Electrical & Electronic Engineering: Theory and Applications Series 2: Ultrasonic and Application

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Abstract: This book is a collection of ultrasonic project for Microcontroller and Microprocessor subject did by third year students in Faculty of Electric and Electronic Engineering, (UTHM). This book chapter is very useful for the reader to understand the ultrasonic operation and how to program the sensor using PIC microcontroller. It is hope that this book can help the reader to build the application based ultrasonic sensor that can be used for their daily live.

This books chapter contain the example of projects that was done by the students using ultrasonic sensor. All the program was clearly discuss in this book, therefore reader will understand how to program deeply. All the third year students have showing their effort to write this book after they success develop their project based ultrasonic sensor.

Keywords: PIC microcontroller, ultrasonic, sensor

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Penerbit
UTHM

2015

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Preface

This book is the second series of book chapter that is produced from Embedded Computing System (Embcos) Research Focus Group Department of Computer Engineering, Faculty Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia (UTHM). This book is the research output and also the progress of the research that is conducted by FKEE's staff. This book can guide other researcher to enhance their knowledge in research especially in Electric and Electronic Engineering area.

This book is a collection of ultrasonic project for Microcontroller and Microprocessor subject did by third year students in Faculty of Electric and Electronic Engineering, (UTHM). This book chapter is very useful for the reader to understand the ultrasonic operation and how to program the sensor using PIC microcontroller. It is hope that this book can help the reader to build the application based ultrasonic sensor that can be used for their daily live.

This books chapter contain the example of projects that was done by the students using ultrasonic sensor. All the program was clearly discuss in this book, therefore reader will understand how to program deeply. All the third year students have showing their effort to write this book after they success develop their project based ultrasonic sensor.

This book chapter is suitable for university's students and hobbyist also the researcher that struggle to find out the coding for ultrasonic as this sensor has huge benefit to give the distance value. There are many applications that use distance as the main parameter.

OPEN GATE REMINDER

Adila Fitrah Abdul Aziz
Lim Swee Chin
Mohamad Anafi Salleh
Norhafiza Hussain

1.1   INTRODUCTION

In general, this project utilizes the importance of microcontroller and ultrasonic sensor as the main design. The aims of this project are to design and to build a measuring distance sensor that is cost reliable. Open Gate consists of ultrasonic sensor, microcontroller PIC 16F877A, and LCD that can detect measurement away from the obstacle. A microcontroller is a small unit of controller that acts following the instruction programmed whereas an ultrasonic sensor, also known as a transceiver for both send and receive, or it is more generally called as transducer. Ultrasonic sensors generate high frequency sound waves and evaluate the echo that is received back by the sensor. Microcontroller PIC16F877A calculates the time interval between sending the signal and receiving the echo to determine the distance to an object. All circuits included in this prototype were designed following the suitability of microcontroller PIC16F877A. In this project, we will also implement a sensor with buzzer that can automatically detect the distance from a specific measurement. Our project is designed to be used at the security guard house. An observation has been made and has found that the guard always has a

2. Increase the features of the product by adding another function such as a card scanner. This card scanner will only permit authorized person to enter and leave the place with ease. The authorized person can easily pass the automatic gate by scanning the card.

3. Use a solar system to replace an electrical base system. This will help to preserve a greener and healthier environment.

1.6.1   Conclusion

As a conclusion, this project has been successfully carried out because the main objective was achieved, which is to develop the application of a microcontroller PIC16F877A, an ultrasonic sensor and a LCD display. This project was designed to control the entrance of any vehicle into certain area. Ultrasonic sensor detects the distance between the vehicle and the guardhouse. The detected distance will be displayed on the LCD. At a certain distance from the vehicle to the guard house, the buzzer is activated, which in turn reminds the guard to open the gate.

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SECURITY OF JEWELLERY BOX

Ahmad Naim Suhaimi
Lau Kae Lih
Norkhadhra Nawawi
Nor Hirmayanti Mohd Daud

2.1   INTRODUCTION

In this modern era, we heard about robbery almost all of the times. Usually, it happened to people who really like to put their jewelleries in a jewellery box. However, what is a jewellery box? Jewellery box is a casket or a container that is usually larger than a box, but smaller than a chest. In the past, it was typically decorated. In recent times, they are mostly receptacles for trinkets and jewels. However, in earlier periods, when other types of container were rarer and the amount of documents held by a typical person was much fewer, they were used for keeping important documents and other purposes.

The Birmingham Mail (19th May) has published about a man who love to steal a jewellery box being caught by a police. The worst happens when a celebrity like Lindsay Lohen lost about 400,000 dollars when her jewellery box is stolen. To prevent this from happening in this busy world, a new security system is implemented on the jewellery box. In the past, jewellery box is usually secured by a key. However, with the new implementation that has an built-in ultrasonic sensor.

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ANTI-CRASH TOLL BARRIER SYSTEM

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Aien Najihah Kamaruddin
Nurliyana Mohamad Arifin
Gunaraj a/l Visvanathan
Ebrahim Abdul Aziz Alsharif

3.1   INTRODUCTION

Every year many people are killed on roads. This does not include those seriously injured and slightly injured people. The average people in a metropolitan country have risk in one of hundred lifetimes being killed in road traffic accidents, and one in three lifetime risk of being injured. Accident affects not only the drivers, but also the passengers. Many accident cases in Malaysiaare related to crash at toll plaza.

One of the major factors of the accidents is the barrier system. This study aimed to design a toll barrier with a distance detector and a buzzer as an alarm to alert people about the distance between their vehicles and the toll barrier. An ultrasonic sensor, a LED light and a buzzer were being placed at the toll barrier as the indicator of the distance. Moreover, a LCD was designed to display the distance between their vehicles and toll barrier.

3.7   CONCLUSION

As for the conclusion, this project was completed successfully and the objectives were achieved. Based on the experiment, we believe that this system is able to reduce the incident such as crushing at the toll. Even though there are many circumstances and unavoidable problems in this project, the ultrasonic sensor is able to detect and display the result in LCD display.

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AUTOMATIC POST GUARD AND PARKING LOT TRACKING SYSTEM

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Nur Hidayah Aminal Hapedz
Lim Hui Teng

4.1 INTRODUCTION

The main problems faced by residences who live in a condominium are parking as well as the level of the security around the condominium. Actually, those problems are caused by outsiders who are also using the parking lot. Usually, it happens due to the absence of post guard at the entrance of the residential area.

In this project, we proposed to design a system that can be deployed in existing parking structures to provide information about available parking spaces for drivers who were trying to access the facility. In addition to the system, we proposed a security post guard system at the entrance so that the residential area will be more secure. It can also prevent outsiders from entering the premises and parking at the parking lot. At the guardpost, security guards identified their identity first by using their pass before they can enter the residential area. If the pass is valid, the security guard will push the button to open the gate.

sensor and a LED to give the best coverage of controlled area. The signal processing allowed the calculation of minimum distance between the vehicle and the guard post. The LED was brightened if there is parking vacancy. Hence, drivers took less time to find parking when they reached parking lot. It is believed that by implementation of the system, problems such as insufficient parking space, difficulties of finding available parking berth and difficulties of finding parked vehicles will be reduced. Both car park operators and car park owners will be benefitted from the system as parking spaces are easily acquired and parking space wastage is reduced.

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REVERSE PARKING SYSTEM

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Lim Weng Chuen
Nurdiyana Ali
Nurul Syafiq Jasmin

5.1   INTRODUCTION

An autonomous parking system has become attention of researches, industry and public due to its potential in commercialisation of consumer product and automobile industry. Autonomous parking trend can be indicated from several commercial car models such as Perodua Alza and Proton Inspira. However, these car models mentioned are not fully equipped with autonomous parking system but sensors to sense the surrounding and monitor to display the rear condition of the vehicle and to regulate the speed and direction manually by the driver to prevent any collision.

Parking can be categorised into three types, which are front parking, parallel or side parking and reverse parking. This project focused on the reverse parking system because reverse parking is one of the most difficult driving skills. An ultrasonic sensor was used in this system because of its ability for distance detection. The whole system was controlled by a microcontroller 16F877A, which received feedback from the ultrasonic sensor and processed the signal to output the corresponding distance measured on Liquid Crystal Display (LCD).

By activating the actuator, besides stopping the vehicle, the changing of vehicle direction is also applicable. This is because the PIC is capable of sending signal to the wheel control unit for changing the vehicle direction to avoid collision with the target object. This application required an advance system to monitor the surrounding and calculation. The PIC16F877A and the ultrasonic sensor played roles in range detection and signal controlling.

The limitations of the PIC166F877A, such as low speed, flexibility and memory, have to be upgraded.

5.6 CONCLUSION

In conclusion, the design of the reverse parking system was successful due to the contribution from the team members and the practice of teamwork. The reverse parking system was constructed successfully with a user-prototype interface, a wireless communication using a IR sensor, a PIC 16F877A, a LCD and an ultrasonic sensor. The reverse parking system was successfully implemented in a chassis. The distance between the chassis and the obstacle was displayed.

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PROSTHETIC ROBOT HAND

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Indah Fitriani Hamidi
Nurul Syafiqah Mohamed Mustakim
Ushananthini a/p Chinnappan
Siti Zarina Mohd Muji

6.1   INTRODUCTION

Losing one of the body parts can mean the end of a person's career since life of a person depends on the movements and actions of the body parts. A person who lost their arm in an accident can lose their hope in life easily. Depending on others to do their own routine works may cause uneasiness for a person. These people need a device that can help them to do work by themselves quickly and easily.

Prosthesis is an artificial device that replaces a missing body part lost through trauma, disease, or congenital conditions. Current prosthetic hands are basically simple grippers with one or two degrees of freedom, which barely restore the capability of the thumb index pinch. Although most amputees consider this performance as acceptable for usual tasks, there is ample room for improvement by exploiting recent progresses by using an ultrasonic sensor, a PIC controller anda LCD for display. This project focused on an innovative approach for the design and development of prosthetic hands using an ultrasonic sensor. A simple mechanical grippers, such as prosthetic hand devices, can lead to large grasping forces, which are simple to implement and to control.

quality can be used so that the motor will rotate according to the desired angle as decided in the source code.

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SECURE PARKING RESERVATION SYSTEM

Endawie Anak Juan
Lim Yi Ning
Nurainul Aqilah Ahmad Rashaidi
Roshazwani Rosli

7.1   INTRODUCTION

Nowadays, almost every family in Malaysia own at least one vehicle, either a car or motorcycle. Every vehicle needs their own parking for a certain period of time. One study showed that 86% of drivers face difficulty in finding a parking space in multilevel parking lots. Finding space during weekends or public holidays can take more than 10 minutes for about 66% of visitors (Kianpisheh *et. al.,* 2012). Due to this situation, many drivers go against the parking rules such as double parking, misuse parking lots that reserved for disable people or park their vehicles on the emergency lane. This proves that our country needs an efficient parking management system to support our transportation development. Therefore, a *Secure Parking Reservation System* was proposed for the parking management system. This system used an ultrasonic device (HC-SR04), a PIC16F877A and a LCD (DS-LCD-162A) as the main components, and was enhanced by a buzzer.

An ultrasonic sensor is a transducer that works on a principle similar to radar or sonar. It generates high frequency sound waves (between
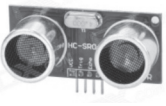
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APPENDIX E

(A) Bill of Material

No	Material	Illustration	Qty	Price	Amount
1.	PIC 16F877A		1	RM17.00	RM 17.00
2.	Ultrasonic sensor		1	RM15.00	RM15.00
3.	PIC Holder		1	RM1.00	RM1.00
4.	LED (Red, Green, Yellow)		1 each	RM0.20 each	RM0.60
5.	Resistors (270kΩ)		4	RM0.40	RM0.40