SEAT MONITORING SYSTEM

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Faculty of Electronic and Computer Engineering
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PROJEK SARJANA MUDA II

Tajuk Projek : SEAT MONITORING SYSTEM

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Dedicated for papa and mama,
and my precious brothers didy and aie.

ACKNOWLEDGEMENT

بسم١الله١الرحمن١الرحيم.

This thesis is the result of months of research, countless effort, and a little pain. The fact that this thesis is the completion of my Bachelor of Electronic Engineering (Industrial Electronics) with Honours, I actually became fond of sensor based technology.

I, hereby, would like to express my deepest gratitude for the ones who had helped me during the whole 2 semesters. I would like to think the reason I have been successful in completing this project is because of the non-stop guides, lesson and motivation that I gained from my project supervisor; Puan Hazura Haroon, my fellow housemates and classmates, and foremost to my dear family.

Not least, my appreciation goes to the proud Faculty of Electronics Engineering and Computer Engineering of Universiti Teknikal Malaysia Melaka.

Thank you.

ABSTRACT

Electronic room response system has been investigated as a potential bridge for the communication gap between lecturers and students. At this early level, this project enables sensor based seat monitoring system to be implemented in lecture rooms, tutorial rooms, or even meeting rooms. It eases monitoring on seats availability and attendance. Combination of temperature sensor for human body heat sensing, and flexible bend sensor for pressure sensing allow the seat detection. Occupants inside the room would be less distracted as the system uses Liquid Crystal Display (LCD) as the display to be placed outside the room. Technologies applied are wireless system, that is Radio Frequency, and microcontroller PIC16F877A. The seat monitoring system consume little power and is adaptable to any seat with cushion padding.

ABSTRAK

Kajian tentang bilik elektronik dengan sistem respon telah dibuat, dan didapati sebagai satu cara yang berpotensi untuk mengurangkan jurang antara pensyarah dan pelajar. Bagi tahap permulaan ini, projek ini menggunakan sistem pemantauan tempat duduk yang berasaskan pengesan untuk diimplementasikan di dalam bilik kuliah, bilik tutorial, atau pun bilik mesyuarat. Sistem ini memudahkan proses pemantauan tempat duduk dan memeriksa kehadiran di dalam sesebuah bilik. Gabungan pengesan suhu dan pengesan boleh lentur digunakan di dalam sistem ini. Penghuni bilik akan rasa kurang terganggu kerana sistem ini menggunakan paparan LCD untuk diletakkan di luar bilik. Teknologi yang digunakan adalah frekuensi radio and pengawal mikro PIC16F877A. Sistem ini menggunakan kuasa yang rendah dan mudah untuk diletakkan di mana-mana kerusi yang beralaskan kusyen.

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CHAPTER I

INTRODUCTION

1.0 Overview

The project is to design a prototype for system that would make monitoring seats availability in a room to be more convenient.

Combination of a flexible bend sensor, a temperature sensor and microcontroller PIC 16F877A are used to detect if a person is sitting on a chair. These sensors are connected to a microcontroller PIC 16F877A that performs ADC conversion. Data transmission would happen to be between an RF transmitter and an RF receiver. LCD (in which is programmed in the microcontroller) will display which seat is occupied or unoccupied.

Features of this project are to have a seat monitoring system that offers wireless transmission of seat availability data, and to able user to view seat availability via LCD.

1.1 Objective

The objectives of this project are to design a wireless seat monitoring system, that should be able to detect person on a seat and consequently, to display the data obtained from the wireless system using LCD. It indicates whether the seat is occupied or unoccupied. In other word, this project is to integrate between hardware and software to build a sensor-based system with application of PIC and wireless RF module.

1.2 Problem Statement

Meeting room, library, lecture hall and tutorial class are always packed with people, and these kinds of rooms offer limited seats. Latecomers who will show up one by one for example, will eventually disturb lecture hall or tutorial class. This could create distraction to the room's occupant, as the latecomers will scramble to find open seat and if they could not, they groan about not able to find empty seat. As the issue of fact, what matter is when the student outside do not have any idea of the seat availability inside the room. The same goes for meeting room and library, which are regularly filled with people.

This project perhaps could unravel such problem, as it will make it easier and convenient for anyone to check seat availability, via display outside the room. Besides that, it could be positive for everyone in the room.

1.3 Scope of Work

This project entails a system to monitor seat availability in room, and display the result via LCD; whether or not the seat is occupied. This project intends to present a model of a seat, which consists of temperature sensor and flexible bend sensor underneath the seat.

This system functions when a load and heat (comes from human body heat with threshold of 30°C) are sensed by the sensors. These wireless devices will be connected to PIC 16F877A, and through an interface, and accordingly the result of occupied or unoccupied seat will be display via LCD.

The limitation of this project is that it cannot display as an occupied seat whenever if a person is idle for more than 15 minutes (for example, gone to the restroom) where the person shall come back to his place.

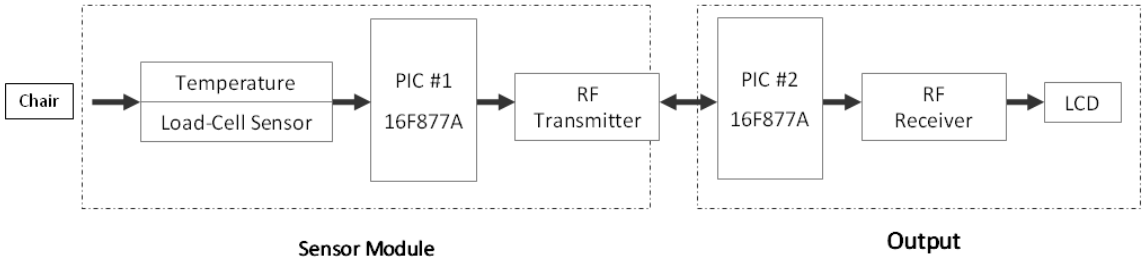

Figure 1.1 System Block Diagram

1.3.1 Chair

A flexible bend sensor and a temperature sensor are placed beneath the chair. The chair is fabric-based. Hence, when sensor modules are placed beneath the padding, the person sitting on the chair will not able to feel them.

Figure 1.2 Chair with cushion padding

1.3.2 Flexible bend sensor

It senses pressure to determine if a person is sitting on the chair. The threshold pressure is set to be less than 8.5V so that a backpack or something else that is lesser flexing the sensor will not accidentally trigger the operation. Means that, once the microcontroller reads the output voltage to be less than 8.5V, the information from the sensor will then be sent to PIC #1.

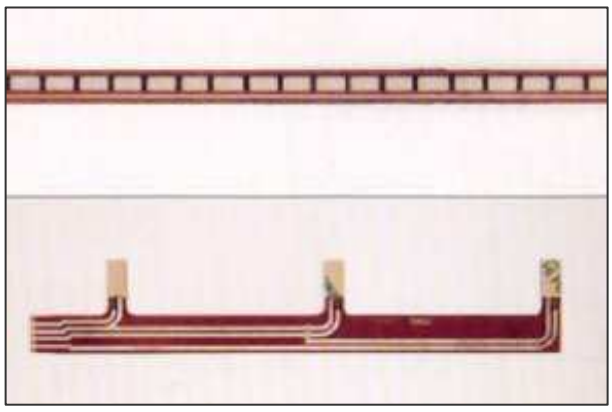

Figure 1.3 Flexible Bend Sensor

Figure 1.4 Bending the Flexible Bend Sensor

1.3.3 Temperature sensor

It senses human's heat temperature to determine if a person is sitting on the chair. The threshold temperature is set to 30°C, which is similarly to normal human body temperature.

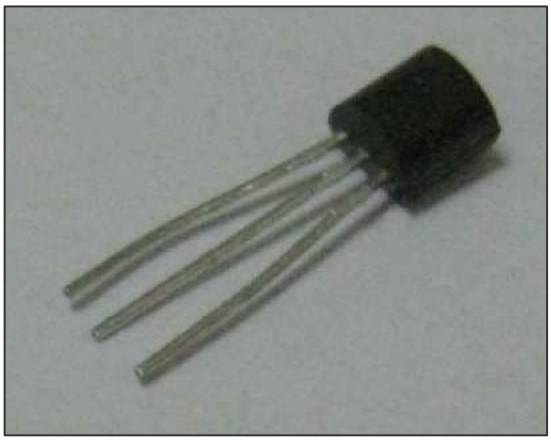

Figure 1.5 LM35DZ

1.3.4 PIC #1

Microcontroller that is used is 16F877A. It takes the output of the sensors and determine what to do next. Once the chair is activated, the information will be sent by wires to the wireless transmitter. At a predetermined time, the PIC will tell the transmitters and sensors to power on. The power is used to interpret data from the sensors through means of Analog/ Digital conversion. Thresholds will be programmed to determine whether a chair is in use, based on sensor readings.

The transmitter will then take the data and send it over a specific channel, repeating long enough so that the receiver is guaranteed to read the data at least once.

Data transmission will be clocked appropriately so that clock edges match the data rate. After the data is sent, the PIC will power down the rest of the components and stay in standby mode until it is ready to send data again.

1.3.5 RF Transmitter

The transmitter components takes the output from PIC #1 and wirelessly send the information to the wireless receiver. It should send correct data to receiver.

1.3.6 RF Receiver

It collect data sent by transmitter through an antenna and outputs the information to PIC #2. It should receive correct data from transmitter periodically every 15 minutes.

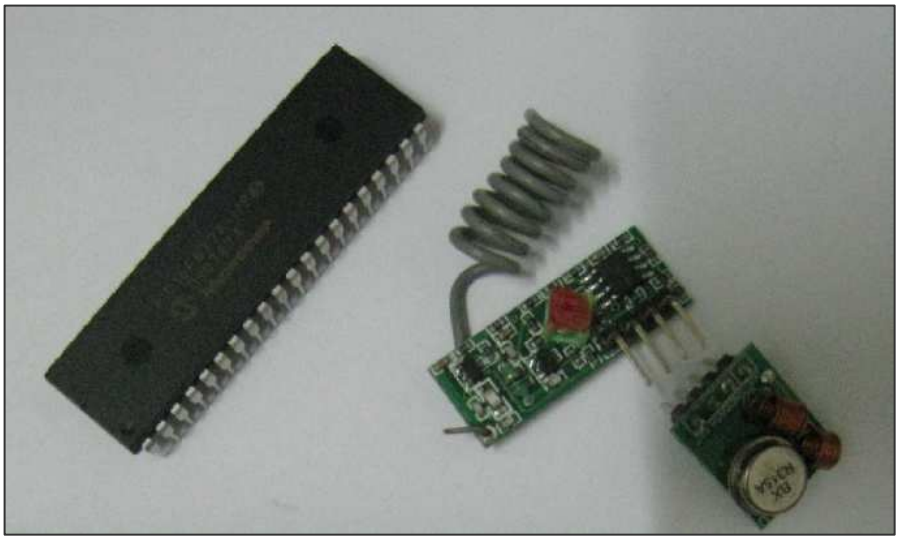

Figure 1.6 PIC 16F877A and RF Module

1.3.7 PIC #2

PIC 16F877A is the microcontroller used. This component deciphers the information sent by the receiver and outputs the information to the LCD. This PIC is responsible to receive data stream from the receiver and getting the unique ID and information regarding the chair current occupancy.

1.3.8 LCD

LCD displays the data on user-friendly interface. User able to check the seat availability status on the display.

1.4 Methodology

Application of Proteus Version 7 and PIC-Compiler softwares are used for programming both PIC 16F877A.

The circuit of this project consists of two main circuits; one for the RF transmitter and the other is for the RF receiver. Transmitter circuit consists of PIC 16F877A, voltage reference circuit, an oscillator circuit, a temperature sensor circuit, a flexible bend sensor circuit, a voltage regulator circuit, two dc sources, and an AND gate IC, and an RF transmitter module. Receiver circuit consists of a PIC 16F877A, voltage reference circuit, an oscillator circuit, a voltage regulator circuit, a dc source and an LCD circuit.

Flow chart of methodology of this project is as described in Chapter 3.

1.5 Thesis Arrangement

This report contains 5 main chapters; Introduction, Literature Review, Methodology, Results and Discussion, and Conclusion.

Chapter I explains project overview, project objectives, problem statement, scope of work, limitations of the project, methods used in the entire project, and thesis arrangement.

Chapter II describes about literature review, which also notify briefly about previous study that was done by other person that is similar to this project. Mechanisms explained in this chapter refer to optional theories and concept that might be compliant in this project. Hypothesis on study of this project is also included in this chapter. Theories and facts as explained, are referred and adapted from articles, journals and some books that are related to the project.

Chapter III describes about Methodology. Methods and approaches that are been used during this project, such as data collection method, processing method and data analysis are described in this chapter.

Flow chart of methodology in completing this project, hardwares and softwares development are also portrayed. The advantages and disadvantages of methods that are chose to be applied in this project are also explained briefly.

Chapter IV tells about Result and Discussion. Overall result and Gantt Chart are included. Outcomes from the project is also been viewed through perspective on objectives and attended problems while accomplishing the project.

Final chapter is Chapter V which tells about Conclusion and Suggestion. Conclusion explained about how efficient and useful the data and how they are compatible with this project implementation. Discussion and evaluation on the methodology is also briefly viewed in this chapter. Suggestion part enlightens about how the system can be improved and how it can be implemented with some other application with a slight alteration.