SEAT MONITORING SYSTEM

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Tajuk Projek : SEAT N Sesi : 2008/20	J NIVERSTI TEKNIKAL MALAYSIA MELAKA JURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA II MONITORING SYSTEM
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Dedicated for papa and mama, and my precious brothers didy and aie.



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بسم الش الرحمن الرحيم.

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.

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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.

CONTENT

CHAP ITEM

PAGE

PROJECT TITLE	i
DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
ABSTRAK	vi
CONTENT	vii
LIST OF TABLES	X
LIST OF FIGURES	xi
LIST OF APPENDICES	xiii

I INTRODUCTION

1.0	Overv	iew	1
1.1	Objec	tive	2
1.2	Proble	em Statement	2
1.3	Scope	of Work	2
	1.3.1	Chair	3
	1.3.2	Flexible bend sensor	4
	1.3.3	Temperature sensor	5
	1.3.4	PIC #1	6
	1.3.5	RF Transmitter	6
	1.3.6	RF Receiver	6
	1.3.7	PIC #2	7
	1.3.8	LCD	7
1.4	Metho	odology	7

II LITERATURE REVIEW

2.0	Prologue 1		10
2.1	Basic	ic of Wireless Sensor Networks	
2.2.	Strain	and Stress	13
	2.2.1	Load-Cell Sensor	14
	2.2.2	Flexible Bend Sensor	16
2.3	Heat a	and Temperature	18
	2.3.1	Thermal Sensor	18
	2.3.2	Thermo-Mechanical Transduction	19
	2.3.3	Thermocouple	19
	2.3.4	Resonant Temperature Sensor	19
	2.3.5	Thermoresistive Effects	20
	2.3.6	Temperature Sensor LM35	21
2.4	Micro	controller	22
2.5	Radio	Frequency	24
	2.5.1	Linx Technology	25
		2.5.1.1 Transmitter Module	25
		2.5.1.2 Receiver	25
	2.5.2	Zigbee [™] Technology	28
	2.5.3	Cytron Technology	30
		2.5.3.1 Transmitter Module	30
		2.5.3.2 Receiver Module	31
2.6	AND	Gate DM74ALS08	32

III	MET	THODOLOGY	33
	3.0	Prologue	33
	3.1	Circuitry Design	33
		3.1.1 Transmitter Circuit	33
		3.1.2 Receiver Circuit	34

10

8

3.2	3.2 Software development		35
	3.2.1	Proteus 7	35
	3.2.2	PIC-Compiler	36
3.3	Hardw	vare Development and Testing	37
	3.3.1	Flexible Bend Sensor	39
	3.3.2	Testing Temperature Sensor	39
	3.2.3	Analogue and Sensor Interfacing	40

IV RESULT AND DISCUSSION

4.1	Circuit Diagram Designation	42
	4.1.1 Flexible Bend Sensor Circuit	42
	4.1.2 Temperature Sensor Circuit	45
	4.1.3 Transmitter Circuit	46
	4.1.4 Receiver Circuit	47
4.2	Programming Flow Chart	48
4.3	Hardware Design	51

V CONCLUSION AND SUGGESTION

5.0	Conclusion	53
5.1	Suggestions	53
5.2	Future Works	54

11

LIST OF TABLES

NO	TAJUK	PAGE
2.1	Measurements for Wireless Sensor Networks	12
2.2	Comparison of Temperature Sensor of LM Series	21
2.3	Specification of Cytron Transmitter Module	31
2.4	Specification of Cytron Transmitter Module	32
3.1	AND Gate Function	41
4.1	Result for Testing Flexible Bend Sensor	45
4.2	Result for Testing Temperature Sensor	45

LIST OF FIGURES

NO TITLE	PAGE
1.1 System Block Diagram	3
1.2 Chair with cushion padding	4
1.3 Flexible Bend Sensor	4
1.4 Bending the Flexible Bend Sensor	5
1.5 LM35DZ	5
1.6 PIC 16F877A and RF Module	7
2.1 Physical form of strain gauge	13
2.2 Bridge circuit for strain gauge use	14
2.3 Wheatstone Bridge Circuit	15
2.4 Variable Deflection Threshold Switch	17
2.5 Resistance Vs Temperature for NTC Thermistor	20
2.6 Basic Centigrade Temperature Sensor	22
2.7 Bottom view of LM 35DZ	22
2.8 Processor program execution	23
2.9 PIC 16F877A Pinout	23
2.10 HP-3 Series Transmitter Block Diagram	25
2.11 HP-3 Series Receiver Block Diagram	27
2.12 Home and Diagnostics Zigbee [™] Examples	29
2.13 Freescale Zigbee [™] MC 1321x Block Diagram for	
Sensor Application	29
2.14 Transmitter Module	30
2.15 Receiver Module	30
2.16 DM74ALS08 Connection Diagram	32
3.1 Transmitter Circuit	34
3.2 Receiver Circuit	35

3.3 Flow Chart of Software Development Methodology	36
3.4 Flow Chart of Hardware Development Methodology	38
4.1 Flexible Bend Sensor Circuit	43
4.2 Variable Resistance Reading of Flexible Bend Sensor	43
4.3 Basic Circuit of Flexible Bend Sensor	44
4.4 Flexible Bend Sensor Simulation Testing	44
4.5 Flexible Bend Testing	45
4.6 Transmitter Circuit	46
4.7 Receiver Circuit	47
4.8 Programming Flow Chart for Transmitter Module	48
4.9 Programming Flow Chart for Receiver Module	49
4.10 Initial State during Circuit Simulation	50
4.11 Low Input during Circuit Simulation	50
4.12 High Input during Circuit Simulation	51
413 Outside View	52
4.14 Inside View	52



LIST OF APPENDICES

NO	TITLE	PAGE
А	Wireless Sensor Networks	56
В	Datasheet LM35	61
С	Datasheet LCD	74



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 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.

