DEVELOPMENT OF A PORTABLE MUSLIM PRAYER TIME TABLE CLOCK

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Dedicated to my beloved sister Aashiyath Sana and nieces Rifah, Rafah and Raufa.

ABSTRACT

The five daily Muslim prayer times namely Fajr, Zuhr, Asr, Maghrib and Isha vary from place to place and from day to day. The timings of these five prayers are not even for locations with same time zones. The exact timing of each of the prayer is important, because it is obligatory for every Muslim to perform these prayers at the correct time. The prayer times for any given location can be mathematically determined if certain parameters such as the coordinates of the location are known. The mathematical calculation become lengthy and tedious when the calculation of all the prayer times are taken into account, but the algorithms can be implemented into computers, microprocessor or on microcontroller. This project is about finding and implementing algorithms required for calculating the accurate five daily Muslim prayer times on ARM7 LPC2138 microcontroller and display the prayer times using 7 segments. Most importantly allowing the users to change the location information and other parameters used for prayer time calculation which describes different figh rules (conventions from major Islamic Organizations) and difference of opinion (in Mazhab) for Asr prayer time. Thus making it a flexible portable Muslim Prayer time clock which can be used almost anywhere in the globe, catering for the minor differing in schools of Islamic thoughts.

ABSTRAK

Solat lima waktu bagi Muslim dinamakan Fajr , Zuhur , Asar , Maghrib dan Isyak berbeza-beza dari satu tempat ke tempat dan dari hari ke hari . Penentuan masa ini lima solat tidak tetap walaupun untuk lokasi dengan zon masa yang sama . Masa yang tepat bagi setiap solat adalah penting , kerana ia adalah wajib bagi setiap orang Islam untuk menunaikan solat ini pada masa yang betul . Waktu solat untuk mana-mana lokasi yang diberikan boleh ditentukan secara matematik jika parameter tertentu seperti koordinat lokasi diketahui. Pengiraan matematik menjadi panjang dan membosankan apabila pengiraan semua waktu solat diambil kira , tetapi algoritma boleh dilaksanakan ke dalam komputer , mikropemproses atau mikropengawal . Projek ini adalah tentang mencari dan melaksanakan algoritma diperlukan untuk pengiraan yang tepat solat lima waktu pada mikropengawal ARM7 LPC2138 dan memaparkan waktu solat menggunakan 7 segmen . Yang paling penting ialah membolehkan pengguna untuk menukar maklumat lokasi dan parameter lain yang digunakan untuk pengiraan masa yang meliputi kaedah-kaedah fiqh yang berbeza (dari persetujuan pertubuhan-pertubuhan Islam utama) dan perbezaan pendapat (dalam Mazhab) untuk waktu solat Asar . Oleh itu menjadikannya jam waktu solat Muslim yang fleksibel, mudah alih, dan boleh digunakan hampir di mana sahaja di dunia, dengan mengambil kira perbedaan pendapat kecil pemikiran Islam .

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

r	-	Sun’s radius
d	-	Sun to Earth distance
eqt	-	Equation of time
N	-	Day number (day of year)
JD	-	Julian day number
UT	-	Universal Time
Y	-	Year
M	-	Month
D	-	Day
L	-	Longitude of the location in degrees
Dec	-	Declination angle of the sun
Lat	-	Latitude of the location
H	-	Height above sea level in meters

CHAPTER 1

INTRODUCTION

This chapter will give an introduction to the project being implemented, highlighting the problems in the current systems and objectives of this project to overcome the problems.

1.1 Introduction

The purpose of this project is to study the available Muslim prayer time clocks and the algorithms required to calculate the accurate Prayer times. And use the algorithms to develop a portable Muslim prayer time table clock, which is flexible to cater for different figh rules and the difference of opinions in Mazhabs for calculating the five daily Muslims prayer times.

The five daily Muslim prayers are namely, from beginning of the Islamic day prayer Magrib (the sunset prayer), Isha which is performed after the disappearance of the twilight of sunset and clear appearance of stars in the sky. Fajr, the Morning Prayer which

is performed at true dawn until sun begin to rise, Zuhr the mid-day prayer which is performed when the sun just declines after reaching its highest point and finally Asr prayer which begins when the shadow of an object is equivalent to its height plus the length of its shadow at noon for standard method. In this project the algorithms needed for calculating the accurate mentioned prayer times will be implemented on ARM7 board (LPC2138) and the prayer times having displayed on 7 segments. The final system will have facilities for some inputs, which can be adjusted for allowing the algorithms inside to calculate accurate prayer time for any given location with figh rules and Mazhab opinions taken in to account, thus making it a flexible portable Muslim prayer time table clock.

1.2 Problem statement

In the available Muslim prayer time table clocks, the parameters are already predefined for calculating the prayer times for a particular place. Thus those clocks are valid for only those places whose parameters are same. It is also found that, using same parameter for large area mostly does not give accurate prayer time. More than that the available Prayer time clocks are not accurate throughout the year, because of the way the parameters are set. And also those clocks does not cater for different Mazhabs beliefs.

1.3 Objective

The objective of this project is to find out the algorithms for calculating the accurate Muslim prayer times and implementing it on ARM 7 (LPC2138) development board with necessary inputs for the user to set the parameters required for computing prayer time to a particular location and set the figh rules intended. Additionally, transferring the design in to copper board and evaluating the system for accuracy.

1.4 Scope of the project

The scope of this project is to design and implement a portable Muslim prayer time clock, which is flexible for catering the different figh rules and the difference of opinions in Mazhab. The final output of this project will be a piece of hardware (manually printed circuit board) with seven segments as display for prayer times, Date, time and other parameters as input. It also includes seven LEDs for indicating the figh rules and Mazhab difference for Asr prayer and a DIP switch (with six independent element) for choosing them. The algorithms will be implemented on LPC2138 development board which will control the display components to show the five daily Muslim Prayer times according to the user specified figh rules and Mazhab intentions given at the input.

1.5 Organization of the project

This report was organized into six chapters. Chapter one contains the introduction. This was then followed by literature review in chapter two. Methodology describing the methods used to calculate the accurate prayer times was presented in chapter three. Chapter four was about the architectural overview of the design. The issues faced in practical implementation was discussed in chapter five. Finally, the project conclusion was offered in chapter six.

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