AUTOMATIC *QIBLAT* DIRECTION USING PDA GPS

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This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Telecommunication Electronics) With Honours

Faculty of Electronics and Computer Engineering
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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : AUTOMATIC *QIBLAT* DIRECTION USING PDA GPS

Sesi Pengajian : 2005/2008

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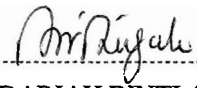
Signature : 

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Special dedication to my loving parents, Hj. Asan bin Abdullah and Hjh. Minah binti Sidek, for giving me birth in the first place, for unconditional support and encouragement to pursue my interests, even when the interests went beyond boundaries of language, field and geography. My best thoughts are extended to my parents, who taught me that education is the rest duty of both parents and children. Also to my siblings, my kind hearted supervisors Mr. Azmi bin Awang Md Isa and Miss Nurmala Irdawaty binti Hassan, all lecturers in Faculty of Electronics and Computer Engineering (FKEKK) and also to my dearest friend, Faridah Azura binti Yahaya.

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ABSTRACT

The Qur'an states that Muslims must Solat (Muslim prayer) in the direction of Mecca at certain times of the day. However, most Muslims have difficulty to perform their duty when they are in traveling because there is no such equipment available to determine the direction of *Qiblat*. Because of that, this project was developed for Muslims to determine the current *Qiblat* direction automatically by using Personal Digital Assistant (PDA) or Pocket PC with Global Positioning system (GPS) capability. This project can determine the current *Qiblat* direction automatically for users, who are on moving vehicles (Mobile) such as airplane, ship, train etc or who are in building (Static). For mobile condition, the *Qiblat* direction can be obtained by pointing the PDA in front of the user or mobile vehicle direction and the arrow of the compass will be pointing to the *Qiblat* automatically. For static condition, the *Qiblat* direction can be obtained by pointing the device (PDA) at any direction. The Graphical User Interface (GUI) based software has been developed using Microsoft Visual Basic.NET. The GPS receiver provides information of users' current location and the information will be synchronized with the developed software in order for the whole system to be operated correctly. This project is divided into 6 application which is contains Prayer Times, Local Time, Location Info, *Qiblat* Direction, Directional Finder and Calendar. This project focuses to improve the development of *Qiblat* Direction, Directional Finder, and Calendar application. The other three applications can be referred to "Mobile Prayer Times for PDA Application" thesis by Faridah Azura binti Yahaya. It is highly hoped that this system could facilitate Muslims to perform their daily duty in a proper manner.

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ABSTRAK

Al-Quran menyatakan bahawa setiap Muslim wajib menunaikan Solat (Sembahyang Muslim) menghadap ke arah Mekah pada waktu-waktu yang tertentu setiap hari. Walau bagaimanapun, kebanyakan Muslim menghadapi masalah untuk menunaikan kewajipan mereka ketika perjalanan jauh kerana tiada peralatan untuk menentukan arah Kiblat. Oleh kerana itu, projek ini telah di bangunkan untuk Muslim mengetahui arah Kiblat semasa secara automatik dengan menggunakan pembantu digital persendirian (PDA) atau PC Poket dengan kebolehan Sistem penentuan global (GPS). Projek ini boleh menentukan arah Kiblat secara automatik untuk pengguna yang berada di dalam kenderaan bergerak (Mobil) seperti di dalam kapal terbang, kapal, kereta api dan sebagainya mahupun yang berada di dalam bangunan (Statik). Bagi keadaan bergerak, arah kiblat dapat diperolehi dengan menghalakan PDA di hadapan pengguna atau pada arah kenderaan yang bergerak dan anak panah kompas tersebut akan menunjukkan arah Kiblat secara automatik. Bagi keadaan statik, arah kiblat dapat diperolehi dengan menghalakan alat (PDA) pada sebarang arah. Perisian Pengguna grafik antara muka (GUI) dibangunkan menggunakan Microsoft Visual Basic.NET. Penerima GPS akan memberikan informasi kedudukan semasa pengguna dan informasi tersebut akan diseragamkan dengan perisian yang dibina untuk membolehkan sistem tersebut beroperasi dengan baik. Projek ini terbahagi kepada 6 aplikasi di mana mengandungi Waktu Solat, Waktu Tempatan, Maklumat Lokasi, Arah Kiblat, Pencari Arah, dan Kalendar. Projek ini fokus untuk meningkatkan pembangunan aplikasi Arah Kiblat, Pencari Arah, dan Kalendar. Tiga aplikasi yang lain boleh merujuk kepada tesis "Mobile Prayer Times for PDA Application" daripada Faridah Azura binti Yahaya. Adalah diharapkan sistem ini dapat memberikan peluang kepada pengguna Muslim untuk menunaikan tanggungjawab mereka menunaikan Solat dengan lebih sempurna.

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LIST OF ABREVIATIONS

GPRS	-	General Packet Radio Service
GMT	-	Greenwich Mean Time
GPS	-	Global Positioning System
GUI	-	Graphic User Interface
IAU	-	International Astronomical Union
NMEA	-	National Marine Electronics Association
PDA	-	Personal Digital Assistant
Qiblat	-	*Ka'bah* in Makkah Saudi Arabia
RAM	-	Random-Access Memory
ROM	-	Read-Only Memory
SA	-	Selective Availability
Solat	-	Muslims Prayers
SVs	-	Space Vehicles/ satellites
USB	-	Universal Serial Bus
UT	-	Universal Time
WAAS	-	Wide Area Augmentation System
WLAN		Wireless Local Area Networks
WWAN		Wireless Wide-Area Networks

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CHAPTER 1

INTRODUCTION

This chapter will discuss about the project background, objectives and scope of the project, problem statement, system operation and report structure.

1.1 Project Background

The Qur'an states that Muslims must pray in the direction of Mecca at certain times of the day. For faithful Muslims, it was vital to be able to calculate the direction of prayer towards Mecca. In the early centuries of Islam, Muslim did not have tools to determine the *Qiblat* with precision. Only from third century onwards mathematical solutions for determining *Qiblat* were available even then their use was not widespread.

A common instrument was the "Qibla Indicator", an adaptation of the compass designed to indicate the direction of Mecca from other major cities. These often incorporated similar features to the sundial. [1]

From 3rd/9th century onwards, Muslim astronomers working in the tradition of classical astronomy devised methods to compute the *Qiblat* for any locality from the available geographical data. For them, the *Qiblat* was the direction of greater circle joining the locality to Mecca, measured as an angle to the local meridian. The

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determination of *Qiblat* according to this definition is a non-trivial problem of mathematical geography, whose solution involves the application of complicated trigonometric formula or geometrical considerations.

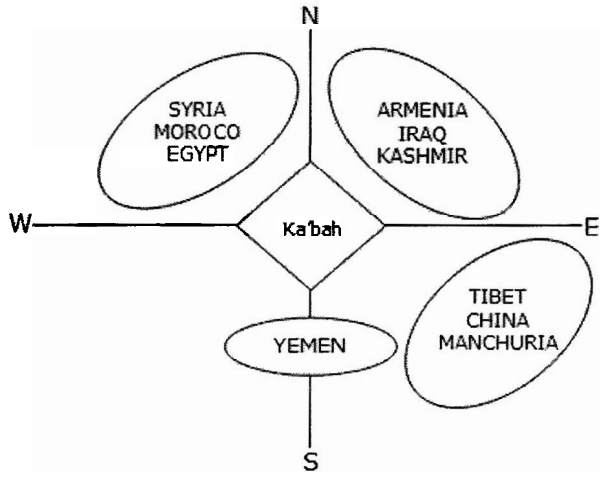

Figure 1.1: A Simple Scheme of Sacred Geography in the Published Text of the Kitab Al-Masalik of Ibn Khurradadhbih (3rd / 9th Century) [2]

However, mathematical methods were not available to the Muslims before the late 2nd / 8th and early 3rd / 9th centuries, the *Qiblat* was not generally found by computation anyway even after the mathematical solutions were available. This is very well illustrated in the diagram below for *Qiblat* in the cities of Cordova, Cairo and Samarqand. [3]

All the material above shows that the early *Solat* accepted some flexibility in the determination of the *Qiblat* and that it was not determined with a compass precision as the early Muslims did not have the tools to find that precision. In the Shafie School, facing the direction of prayer is a necessary condition.

Figure 1.2 shows a "Qibla Indicator" which is used for finding the direction of Mecca. The ornamental plate over the compass is engraved with the names of the four cardinal points and with a scale of degrees. On the bottom of the compass-box are engraved lines indicating the direction of the South point of the compass and various places including Medina. [1]

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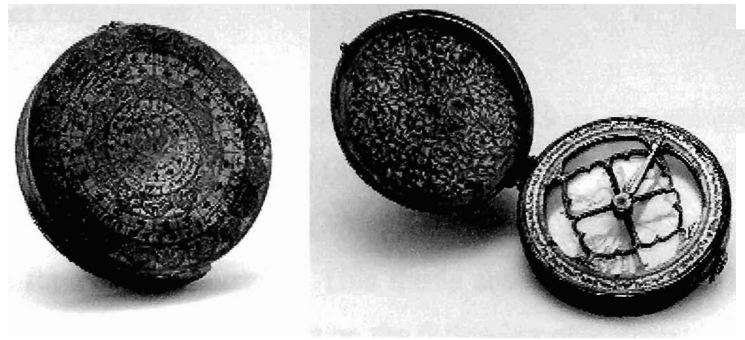

Figure 1.2: Qibla Indicator, Persian, 18th Century

The importance of the prayer in Islam cannot be understated. It is the first pillar of Islam that the Prophet (peace be upon him) mentioned after mentioning the testimony of faith, by which one becomes a Muslim. It was made obligatory upon all the prophets and for all peoples. Allah has declared its obligatory status under majestic circumstances.

However, most Muslims have difficulty to perform their duty when they are in traveling because there is no such equipment available to determine the direction of *Qiblat*. For an instance, Muslims traveling abroad on airplanes are still required to perform prayers, even though they may encounter difficulties to do so due to high velocity of the airplane and its orientation. Furthermore, Muslims need to identify their current location in order to know *Qiblat* direction. It is extremely difficult to determine the direction of *Qiblat* due traveling.

This project is divided into two major part; hardware and software. For hardware part, the Personal Digital Assistant (PDA) with built-in Global Positioning System (GPS) is used with the software developed using Microsoft Visual Basic.NET. PDA with built-in GPS will give the information of the latitude and longitude. Then, the program that have done develop using Microsoft Visual Basic.NET will synchronize with the information of PDA with built-in GPS. This project need to study on how to develop GUI-based software, which can determine the current *Qiblat* direction with additional features that can be incorporated into portable devices such as Personal Digital Assistant (PDA) or Smartphones with Global Positioning System (GPS) capabilities.

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1.2 Project Objectives

The final project is named as GPSolat, which is a combination of Global Positioning System (GPS) and *Solat* (Muslim Prayers). This GPSolat is divided into 2 main parts which is Automatic *Qiblat* Direction Using PDA GPS and Mobile Prayer Times for PDA Application. This thesis covered the *Qiblat* Direction Using PDA GPS application and carried out on the following objectives:

a) To improve and design an innovative system for Muslims to determine the current *Qiblat* direction in real time automatically by using Personal Digital Assistant (PDA) or Pocket PC with Global Positioning system (GPS) capability.

b) To develop multi-function application such as directional finder, calendar, converter Gregorian to Hijri vice versa, and etc.

c) To develop the GUI-based software to make it user-friendly device.

d) To study how GPS works and the functionality of PDA with built-in GPS.

e) To commercialize the project with protection '30 Days trial license key' and Help Menu.

1.3 Problem Statements

The importance of the prayer in Islam cannot be understated. It is the first pillar of Islam that the Prophet (peace be upon him) mentioned after mentioning the testimony of faith, by which one becomes a Muslim. Performance of *Solat* five times a day is mandatory to all Muslims. During performance of *Solat*, Muslims must turn their face towards the *Ka'bah*. It was made obligatory upon all the prophets and for all peoples. Allah has declared its obligatory status under majestic circumstances.

قَدْ نَرَىٰ تَقَلُّبَ وَجْهِكَ فِي ٱلسَّمَآءِ ۖ فَلَنُوَلِّيَنَّكَ قِبْلَةً تَرْضَىٰهَا ۚ فَوَلِّ وَجْهَكَ
شَطْرَ ٱلْمَسْجِدِ ٱلْحَرَامِ ۚ وَحَيْثُ مَا كُنتُمْ فَوَلُّوا۟ وُجُوهَكُمْ شَطْرَهُۥ ۗ وَإِنَّ
ٱلَّذِينَ أُوتُوا۟ ٱلْكِتَٰبَ لَيَعْلَمُونَ أَنَّهُ ٱلْحَقُّ مِن رَّبِّهِمْ ۗ وَمَا ٱللَّهُ بِغَٰفِلٍ عَمَّا
يَعْمَلُونَ ﴿١٤٤﴾

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(O Prophet!), We see your face turning to the heaven (For guidance). Now shall please you turn then your face in the direction of The Sacred Mosque; Wherever you are, turn your faces in that direction. The people of the book know well that this is the truth from their Lord. And Allah is not unmindful of what they do.

(Sura Al-Baqara, Juz 1: 144) [4]

Recently we are facing some confusion regarding the methods of finding out the direction of the *Ka'bah*. As far as my knowledge goes, this is the first time such confusion has appeared since the inception of *Solat* more than fourteen hundred years ago. Moreover, this confusion is apparently confined to North America. I strongly feel that a thorough discussion and deliberation in a congenial environment is needed to remove the confusion once and for all.

The main problem in Islamic astronomy is the accuracy of *Qiblat* (the position of facing the '*Ka'bah*' during prayers). There were no accurate methods in finding the *Qiblat*. Muslim astronomers and geographers starting from the 8th century took up for best methods of *Qiblat* direction using the techniques of measurement of geographical coordinated and trigonometry that they have acquired from the Greeks.

However, most Muslims have difficulty to perform their duty when they are in traveling because there is no such equipment available to determine the direction of *Qiblat*. For an instance, Muslims traveling abroad on airplanes are still required to perform prayers, even though they may encounter difficulties to do so due to high velocity of the airplane and its orientation. Furthermore, Muslims need to identify their current location in order to know *Qiblat* direction. It is extremely difficult to determine the direction of *Qiblat* due traveling.

The previous project has their disadvantages and this project will update and recover their disadvantages. The main disadvantage is the previous of this project is the *Qiblat* direction is only can be used on moving condition (Mobile) such as inside moving vehicles, but not on static condition. When we in the static condition, we cannot know the *Qiblat* direction.

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