

GPS CLOCK

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PROJEK SARJANA MUDA II

Tajuk Projek : GPS CLOCK

Sesi Pengajian :

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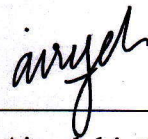
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**Dedicated in thankful for appreciation for support, encouragement understanding
to my beloved mother and all my family members**

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ABSTRACT

The purpose of this project is to develop a GPS clock where the information of GPS data is extracted from GPS modem. GPS Modem is a device that provides accurate information such as time, date, longitude, and latitude. To ensure the accuracy of the GPS clock, GPS clock is compare with Malaysian Standard Time. The advantages of this GPS clock is it can provide the most accurate time to user and it also required less technical maintenance. The difference between GPS clock and high spot wall clock is that the time sometimes need to be adjusts because the time deviation is not very accurate. The user needs to climb up manually to adjust the wall clock where it is hard to reach. GPS clock provide the solution for this problem which automatically correct time information. In addition, this GPS clock is embed with Xbee, a wireless communication device that can transmit and receive the time data accordingly. The transmitter of Xbee will transmit the data from fragmentation date and time data of GPS and sent to the destination address of receiver Xbee. It is hoped that this project will be beneficial to the community and act as reference clock anywhere.

ABSTRAK

Tujuan projek ini ialah untuk membangunkan satu jam GPS di mana maklumat data GPS dikeluarkan dari modem GPS. GPS Modem ialah sebuah alat yang memberikan maklumat tepat seperti masa, tarikh, garis bujur, dan latitud. Untuk memastikan ketepatan jam GPS, jam GPS bandingkan dengan Standard Malaysia Time. Kelebihan jam GPS ini ialah ia boleh menyediakan paling masa tepat untuk pengguna dan ia juga perlukan penyenggaraan yang kurang teknikal. Perbezaan antara jam GPS dan jam dinding yang tinggi adalah kadangkala paparan masa perlu dilaraskan semula kerana sisihan masa tidaklah terlalu tepat. Pengguna perlu melaras jam secara manual untuk membetulkan paparan jam dinding di mana ia adalah sukar untuk dicapai. Jam GPS menyediakan penyelesaian untuk masalah masa ini yang secara automatik membetulkan maklumat tersebut. Di samping itu, jam GPS ini disambungkan dengan XBee, alat komunikasi tanpa wayar yang boleh menghantar dan menerima data masa sewajarnya. Pemancar XBee akan menghantar data dari pemecahan data GPS masa dan tarikh; dan dihantar ke alamat destinasi penerima Xbee. Diharapkan bahawa projek ini memberi manfaat kepada masyarakat sebagai rujukan masa di mana saja.

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LIST OF ABBREVIATIONS

ASCII	-	American Standard Code for Information Interchange
BOR	-	Brown-out Reset
EEPROM	-	Erasable Programmable Read Only Memory
GPS	-	Global Positioning System
GPGGA	-	Global Positioning System Fix Data
GLL	-	Geographic Latitude and Longitude
GSA	-	GPS DOP and active satellites
GSV	-	GNSS Satellites in View
GMT	-	Greenwich Mean Time
IEEE	-	Institute of Electrical and Electronics Engineers
I/O	-	Input or Output
LCD	-	Liquid Crystal Diode
NMEA	-	National Marine Electronics Association
OST	-	Oscillator Start-up Timer
PIC	-	Programmable Interface Controllers
PC	-	Personal Computer
PWM	-	Pulse Width Modulation
PDIP	-	Plastic Dual Inline Package
POR	-	Power-On Reset
PWRT	-	Power-up Timer
QFN	-	Quad Flat No-Lead
RS232	-	Recommended Standard 232
RISC	-	Reduced Instruction Set Computer

RMC	-	Recommended Minimum Specific GPS Data
SOIC	-	Small-Outline Integrated Circuit
SIRIM	-	Standards & Industrial Research Institute of Malaysia
UTeM	-	Universiti Teknikal Malaysia Melaka
UTC	-	Coordinated Universal Time
VTG	-	Course over Ground and Ground Speed
ZDA	-	Time and Date

CHAPTER 1

INTRODUCTION

1.1 Background

Global Positioning System or GPS is well known and widely used. Example of application using global positioning system is the current smart phone. This system provides location and time information in all weather conditions and can help the user to give exact location time based on their current location.

There have been many types of global positioning system such as sport GPS system and watches; phones with GPS and street navigation system.

1.2 Introduction of Project

This project starts with a research from internet and observation surrounding. Nowadays, the GPS information system only focuses to application for vehicle and mobile phone user. Hence, the project to design a prototype of broadcast system to display the time information via GPS clock system needed to be developed. The systems provide an accurate time and date information for the clock to display on LCD with GPS

fragmentation data. GPS receiver will provide location position and current time information. The data from GPS will be sent to an embedded microcontroller device to process and display the time and date. The system will automatically correct and update current time and date accordingly through GPS modem data.

The GPS clock is a digital display clock. When the GPS clock is turned on, it will initialize less than one second for GPS to modem receive the information data and PIC microcontroller extract the data. The GPS fragmentation data after that displayed on LCD which include the time and date. At the same time, fragmentation of data will be broadcast from one point to another point via Xbee modem and displayed on LCD. The GPS clock time and date will continuously update and autocorrect information as long as the power supply is turned on. This will reduce the need for maintenance in the future when the system is fully produced. GPS systems can also be implemented on the time display to be positioned in a building or other facility.

These GPS clock is divided into two clock device, one is main GPS clock and another one is wireless clock of GPS clock. The main GPS clock is contain GPS modem, PIC microcontroller, Xbee modem and LCD display. The wireless clock of GPS clock is only consist Xbee modem and PIC microcontroller. Xbee is used as wireless communication devices that transmit and receive the time and date data. This wireless clock used Xbee modem as receive the time and date from the transmitter of Xbee at main GPS clock and display the receive data at LCD display. This system consists two parts which is main GPS clock and wireless clock of GPS clock:-

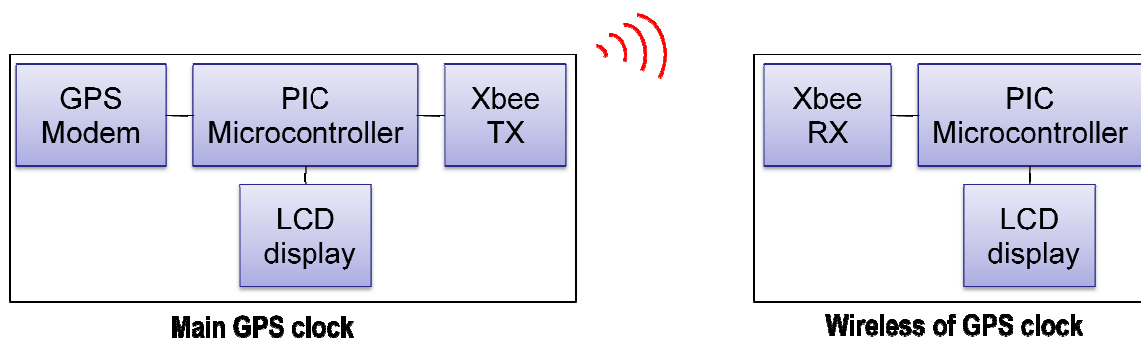


Figure 1: Two part in this project

Using the GPS receiver as a data resource of an accurate time gives more positive and useful for user. The advantages of GPS clock is:

- i. An autocorrect clock system when power is up because it is used DC supply.
- ii. Free maintenance: Consumer no need to adjust the clock data (time) because it is autocorrect clock.
- iii. Inside building: Consumer inside the building get the right and same information of time and date of GPS clock in their broadcast range.
- iv. Education: Give more time for learning. For lecture or teacher, it will help most of class time by drafting time teach them with more quality per chapter. But for student, it will teach students to be more punctual when step to classes. So it will increase potential of the student community to more appreciate the value of time.
- v. Government or Non-government sector: The employer will standardize the time of employees punch in and out. With an accuracy of time-tracking, it will capture lost productivity with precise timing by following their standardize time and goal.
- vi. Public: If the GPS clock placed in high spot and clearly to see, it can help public estimate their travel time from one destination to another destination. So, it will educate society to more appreciate in time.
- vii. Corporate: The employees improve productivity and increase accountability for managing time starting and ending their day on time. The meeting will start and finish on schedule and as to keep breaks limited time stated in Human Resource policy.

1.3 Project Objectives

The main objectives of this GPS Clock project are to give the user the accurate time with real time system.

The objectives to develop this project are:

1. To design and developed a GPS clock.
2. To extract data and time from GPS modem, then segregate the data, and display on the LCD display.
 - a) The GPS modem receives a continuously data string with contains location and time in NMEA protocol. The GPS clock only use and display data of time which is hour, minute and second. By using developed software, the data string of another information and time need to be successfully extract from GPS modem, then segregate the data, and display only time on LCD display.
3. To develop an algorithm to update or reset clock when deviation from GPS clock is high.
 - a) The algorithm to update or reset clock when deviation from GPS clock high is developed by using programmed software. The meaning of GPS clock deviation high is when GPS receive data which include of UTC time. The problem is UTC time need to update or reset by refer to local time zones. As developed software is an algorithm to correct the time accurately in this project.
4. To compare accuracy of GPS clock with Malaysian Standard Time
 - a) The accuracy of GPS clock and Malaysian Std. Time is compare manually. The collected data is presented in table analysis in result.
5. To establish a communication between the GPS modem, PIC microcontroller, Xbee modem and LCD display.
 - a) The communication between each component influence in this project must troubleshoot and test their performance as show the final result of GPS clock is achieved.

1.4 Problem Statement

There have several problems if user does not know the time of a day accurately. It is important to neither get perfect time for arranged working time nor do anything else. GPS Clock with navigational system determines us the time of a day accurately and display only hour, minute and second in LCD display in any weather. In the situation where when wall clock were in high spot and difficult to be achieved, consumer no need to keep climb up to adjusted anymore the time but the GPS clock will automatically adjusting time if any inaccurate time occurs during it function.

There have been several problem statements that involve implementing this GPS clock project:

1. Useless battery consumption: The used of disposable battery consumption affect the performance of clock making the performance slow and time display not accurate. The disposable battery also cannot use for long term.
2. No accurate time: There no standardize of time display in inside building or in office room, the employee will not punctual in and out. This will cause the weakness productivity and quality of time management because of the time display not correct.
3. No exactly time display: Consumer will deliberately or certainly set their clock leading than usual time clock. This is to avoid them from too late get up at the morning, to complete the work or task, and any other reason. This is because people are do not know the exactly the time, so they lead the time than usual.
4. Difficult maintenance: In high spot wall clock, sometimes the time need to adjust because the time is lag or lead is high. The consumer need to climbing up to manually adjust wall clock were it is difficult to be achieve.
5. No automatic correct for the clock when the power source is off.

As problem statement listed above, by implement this GPS clock will display an accurate and exactly time display, use direct current source which maintain clock

performance, free maintenance and autocorrect the clock automatically when power up. This will cause generate society is disciplined and more appreciating time. Furthermore, it is will improve and enhance productivity and quality of time management in that facility area.

1.5 Project scope

There are three main parts involve in this project of GPS clock which is research of other related project, software developed and hardware developed. In research with other related project is a from literature review with other related GPS clock project. In software developed is study in basic C programming, GPS data protocol, writing program command for GPS clock, setting Xbee modem for broadcast GPS clock data and show on LCD display. The design circuit of GPS clock is also carried out in design circuit software. For the hardware part is the process of connection the PIC microcontroller, GPS modem, Xbee modem and LCD display. After that, integrate the program code with hardware. The test and troubleshoot implement if there is an error occur. All parts should be completed to ensure this system operates properly.

The scope of work in this project is described as follows:

1. Literature Review of GPS clock project
2. Study the Basic C Programming
3. Design the PIC microcontroller of PIC16F876A circuit
4. Setting the condition of Xbee transmitter and receiver address number
5. PIC Programming for GPS Clock, Xbee and the LCD display
6. Integrate Program Code with Hardware
7. Configure communication between microcontroller PIC16F877A, GPS modem, Xbee modem and LCD display
8. Develop the hardware
9. Test and Troubleshoot the system

10. Data Analysis

The scope of work in this project is included design circuit diagram of PIC microcontroller (PIC16F876A) and its connection to GPS modem, Xbee modem and LCD display.

1.6 A Short Description of Methodology

The project will be divided into two parts, which are part 1 and part 2. The part 1 of the project will be done in the first semester and part 2 will be done in the second semester. Further explanation of methodology will be discussed in Chapter 3.

Part 1 will cover a few stages, which are:

- a) Research and understand the flow of GPS system function.
- b) The reliability of GPS data extracted from GPS modem must be tested with a PC through RS232.
- c) Extract the GPS data from the GPS modem and display on the HyperTerminal software.
- d) Understand the function of GPS data output that produces in NMEA protocol.

Part 2 will cover a few stages, which are:

- a) Design and develop the circuit of PIC16F876A circuit.
- b) Setting the Xbee modem for transmitter and receiver.
- c) Write the program code for extracting data string from GPS receiver module and segregate it into useful data for time synchronizing and then display on LCD.
- d) The developed program code as an algorithm to update or reset clock and then compare with Malaysia Standard Time.
- e) Develop the integration of software and hardware, testing and troubleshooting if there are any errors.