



**Faculty of Information and Communication Technology**

**INTELLIGENT MUSLIM PRAYER COUNTER WITH  
PROGRAMMABLE INTERFACE CONTROLLER (PIC)**

**Hasniza Binti Hassim**

**Master of Computer Science in Software Engineering and Intelligence**

**2014**

## BORANG PENGESAHAN STATUS THESIS

JUDUL : INTELLIGENT MUSLIM PRAYER COUNTER WITH  
PROGRAMMABLE INTERFACE CONTROLLER (PIC)

SESI PENGAJIAN: 2012 – 2014

Saya : HASNIZA BINTI HASSIM

(HURUF BESAR)

Mengaku membenarkan tesis Sarjana ini disimpan di Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dengan syarat-syarat kegunaan seperti berikut:

1. Tesis dan projek adalah hak milik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. \*\* Sila tandakan (/)

\_\_\_\_\_ SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

\_\_\_\_\_ TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

\_\_\_\_\_ TIDAK TERHAD

\_\_\_\_\_  
(TANDA TANGAN PENULIS)

Alamat Tetap: No.108, Jln TTJS 3/8,  
Tmn Tuanku Jaafar,  
71450 Seremban, N.Sembilan

\_\_\_\_\_  
(TANDA TANGAN PENYELIA)

Profesor Madya. *Dr. Burairah Bin Hussin*  
Nama Penyelia

Tarikh: \_\_\_\_\_ Tarikh: \_\_\_\_\_

CATATAN : \* Tesis dimaksudkan sebagai Laporan Akhir Projek Sarjana (PS).

\*\* Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa.

**INTELLIGENT MUSLIM PRAYER COUNTER WITH  
PROGRAMMABLE INTERFACE CONTROLLER (PIC)**

**Hasniza Binti Hassim**

**A thesis submitted  
in fulfillment of the requirements for the degree of Master of Computer Science in  
Software Engineering and Intelligence**

**Faculty of Information and Communication Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2014**

## DECLARATION

I declare that this thesis entitle “Intelligent Muslim Prayer Counter With Programmable Interface Controller (PIC)” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature: .....

Name : .....

Date : .....

## **APPROVAL**

I hereby declare that I have read through this project report and in my opinion this project report is sufficient in terms of scope and quality for the award of the degree of Master of Computer Science (Software Engineering and Intelligence).

Signature: .....

Name : .....

Date : .....

## **DEDICATION**

I dedicate special thanks to my husband and my parents whose giving me support and motivation throughout my project class. This dedication are also to my lecture, Associate Professor Dr. Burairah bin Hussin for the consultation, advices, comments and support just to make sure that I can finish this project successfully. Thank you for the support in entering the UTeMEX 2013 Exhibition as well. I also want to thank you to all my friends especially to Musa bin Yusup Lada from Faculty of Electrical Engineering who has help me to design the hardware and finally won Bronze in UTeMEX 2013 Exhibition.

## **ACKNOWLEDGEMENT**

Firstly, thanks to Allah for given me a chance and strength to me for finishes this project which are Project 1 and Project 2 in one semester.

Special thanks to my lecture, Assoc. Prof. Dr. Burairah bin Hussin for all the guidance and help. I will never forget whatever he have support me and for being really understanding to me for complete this project successfully. Without his guidance and persistence help, this dissertation would not have been possible.

I also would like to thanks my project evaluators, Dr. Abdul Samad bin Hassan Basari and Dr. Abdul Samad Shibghatullah for their good comments and improvement that they have suggested.

Lastly, I would also like to thank to my fellow friend from Faculty of Electrical Engineering, Musa bin Yusup Lada who helps me a lot to complete my Project.

## **ABSTRACT**

Praying five times a day is a pillar of Islam which is fulfilled by all Muslims. Every rule of prayer should be implemented so that prayer worked perfectly acceptable to God. However, when performing prayer, it is possible that we lose focus and this has been proven through studies Electroencephalography studies. Very often we pray, we are doubt about the number of units completed, especially during perform four raka'ah prayers. Intelligent Muslim Prayer Counter with PIC algorithm has been designed to solve this problem. The use of the PIC algorithm is also not just limited to this current product but it can also be used to improve future products. One existing design has been review to find the product weaknesses and the improvement needed. A project by Hassan Faouaz which entitled Muslim Prayer Counter has been reviewed to develop the new circuit and study the weaknesses for the improvement for this invention. The design is also focus on the suitability for all different size of user and the design of algorithm used to program the PIC chip. By using PIC algorithm, there are more improvement can be made in future based on further value added requirement request by user or manufacturer.



## ABSTRAK

Menunaikan solat lima waktu merupakan rukun Islam yang wajib ditunaikan oleh semua umat Islam. Setiap rukun solat hendaklah dilaksanakan dengan sempurna supaya solat yang dikerjakan diterima oleh Allah SWT. Namun, ketika mengerjakan solat, ada kemungkinan kita kehilangan fokus dan ini telah dibuktikan melalui kajian Electroencephalography (EEG). Apabila kita menunaikan solat, kita seringkali ragu-ragu dengan bilangan rakaat yang telah diselesaikan terutamanya ketika menunaikan solat empat rakaat. Intelligent Muslim Prayer Counter dengan menggunakan PIC algoritma telah direkapi bagi menyelesaikan masalah ini. Penggunaan PIC algoritma ini juga bukan sahaja terhad untuk produk ini malah ia juga masih boleh digunakan untuk penambahbaikan produk pada masa akan datang. Selain daripada itu, terdapat satu produk yang berasaskan penggunaan alat pengiraan rakaat di sejadah yang direkapi oleh Hassan Fouaz dikaji kelemahan dan penambahbaikan produk dikenali. Reka bentuk pengiraan rakaat ini juga memberi tumpuan kepada kesesuaian untuk semua ketinggian pengguna dan reka bentuk algoritma yang digunakan untuk program cip PIC. Dengan menggunakan algoritma PIC, lebih banyak peningkatan boleh dibuat pada masa akan datang berdasarkan kepada penambahbaikan dan kepintaran produk berdasarkan permintaan pengguna dan juga pengilang.

## TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
	DECLARATION	i
	APPROVAL	ii
	DEDICATION	iii
	ACKNOWLEDGEMENTS	iv
	ABSTRACT	v
	ABSTRAK	vi
	LIST OF FIGURES	x
	LIST OF ABBREVIATION	ix
	LIST OF APPENDICES	xii
CHAPTER 1	INTRODUCTION	
	1.1 Background	1
	1.2 Problem Statement	2
	1.3 Objective	2
CHAPTER 2	LITERATURE REVIEW	
	2.1 Introduction	3
	2.2 Capture / Locate Knowledge	3
	2.3 Create Knowledge	5
	2.4 Transfer/ share knowledge	6
	2.5 Apply knowlegde	7
	2.6 EEG Analysis	7
	2.7 Muslim Prayer Counter (Faouaz)	11

<b>CHAPTER 3</b>	<b>METHODOLOGY</b>	
3.1	Introduction	12
3.2	Detector	13
3.3	Sensor Positioning	15
3.4	Counting Prostration	16
3.5	Product Improvement Needed	17
3.6	Circuit Development	17
3.6.1	PIC Microcontroller	17
3.6.2	Switching System	18
3.6.3	Software	18
3.6.3.1	Proteus 7 Prof.	18
3.6.3.2	ISIS 7 Prof.	19
3.6.3.3	PIC C	21
3.7	PIC16F84A	22
3.8	Flow Chart Diagram	24
<b>CHAPTER 4</b>	<b>RESULT AND DISCUSSIONS</b>	
4.1	Circuit Development	25
4.1.1	Circuit Design	25
4.1.2	PIC Connection	26
4.2	Raka'ah Counting Algorithm	28
4.3	Finished Product	30
4.4	How Does It Work	31
4.5	Functional Test	33
4.6	Conclusion	33
<b>CHAPTER 5</b>	<b>FUTURE WORK AND CONCLUSION</b>	
5.1	Future Work	34
5.1.1	Expend Area of Detector	34
5.1.2	Seven Segment Display	35
5.2	Conclusion	35
	<b>REFERENCES</b>	36
	<b>APPENDIX A</b>	38

## **LIST OF ABBREVIATION**

PIC	Programmable Interface Controller
$RP_{\alpha}$	Alpha Relative Power
PCB	Printed Circuit Board

## LIST OF FIGURES

FIGURE	TITLE	PAGE
2.1	Electrode positions on the scalp	8
2.2	$RP_{\alpha}$ during resting and the <b>actual</b> salat	9
2.3	$RP_{\alpha}$ during resting and the <b>acted</b> salat	
2.4	EEG reading during rest, actual and acted salat.	9
2.5	Muslim Prayer counter drawing. (Faouaz, 2004)	11
3.1	Length of users doing prostration.	12
3.2	Input and output sequence when using common switch.	14
3.3	Input and output sequence when using force sensor	14
3.4	Sensor positioning	15
3.5	Sensor position to detect forehead and hands	16
3.6	PIC16F84A pins overview	18
3.7	Window to design electronic circuit	19
3.8	Button to find the component	20
3.9	Component Library	21
3.10	PIC C Compiler Window	22
3.11	Placing The Cursor at PIC chip	23
3.12	Edit Component Window	23
3.13	Circuit Debugging	24
3.14	Flow chat of counter	24

4.1	Design of complete circuit	25
4.2	PIC16F84A input and output connection	26
4.3	Common cathode of seven segment display.	27
4.4	Electronics component on PCB	30
4.5	Finished product	31
4.6	Seven segment display '0'	31
4.7	Seven segment display '1'	32
5.1	Rug with larger area of detector	34

## **LIST OF APPENDICES**

<b>APPENDIX</b>	<b>TITLE</b>	<b>PAGE</b>
A	Counter Programming	38

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background**

Perform five times of salat is compulsory for all muslims. The five times prayer is already stated in Al-Quran where its compulsory to perform two raka'ah of Fajr which is before sunrise, four raka'ah of Zuhur, four raka'ah of Asr which is in midway between noon and sunset, three raka'ah of Maghrib, and four raka'ah of Isya' during night.

While perform praying, there are possibility to forget how many raka'ah have been settled especially during perform four raka'ah which are Zuhur, Asr, and Isya'. This situation might affect our concentration during perform praying.

To prevent this situation, one tools which is used by all muslims is identify. Praying rug is found the most suitable tools that can help to count raka'ah. Rug is being used for muslims at all level of age during perform salat. The new invention of rug can help user to count the raka'ah which already settled during perform salat. This innovation which named as Robust Muslim Prayer Counter is hope can help user to prevent from forgetting the raka'ah. Therefore, concentration and quality of salat can be improved.



## **1.2 Problem Statement**

Perform five times of salat is compulsory to all muslim. As a muslim we should follow the praying principle from start to end of praying. Sometimes while we salat, we may forget how many raka'ah have done. This will happen especially during perform four raka'ah of salat. This innovation is designed specially to prevent us from forget the raka'ah sequences and can be useful to teach children as well and help the elders and Alzheimer's from forgetting the raka'ah. In this project, the invention includes the effectiveness of the counter to count the raka'ah and also need to consider the position of each electronics component convenient to the different gender, size and age of user. One existing innovation has been review as a reference to develop the hardware. The project is by Hassan Faouaz entitled Muslim Prayer Counter. The innovation has been studies and find the improvement needed to make this praying rug are more user friendly and suitable for all level of user.

## **1.3 Objective**

- a. To design the model that intelligently count the raka'ah
- b. To develop the model using Programmable Interface Controller (PIC) algorithm
- c. To test the model and find further improvement for future work.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This project is analyze base on Personal Knowledge Management (PKM) theory.

The concept of knowledge is explored by Seufert, Back and von Krogh (2003) There are four generic KM processes identified which are (1) Capture / Locate

knowledge, (2) Create knowledge , (3) Transfer / Share knowledge and (4) Apply

knowledge. They attempt to explain knowledge management as a process of managing knowledge to enable “creation of entirely new knowledge, while also accelerating the innovation” (Seufert et al. 2003: 106).

#### **2.2 Capture / Locate Knowledge**

Perform five times prayer daily is compulsory for all muslim. The number of raka'ah are between two to four times. While perform salat, we might forget how many raka'ah have been done . In praying ethics there is a special movement that we can do which is sujud al-sahwi in case we if forget the raka'ah whether we have perform more or less than four raka'ah.

Below here are two hadith of why and when performing this movement :

1. [Narrated by Muslim, 1718]

But if he did that extra thing by mistake, then his solāt is not invalidated, but he should perform Sujud al-Sahwi (Prostration of Forgetfulness) after saying the Salām. The evidence for it is the sahih hadith of Abu Hurayrah (radiyallāhu`anhu).

Abu Hurayrah (radiyallāhu`anhu) reported, “When the Prophet (Sallallāhu `alayhi wasallam) said the Salām, after two rak`at in one of the two afternoon solāh, either Dzuhur or `Asar, and then they told him about it, he (Sallallāhu `alayhi wasallam) did the rest of the solāh, then he said the Salām, and then he observed the Sajdah twice (Sujūd Sahwi) after saying the Salām.”

2. [Narrated by al-Bukhari, 482; Muslim, 573]

Ibn Mas`ud (radiyallāhu`anhu) narrated, “The Prophet (Sallallahu `alayhi wasallam) led them in Solāt Dzuhur and he observed it five raka`at. When he had concluded, it was said to him: “Has something been added to the solat?” He said: “Why are you asking that?” They said: “You observed Salat five (rak’ah).” So he turned towards the qiblah and performed the Sajdah twice [i.e Sujūd Al-Sahwi]”.

In this hadith prove that if we had done five raka`at when perform four raka’ah in particular salat, we should also perform sujud al-sahwi.

Based on situations above, we can conclude that sujud al-sahwi can be perform if either we had done more or less rak'ah in certain time of salat.

By preventing sujud al-sahwi, we actually can improve the quality of salat. This is because we are fully concentrated and focus when performing salat without any doubt. To make sure that we keep on track when perform salat, counter which is placed on praying rug can help us in case if we are forgetting the raka'ah. By placing the counter on rug that can count raka'ah, we will no longer feel confuse on the sequence of raka'ah and this will help us to improve the quality and concentration when performing salat.

### **2.3 Create knowledge**

Information technology with electronics knowledge can help to develop the human computer interaction. Rug is chosen because it is the best tool to refer when we forget the raka'ah. This is because the position of user eyes is only on the rug so the user can refer to the counter once they forget the rak'ah.

By referring Muslim Prayer Counter that have been patterned by Hassan Faouaz, 2004, this new evolution will be improved based on the suitability to all level of user, children or adult, and the size of user whether tall or short. The suitable electronics component need to upgrade so the rug will be user friendly for example can be placed and carry anywhere without broken the electronics component and the placement of the counter will not interrupt the user concentration.

Listed below are a few improvement needed for Muslim Prayer Counter:

1. Ensure the counter can be used or not by step on the rug before perform salat.

In normal usage, user will step on rug before perform salat. To make sure that the counter can function during salat otherwise user's concentration might be interrupted during perform salat if counter is not functioning.

2. Because of user's physical is not same, the position of user's step is different. In this project two different position of foot detector will be placed on the rug. This matter will be discussed in methodology section.

3. Base on Hassan Faouaz pattern, he used switch to on the counter and count raka'ah. In this project, other method to detect the prostrating will be study to replace the switch.

Sometimes there are other object might be interrupt the counter for example baby is sitting on the counter or pet step on the counter. So the function of counter to count the raka'ah will be interrupted. Another two points will be added to ensure that counter counting raka'ah. The points are two palms that are touch the rug when doing prostration.

## **2.4 Transfer / Share knowledge**

When all the idea is identify, it will transfer to software and hardware design. The software design is focus on counter sequence. The idea is counter will count two times of prostrating for one raka'ah. For example in first raka'ah, the first prostrating, counter will turn to '1', followed by second prostrating, counter will display '1' also. Counter will display '2' on third and fourth prostration and it will be counting until the counter display '4' at seven segment display.

Hardware design is focus on the input and output of chip. The smallest number of input and output of chip is identify due to maximize the usage of pin at the chip.

## **2.5 Apply knowledge.**

The electronic circuit will be design using electronic software which is call Proteus while the programming or code will be write and compile in PIC C Compiler software.

## **2.6 Electroencephalography (EEG) Analysis**

EEG reflects the action of the brain. It is the electrical activity produced by the firing of the vast number of neurons recorded from the scalp. (Haider H.Alwasiti, 2010)

The practice of the Muslim prayer was capable of producing a higher state of calmness in the human mind, likely to be due to an increase in concentration and focus during the prayers. (Hazem Doufesh, Tarig Faisal, Kheng-Seang Lim, Fatimah Ibrahim, 2011).

EEG is a way of easily recording certain aspects of brain activity. When nerve cells in our brains are active, they produce electrical signals which reach the scalp surface. Therefore by using electrodes placed on the scalp we can measure these natural changes in voltage whilst doing an activity or solving a problem, and the pattern that is recorded is what is know as our 'brain waves'.

Figure below shows how the EEG data was recorded based on electrode positions on the scalp. Data is captured from eight position of electrodes. They are homologous frontal (F3, F4), central (C3, C4), parietal (P3, P4) and occipital (O1, O2) sites. The experiment is based on calculated mean alpha relative power ( $RP_{\alpha}$ ) between the alpha amplitude in the Dhuha prayer and the acted conditions in all eight electrode positions.

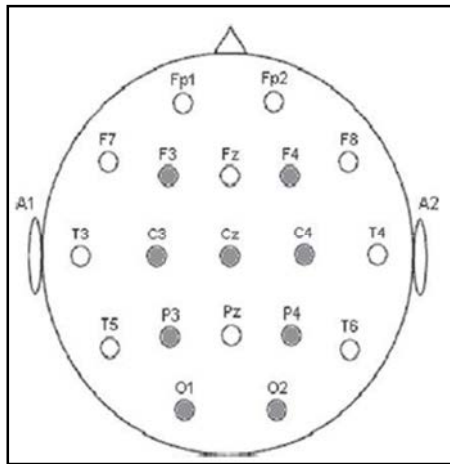


Figure 2.1 Electrode positions on the scalp

In this paper, nine muslims subjects between 20 and 29 years old were recruited (six males and three females). Based on the result, it clearly depicted the increase of mean  $RP_{\alpha}$  at parietal and occipital electrode positions during the prostration position, suggesting that the subject is experiencing the highest level of relaxation while performing it.

Figure below shows the reading of alpha relative power ( $RP_{\alpha}$ ) for actual and acted salat. The reading is collected during standing, bowing, sitting, prostrating, and rest.

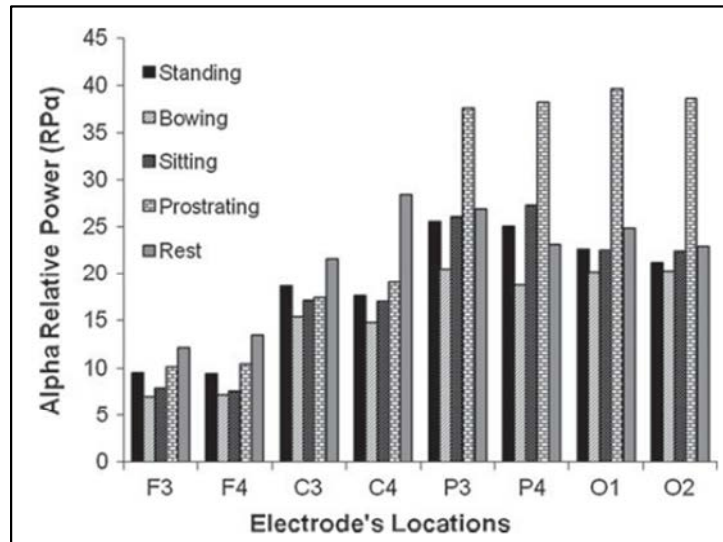


Figure 2.2 Mean alpha relative ( $RP_{\alpha}$ ) during resting and the **actual** salat

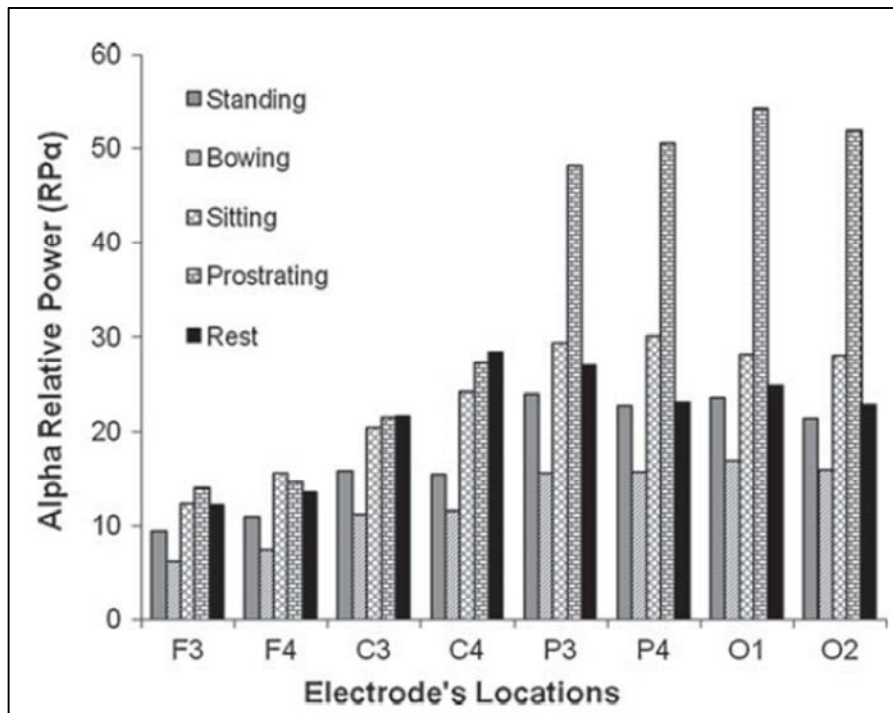


Figure 2.3 Mean alpha relative ( $RP_{\alpha}$ ) during resting and the **acted** salat