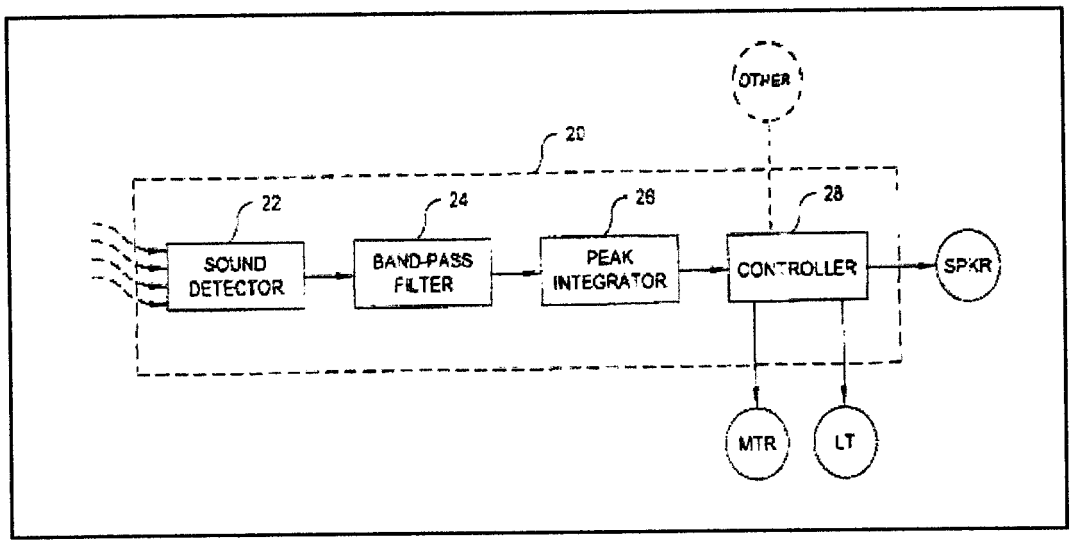

Figure 2.6: The Block Diagram of the Sound Detector [20]

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