SMART TRACKING SYSTEM FOR CHILDREN DETECTION

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CERTIFICATION OF APPROVAL

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Mohd Naufal bin Ahmad Khairi

A project dissertation submitted to the
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Approved:

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Project Supervisor

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK

June 2009

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

MOHD NAUFAL BIN AHMAD KHAIRI

ABSTRACT

Nowadays, we often read the kidnapping crimes especially among children whether in newspaper or television. Until now, many of the crime cases were ending unresolved because the authorities lost track and hints of the kidnapper. This crime getting worst time by time, and generally all parents and authorities have to re-counter this crime. This project was proposed to help them to secure these children from kidnapper and track the children while there are far away from the parents. The main purpose of this project is to locate and track children movement in real-time from control center system; PC or PDA, and the data will be recorded. The Smart Tracking System for Children Detection is an application system that will use a combination of Global Positioning System (GPS) and Global System for Mobile Communications (GSM) technology. GPS is officially called NAVSTAR-GPS that can give information of person or object's location, speed, direction and time. While, the GSM is a technology of cellular network which able to communicate with other network carriers through voice calls or Short Message Service (SMS). Then, this report will also include the findings and results of all related work those had been completed. This report will detail the method approached to carry out this project up until it become successful. At last this report will conclude the overall project to approve concepts based on findings and results.

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First and foremost, the author would like to express his grateful to God, for His blessings. The author's utmost gratitude goes to his project supervisor, Dr Mohd Yunus bin Nayan. Without his guidance and patience, the author would not be succeeded to complete the project.

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LIST OF ABBREVIATIONS

STSCD	Smart Tracking System for Children Detection
GPS	Global Positioning System
GSM	Global System for Mobile Communication
KML	Keyhole Markup Language
PC	Personal Computer
XML	Extensible Markup Language
NMEA	National Marine Electronics Association
PDA	Personal Digital Assistant
RINEX	Receiver Independent Exchange Format
RTCM	Radio Technical Commission for Maritime Services
USB	Universal Serial Bus
ICSP	In-Circuit Serial Programming
TTL	Transistor-Transistor Logic

CHAPTER 1
INTRODUCTION

1.1 Background of Study

Almost every day, we have been triggered with children kidnapping crimes occurring around the world. Our country, Malaysia is not exceptional. The cases of Sharlinie and Nurin Jazlin were among the crimes those have catch public's eyes.

This project was developed to secure and protect children from the kidnapping crimes. This system has the functionality almost similar with car security system. It is able to help parents and authorities to track targeted children from control center by using GPS-GSM technology. Current technology of GPS is able to penetrate through window even the roof. So regardless if your child is inside a concrete building, parking garage, under a bridge or unconscious in heavy foliage, they can be quickly found, and if necessary, help rendered. This technology will be integrated with alarm system in the control center in case the children trapped in dangerous situation. The child security system is a prototype based on the real-life context.

The Smart Tracking System for Children Detection (STSCD) is a device that is divided by two terminals; the control center and the security device wear by the children. As mentioned, the STSCD system consist of GPS technology, where the parents or authorities are able to keep track the targeted person / children and record the location, time, and speed in database system. While, the security device which is wear by children communicate with control center using GSM technology. The children will have a unique ID to be identified.

The control center is a database system that able to store and display the data through graphical user interface (GUI) to show the location of children. To compromise its security level, the data can be updated for every minutes or less. If the child is in emergency situation, he/she can alert the control panel and the data information will be updated frequently faster than default timing.

The STSCD circuit will consist of microcontroller, switch buttons, GPS receiver and GSM modem. The microcontroller extracts the location information from the GPS receiver using a specific data transmission standard either from NMEA (National Marine Electronics Association), RINEX or RTCM. Figure 1 brief the operation of this system.

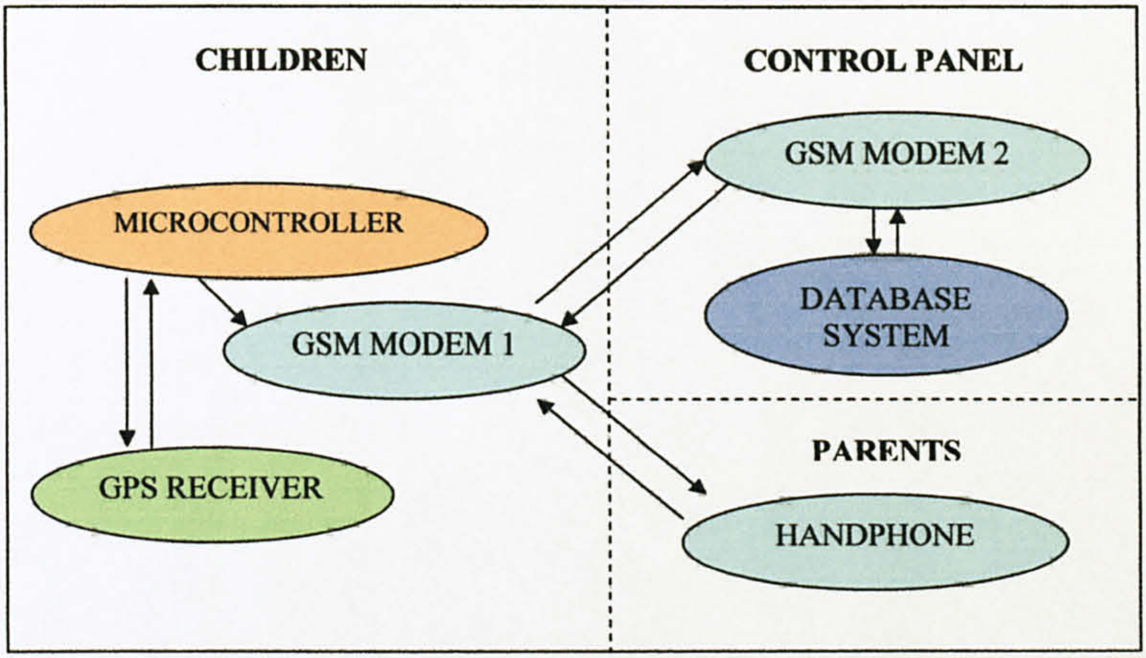
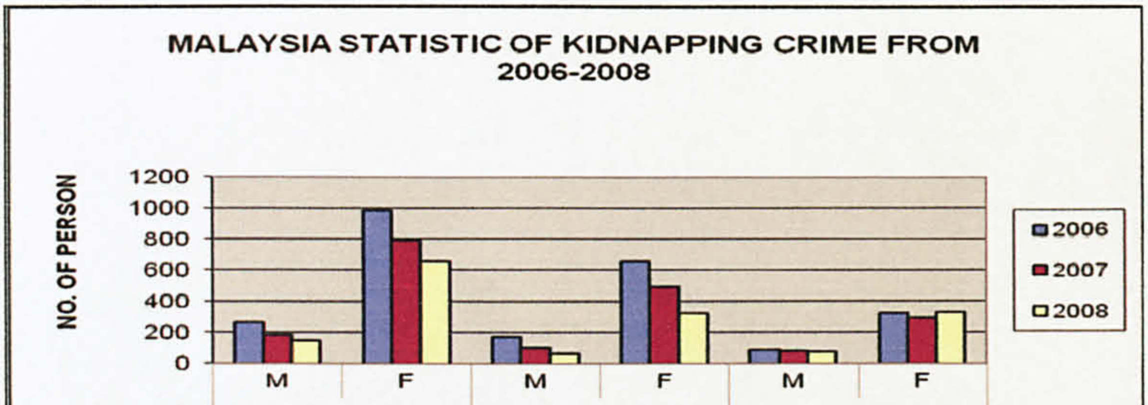


Figure 1: Major Components of Smart Tracking System for Children Detection (STSCD)

Figure 1 shows the operation and major components of the overall system. It is clearly obvious that the microcontroller is the main controller between all the other components, with the two GSM modems communicating with each other. GPS receiver only talks to the microcontroller and the microcontroller will tell the GSM modem 1 to send the data (i.e.: location, time, speed) to the parents who will be in the control center or own the main link. This link is referred to hand phone owned by selected people, especially parents. The STSCD is the first step towards the real security system for children outside, and it will become more advance in the future.

1.2 Problem Statements

The kidnapping crime shows significant value due to several factors such as syndicate of child kidnapping to run illegal business where the babies or child will be sold to other parties or raped. The authorities try to reduce this crime by strengthening the laws and rules, increase the forums and security system in public areas.



	TOTAL OF LOST		FOUND BACK		STILL MISSING	
	M	F	M	F	M	F
2006	265	985	174	659	91	326
2007	187	791	105	494	82	297
2008	150	661	69	327	81	334

Figure 2: Kidnapping Crime Statistics in Malaysia 2006-2008 (August)

Figure 2 shows the statistic of kidnapping crime that include all age of victim in Malaysia. The statistic shows that the total of lost person is decreasing by year, but the number is still high where more than 100 male and 600 female of children are considered lost. Furthermore, the number of missing person also doesn't show a big decreasing. The statistic also shows that the number of female victims is about 3 times higher than male.

Kidnapping especially among children has been on the rise globally. This problem might be related to obstacles those need to be solved. There are described as below:

1. Authorities need times to solve the kidnapping cases due to lack information.
2. The victim might be hiding by kidnappers at unknown places.
3. Weakness in security system for public
4. Parents are careless in guarding and monitoring their children.
5. Parents don't have enough time to monitor or be with their children because of other commitment.

1.3 Significance of Project

People nowadays especially parents need help in guarding and monitoring their children whereabouts. While the authorities especially police will need advance technology to help them to solve kidnapping crime cases..

The Smart Child Detector can help both parties and others in monitoring targeted person's location, speed and direction in real time. It can be used to protect people we care even though they are far away from us.

The system is reliable to be used nowadays since the technology of GPS and GSM were highly used by people around the world.

1.4 Objective

Upon completing the project, a few objectives need to be achieved. The objectives of this project are as follows:

1. To prevent the children from being kidnapped by establish the real time tracking or navigating
2. To let the parents keep track and monitor their children to keep them safe.
3. To help the authorities to solve the kidnapping cases easily by providing the important information such as last location detected through database.

1.5 Scope of Study

This project will cover all the research of all technical and non-technical as below:

1. Investigating and analyzing the real situation of kidnapping crimes among children especially in Malaysia
2. Learn and build understanding of GPS and GSM technology concepts and applications,
3. Design the prototype of GPS-GSM module interfacing with microcontroller
4. Create a windows application and database system to record and store data,
5. Integrate both hardware and software to be a complete system.

CHAPTER 2
LITERATURE REVIEW

2.1 Kidnapping Crime against Children

The United Nations Convention on the Rights of the Child defines a child as "every human being below the age of 18 years unless under the law applicable to the child, majority is attained earlier." Biologically, a child is anyone in the developmental stage of childhood, between infancy and adulthood. Globally, the kidnapping to children is happening because of personal interest of kidnappers. This consequences can relate to as simple as hostage for money, adultery cases until as worse as murdering and illegal organ trading. [1]

In Malaysia missing children are basically can be classified into two categories. The first category is disappearance, which includes running away from home. The other category is kidnapping or abduction. If parents abduct their children, it is usually classified as an ordinary missing person's case.

Since 2004, more than 6,270 teenagers have been reported missing in Malaysia and out of these 4,620 of the missing children are teenage girls. However, the police statistics have revealed that in 2005, 71 girls who ran away from their homes were found death. In 2006, another 71 missing girls' bodies were found. In 2007, there were 3,246 reports lodged with the police for missing girls.

Between January 2004 and May 2005, 4,237 of the 6,270 missing children, mostly teenagers, were found and returned to their home. However, during the same period, a total of 149 girls under the age of nine were also reported missing.

Statistics of missing children in Malaysia reveal that since 2004, a total of 5,996 children under the age of 18 went missing from their homes. Other than 1,904 children, the rest subsequently returned home or were found and returned home by the police. The majority of children the 1,904 children still missing are girls and they are aged between 14 years and 17 years. In 2008, between January 1 and April 13, 303 children and teenagers below the age of 18 have been reported missing in Malaysia according to the Deputy Int ernal Security Minister of Malaysia. [2]

2.2 Currently Available Method

The implemented methods to counter crime such as law and policy enforcement, launching the awareness programs such as consensus, seminar and forums, and strengthening the defense unit are among methods we have currently. The mobile technology has proved its significance benefits towards public safety. For instance, GPS-GSM has been combined to develop tracking system for vehicle such as ship and car. After, GPS application has been introduced for civilian at year 1983, it had been advanced and improved. Most of the application of the system was started popular around year 2000 where the use of GPS technology has shown it's relevant to public people. As GPS has been started open for public, the GPS technology has been applied for many tracking purposes such as tracking of vehicle, person, pet and assets as well as for navigation purpose.

In developed countries such as US, Britain and Japan, they have widely developed this system for personal interest and public safety. This technology is believed will become more useful, it is very relevant and reliable in terms of its size, accuracy and function soon. A Mexican company has discovered and launched a service to implant microchips in children body as an anti-kidnapping device. Solusat, as a distributor of Verichip, is a rice-size microchip that is injected beneath the skin and transmits a 125-kilohertz radio frequency signal. They have market the device as an emergency ID under its new VeriKid program. Currently, most of the system's applications are expensive and many people cannot afford for it.

2.3 Global Positioning System (GPS)

The **Global Positioning System (GPS)** is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. It is the only fully functional Global Navigation Satellite System (GNSS). The GPS uses a constellation of at least 24 (32 by March 2008) Medium Earth Orbit satellites that transmit precise microwave signals, that enable GPS receivers to determine their location, speed, direction, and time. GPS was developed by the United States Department of Defense. Its official name is **NAVSTAR-GPS**. Although NAVSTAR-GPS is not an acronym, a few acronyms have been created for it. The GPS satellite constellation is managed by the United States Air Force 50th Space Wing [3].

GPS has become a very popular to navigation worldwide, and a useful tool for map-generator, land surveying, commerce, scientific purposes, and as simple as hobbies such as geo-caching. GPS also can provide a precise time reference used in many applications including scientific study of earthquakes, and synchronization of telecommunications networks all around the world. The GPS worldwide satellite control system consists of five monitor stations and four ground antennas. The monitor stations use GPS receivers to passively track the navigation signals of all the satellites. Information from the monitor stations is then processed at the master control stations, used to accurately update the satellites' navigation messages.

Each GPS satellite transmits data that indicate its location and the current time. All GPS satellites synchronize operations so these repeating signals are transmitted at the same instant. Ground stations precisely track each satellite's orbit. GPS satellites transmit signals on two main carrier frequencies, L1 and L2. The signals, moving at the speed of light, arrive at a GPS receiver at slightly different times because some satellites are farther away than others.

The distance to the GPS satellites can be determined by estimating the amount of time it takes for their signals to reach the receiver. When the receiver estimates the distance to at least four GPS satellites, it calculates its position in three dimensions. The accuracy of a GPS-determined position depends on the receiver. Most hand-held GPS units have 10-meter to 20-meter accuracy. Other receivers use a method called differential GPS (DGPS) for much higher accuracy.

2.4 Global System for Mobile Communications (GSM)

Global System for Mobile communications or originally the name of Groupe Spécial Mobile is the most popular standard for mobile phones in the world. This system is used by over 3 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. Because of GSM differs from its predecessors in that both signaling and speech channels are digital, it is considered a second generation (2G) mobile phone system. This means that data communication was easy to build into the system. A GSM modem can be an external modem device, where we can insert a SIM card into this modem, and connect the modem to an available serial port on computer's serial terminal.

The ubiquity of the GSM standard has been an advantage to both consumers (who benefit from the ability to roam and switch carriers without switching phones) and also to network operators (who can choose equipment from any of the many vendors implementing GSM). GSM also pioneered a low-cost, to the network carrier, alternative to voice calls, the Short message service (SMS, also called "text messaging"), which is now supported on other mobile standards as well. Another advantage is that the standard includes one worldwide Emergency telephone number. This makes it easier for international travelers to connect to emergency services without knowing the local emergency number [4].

Newer versions of the standard were backward-compatible with the original GSM phones. They are several version including GPRS and EDGE. For example, Release '97 of the standard added packet data capabilities, by means of General Packet Radio Service (GPRS). Release '99 introduced higher speed data transmission using Enhanced Data Rates for GSM Evolution (EDGE).

CHAPTER 3
METHODOLOGY

3.1 Procedure

In order to make sure all the project steps is done and running smoothly, this project must be done according to phases as below:

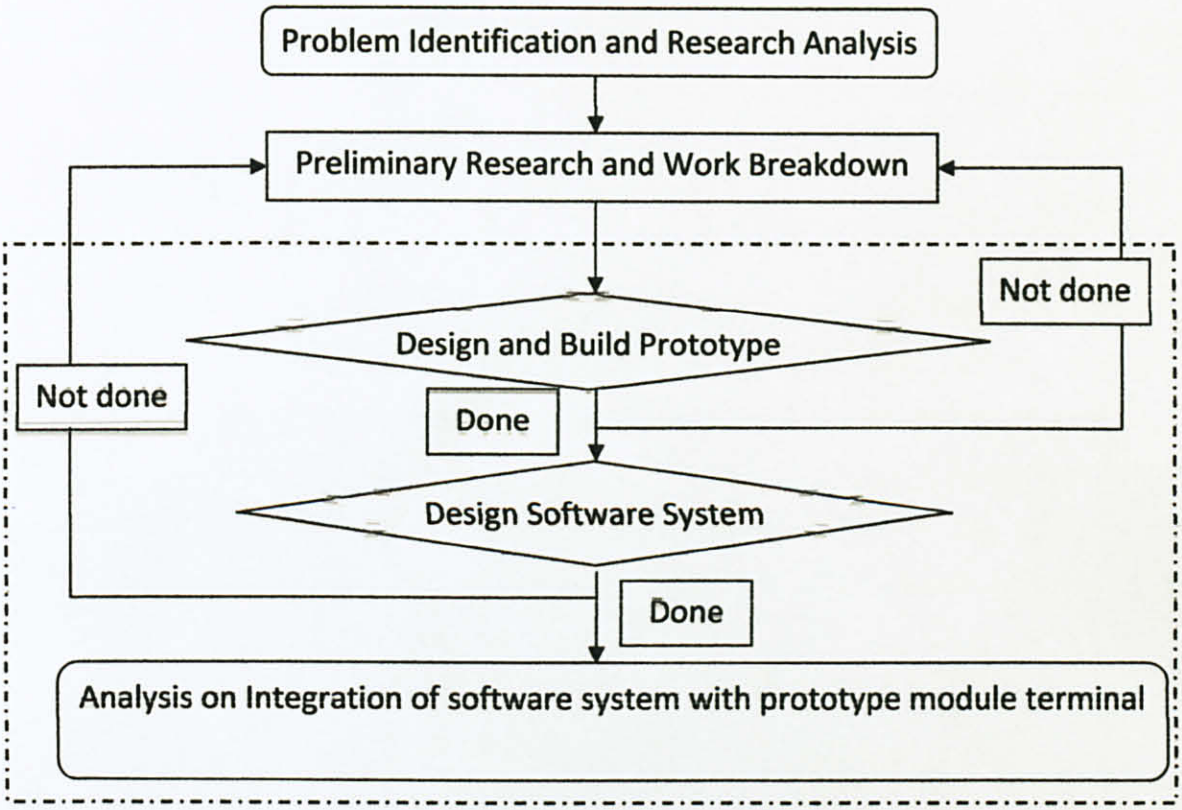


Figure 3: Flow Chart of Project's Methodology

This chapter entails the procedures and the processes of the whole project that correspond to the objective of the project. The author realized that this project would take a big responsibility, in terms of time, cost, and technical knowledge; the author has made a plan to capture all the objectives and to reduce the possibility errors and wrong assumptions. The author has listed several steps taken to run the project by knowing the period to complete this project successfully. The lists of all development stages are details as below:

3.1.1 Problem Identification and Research Analysis

Before the project can be started, the problem needs to be identified and analyzed. Problem identification refers to the problems or challenges to be faces that results from the background study and objectives of the project. This section will need the student to do research and studies about general known issues, including the news of crime cases, and to learn the technical stuff and all about the application related to the project types and any important information of GPS and GSM including programming based or circuitry based.

3.1.2 Preliminary Research and Work Breakdown

Once the objectives and problems are tackled, the issue now is to divide the work into sections so the overall project will be organized and hassle-free. Breaking down the work into sections and parts will make things easier and help student to focus the attention to specific part and concentrate on its success. For this project, the sections are divided into four – GPS receiver, GSM Modem, Microcontroller circuit and Visual basic. These will be further divided into smaller parts so that the scope of the preliminary research is smaller and easier.

3.1.3 Design and Build Prototype (Hardware Development)

The student responsible to work on prototype, where he will design and build it based on the available parts and components. This is important and necessary to show how the prototype is working initially before it will be enhanced.

3.1.4 Design Database System (Software Development)

For this section, the student will work on designing the windows interface for database and control center system. The student will use Visual Basic 2005 combined with Microsoft Access 2003 as a database system.

3.1.5 Analysis on Integration of Software System with Prototype Terminal

When all the parts are completed, the next stage is to integrate all of them as a whole working unit. This section focuses more on the interfacing between devices, hardware and circuitry of the project. The student will run the testing, troubleshooting and debugging for the compatibility of software and hardware; indirectly will enhance the functions and features as possible to make it more reliable and precise.

3.2 Tools

The system of this project will feature the 3 main components part; microcontroller, GPS chip and GSM device. The student chose PIC16F877A microcontroller, EB-85A GPS receiver and MOD 9001D RS232 GSM/GPRS Modem.

3.2.1 PIC16F877A

This microcontroller is a product of Microchip Inc. It has Flash memory capacity of 32Kbytes, 1536 bytes of On-Chip RAM and 256 bytes of EEPROM. It has 16 bit-wide instructions and 8 bit-wide data paths. It also has 33 pins for General Purpose Input / Output including several functionalities and peripheral features.

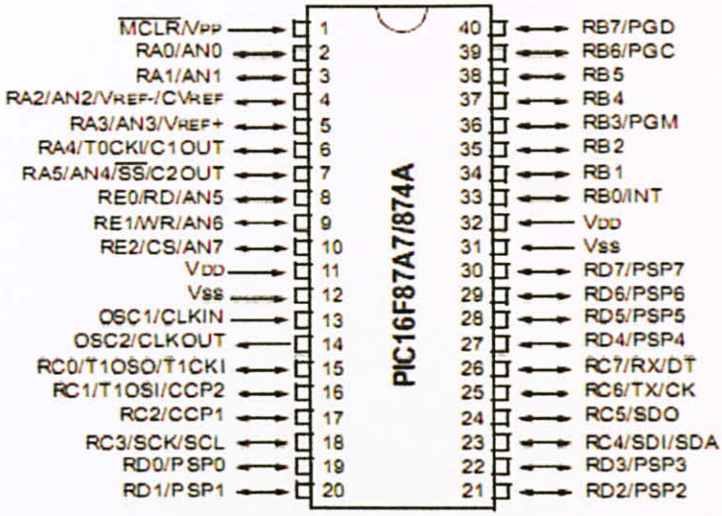


Figure 4: PIC 16F877A

3.2.2 MOD 9001D RS232 GSM/GPRS Modem

This modem supports DATA and FAX transmission, short messages (point to point and cell broadcast) and voice calls. It comes with comprises package as below:

- 1 Modem
- 1 Power Supply Cable
- 1 Serial Cable
- 1 User Manual

Figure 5: MOD 9001D RS232 GSM/GPRS Modem

3.2.3 USB ICSP PIC Programmer

This programmer is capable to program and debug the circuitry while under working with the circuit. This will help the student to simulate the programming in real time based without to disconnect the circuit with the microcontroller to load the program.

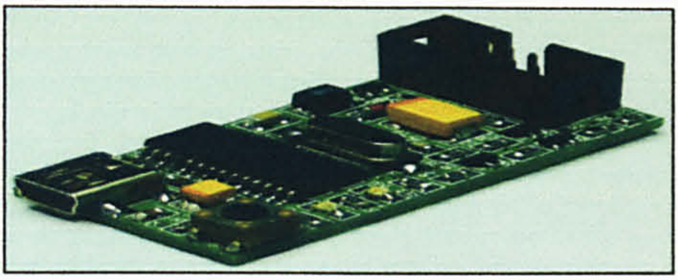


Figure 6: USB ICSP PIC Programmer

3.2.4 EB-85A GPS Receiver

EB-85A is a GPS module receiver equipped with 32 channels and has 5Hz update rate. The unit is completely configurable and the configuration settings are stored in a volatile memory and may be reset in a power cycled. The other features it has such as below:

- 5Hz max update rate
- Default 38400bps
- Selectable update rate from 1 to 5Hz
- Selectable baud rate from 4800 to 115200bps
- Support for DGPS, WAAS, EGNOS, MSAS
- 32 parallel channel receiver architecture
- -158dBm sensitivity
- 3.3m accuracy
- 2.6m accuracy with DGPS
- 3.3 to 5V supply
- 59/42/33mA power consumption
- 2 NMEA serial ports
- Battery backup pin

Figure 7: EB-85A GPS Receiver

3.2.5 GPS Evaluation Board

This evaluation board from Etek is build for various types of GPS modules to get interface between GPS with Personal Computer (PC). It supports connection to the various GPS modules sold by SparkFun. It has serial interface for USB over the FT232RL and a classic RS232 interface. Power is provided over USB or a DC barrel jack. A power switch, port selection, and serial isolation switches are available.

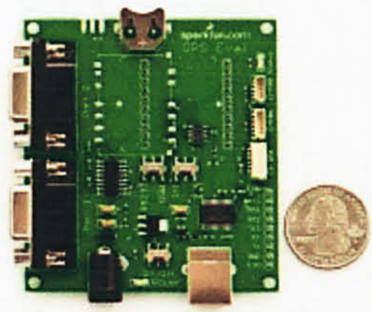


Figure 8: GPS Evaluation Board

CHAPTER 4
RESULT AND DISCUSSION

4.1 Results

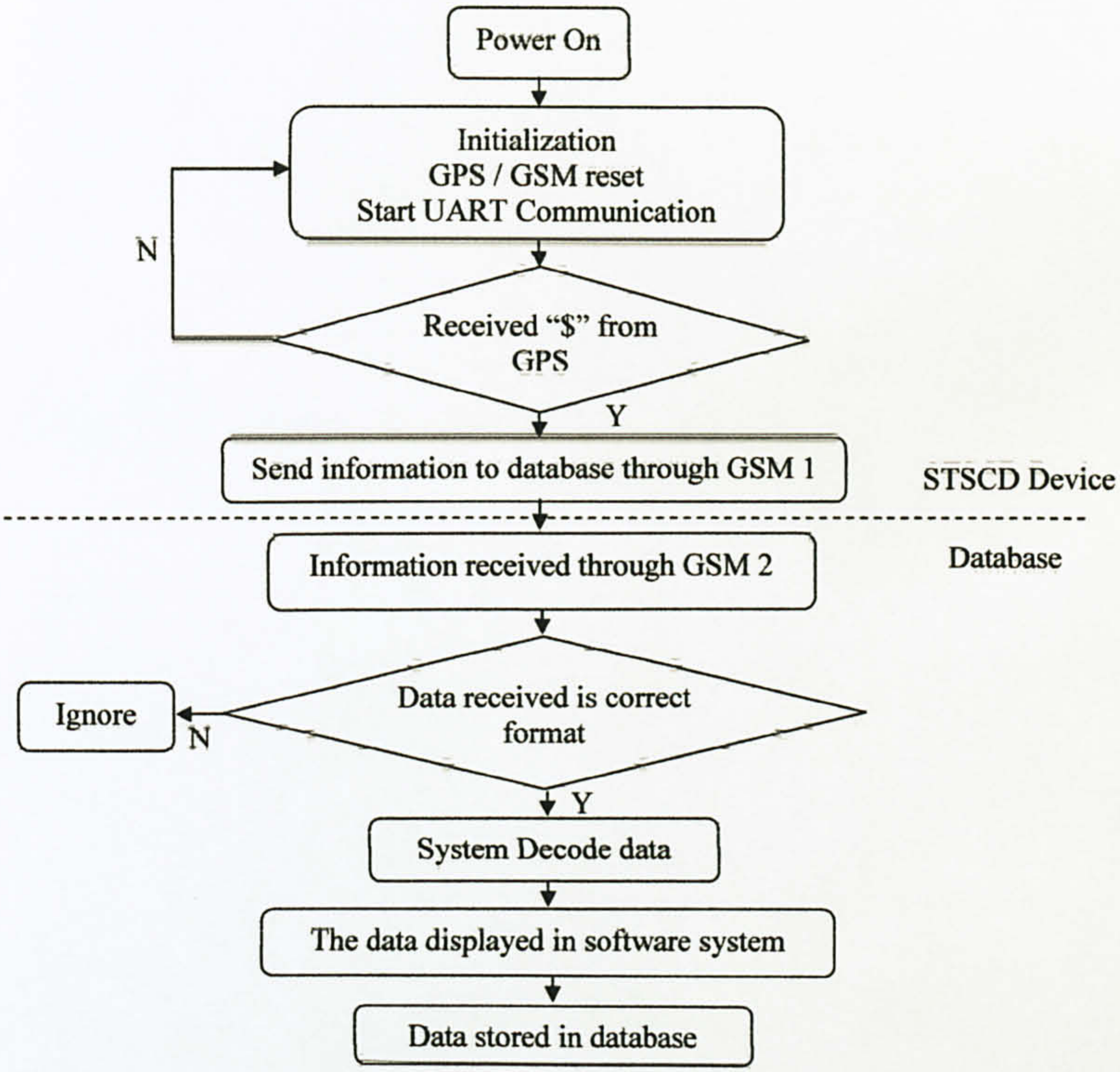


Figure 9: STSCD Operation Flow

Figure 9 shows the operation flow of STSCD device or detector module in detail and how it connects to a database. From STSCD device, it need to be turned on, by switch, and then the program inside microcontroller in STSCD device will initiate the communication link between it with GPS receiver and GSM modem. After it read the sign '$' from GPS receiver, the microcontroller will start interpret the data from it and then this data will be sent to the database trough GSM modem 1 connected with STSCD device. While, the database system will start receive the information from STSCD device represent a children through GSM modem 2 connected with it. Then, the data will be interpreted again and to prove the validity of information and format of the data. If the data is not valid, the system will just ignore it and just waiting for the next data. If the data is valid, then it will be decoded and displayed in STSCD windows application or software and Google Earth. At the last stage the data will be saved in database system to keep it as a reference for in future.

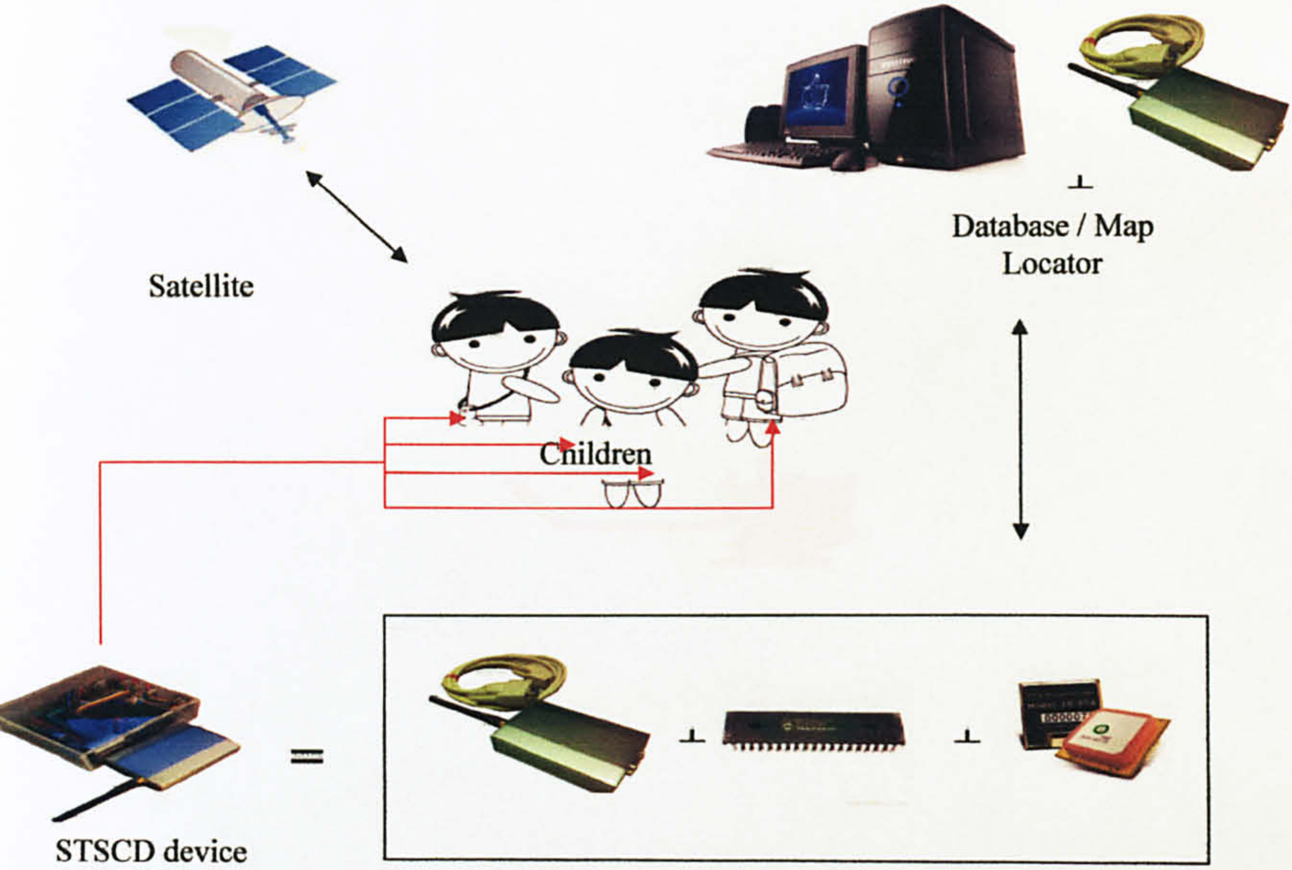


Figure 10: System Architecture of Smart Child Detector

Based on the methodology stage mentioned, the project work was sub-divided into 3 main parts: Hardware, Software, and Firmware. Figure 11 describe the project arrangement:

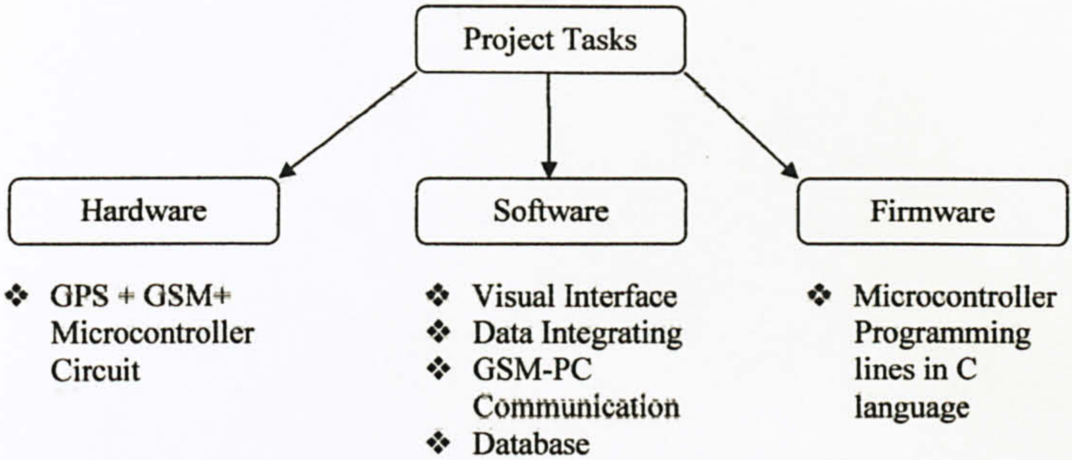


Figure 11: Project Work Arrangement

4.1.1 Hardware

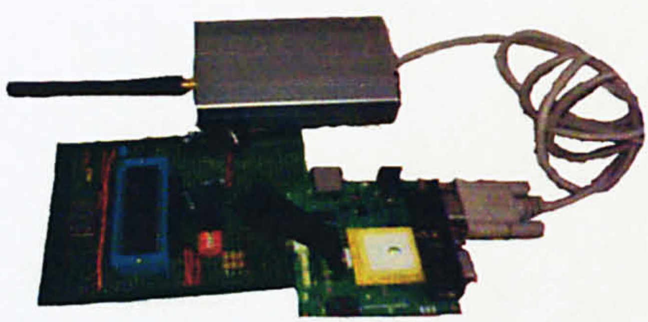


Figure 12: Smart Tracking System for Children Detection Hardware

The objective of this part is to build the circuit and integrating the EB-85A GPS with GSM modem together with PIC16F877A microcontroller. The circuit schematic is shown to on the next page:

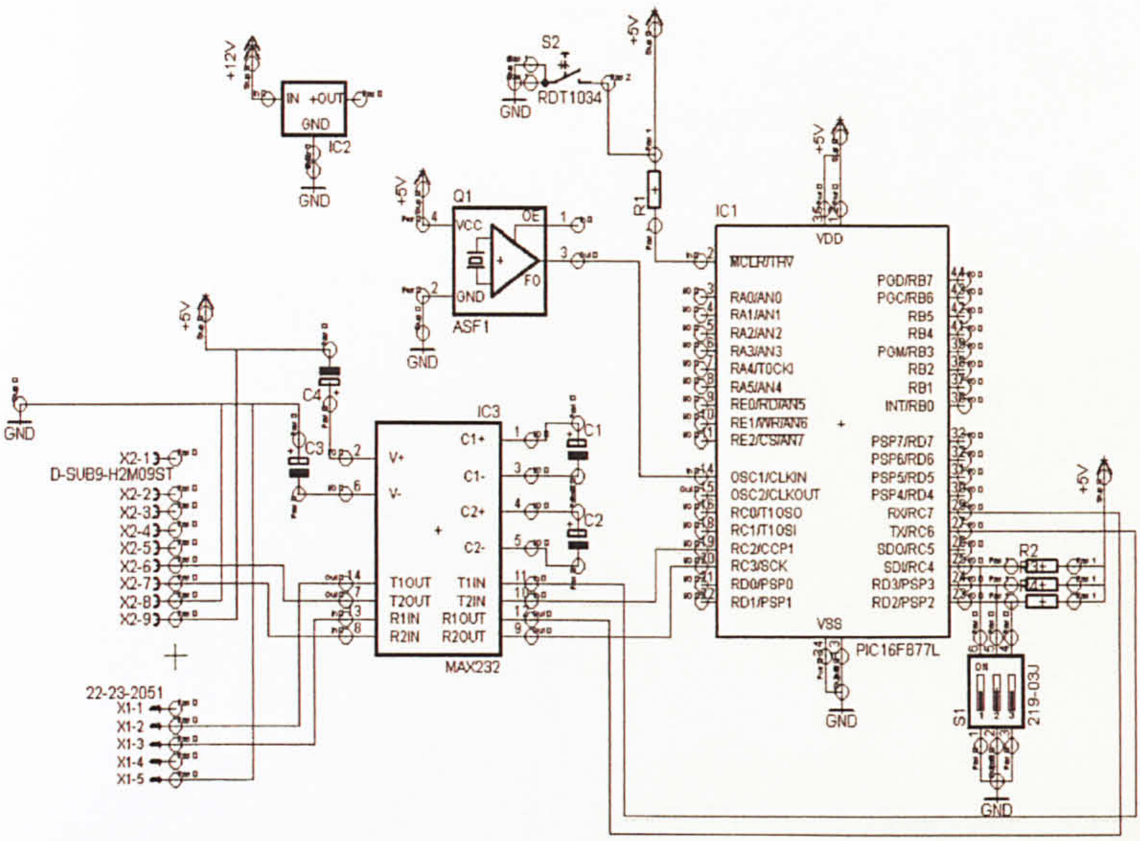


Figure 13: STSCD Main Schematic

This circuit consists of microcontroller, PIC16F877A, both terminal connection to GPS receiver and GSM modem, switch, voltage regulator LM7805, MAX232 IC, switches and several basic components. The microcontroller will act as a main controller to interpret the data from GPS and send it to GSM modem. Whereas, MAX232 IC is functioning to convert data of RS232 level to TTL logic pulse.

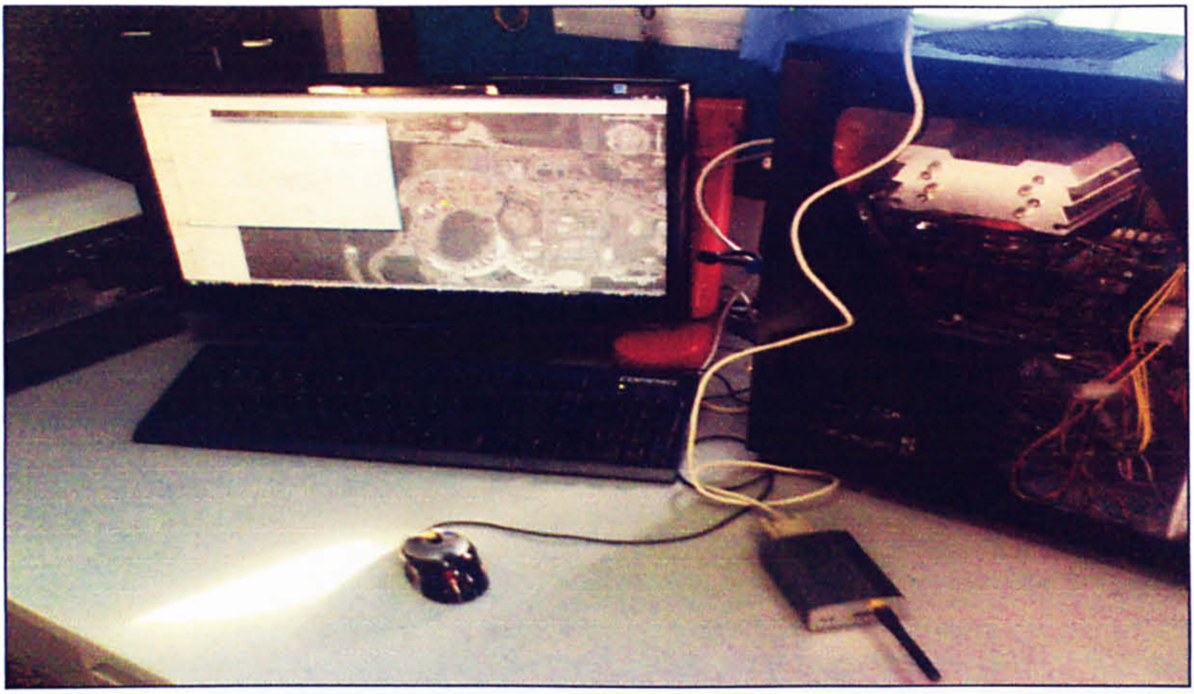


Figure 14: Connection between PC and GSM

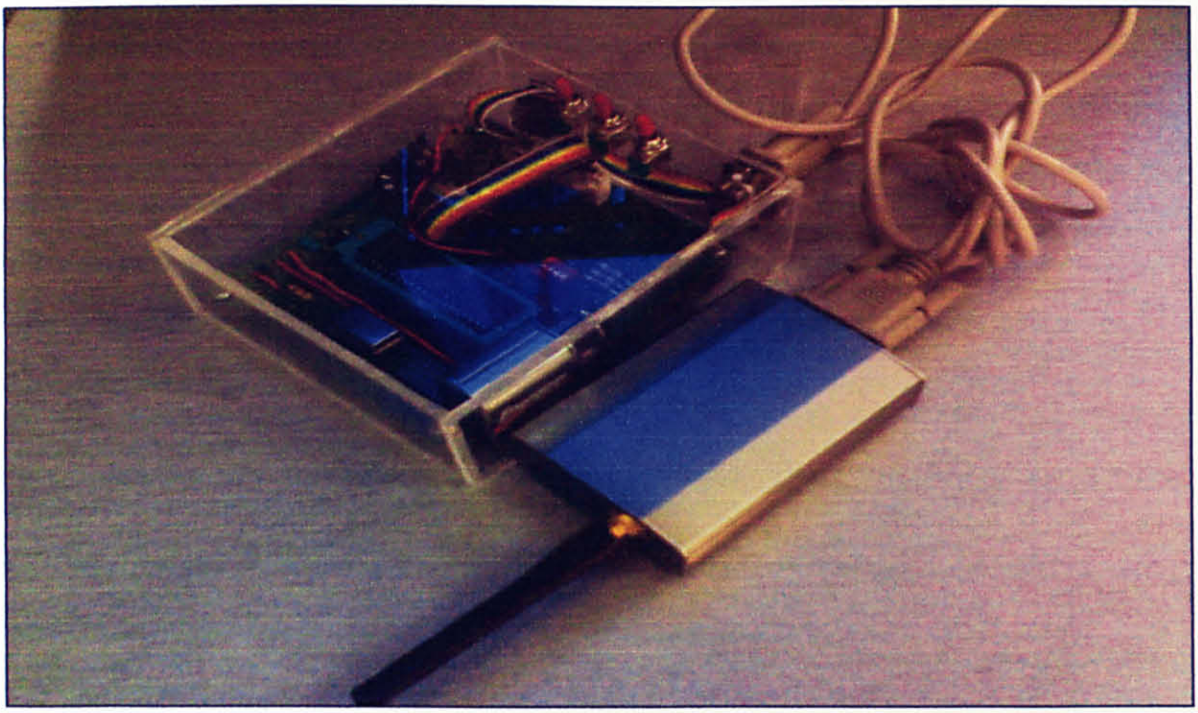


Figure 15: STSCD Hardware Connection

4.1.2 Software

This STSCD control panel is a windows application or software that act as a medium between users with the STSCD device through PC. It interprets GPS data sent from STSCD device, and then it will store the data into database system. Meanwhile, the data will be converted into Keyhole Markup Language (KML) format to integrate the data with Google Earth application. The data converted will then be shown through Google Earth so the users can see the target location. This software also will configure the connection between PC with GSM modem. The database system will store the information of target ID, location, time and date.

4.1.2.1 Visual Basic 2005 Express Edition

Visual Basic Express 2005 is used to develop the software. This software has two main interfaces; Connection Settings and GPS Information. The Connection Settings let the users configure the hardware connection between GSM with PC, and GPS Information will show the status of GPS coming from the STSCD device, such as targeted person's name, location, time, date etc. Meanwhile, it also lets the user to configure KML settings of output data through Google Earth. Figures at the next page show the visual interfaces of STSCD system.

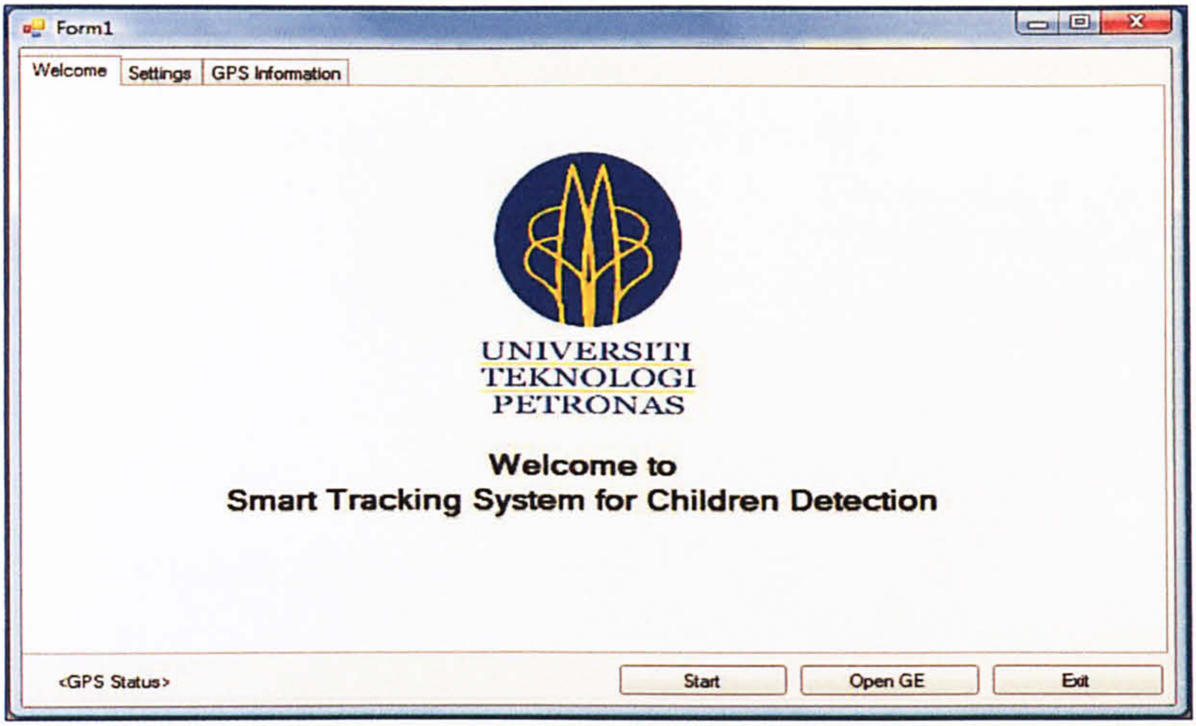


Figure 16: Front Tab (Welcoming Screen)

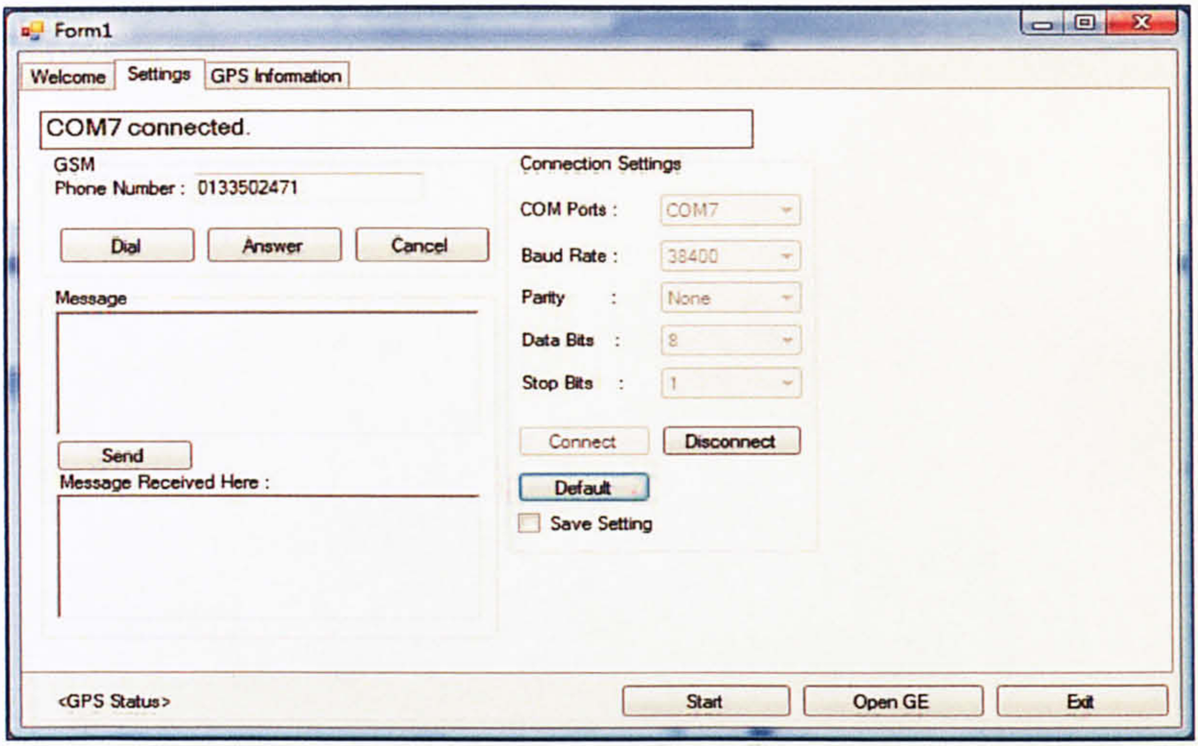


Figure 17: Second Tab (Connection Settings)

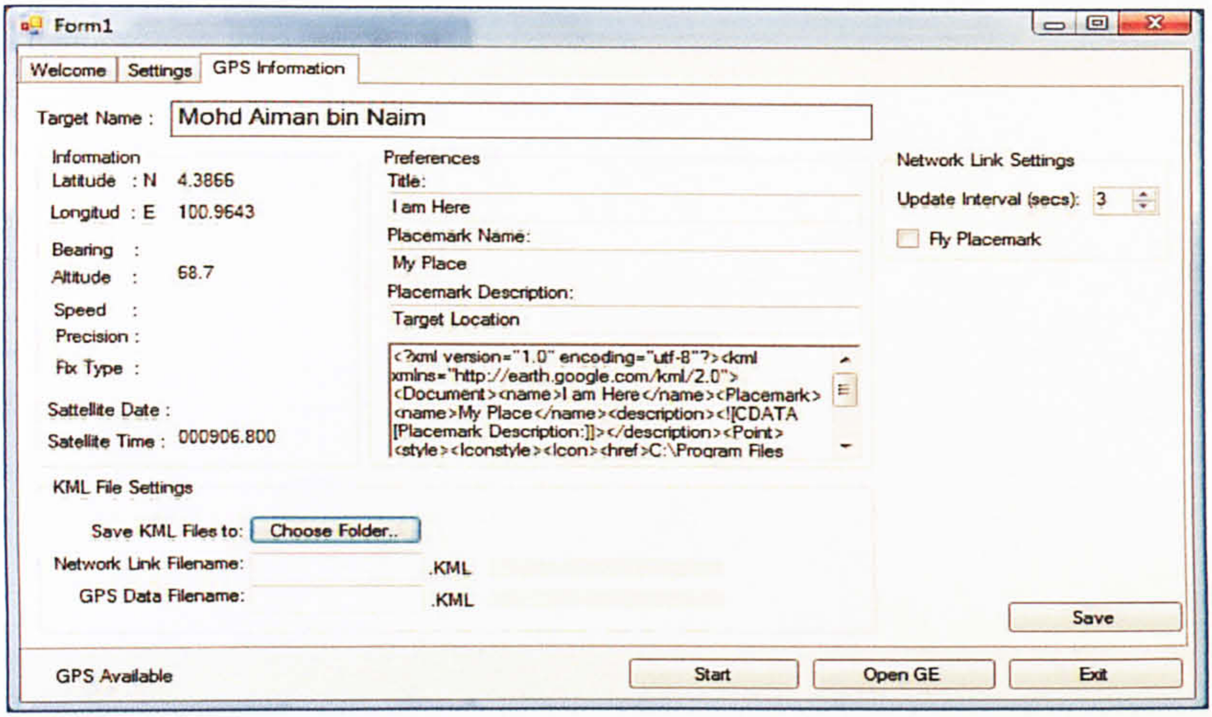


Figure 18: Third Tab (GPS Information)

4.1.2.2 Microsoft Access 2003

Microsoft Access 2003 is used to develop a database system for STSCD system. This application is categorized as desktop database, means it is oriented toward single-user applications and resides on standard personal computers. It also has user-friendly interface. As Figure 21, this database will record a several parameters such as name of person, date, time and location in terms of latitude and longitude.

4.1.2.3 Google Earth

This application is used to view the location of target person after he/she has been identified through STSCD system. This application will make the system user-friendly and will help parents to monitor their children easily. Google Earth can operate without internet connection after it has downloaded the maps because the maps will be saved in PC's memory cache.

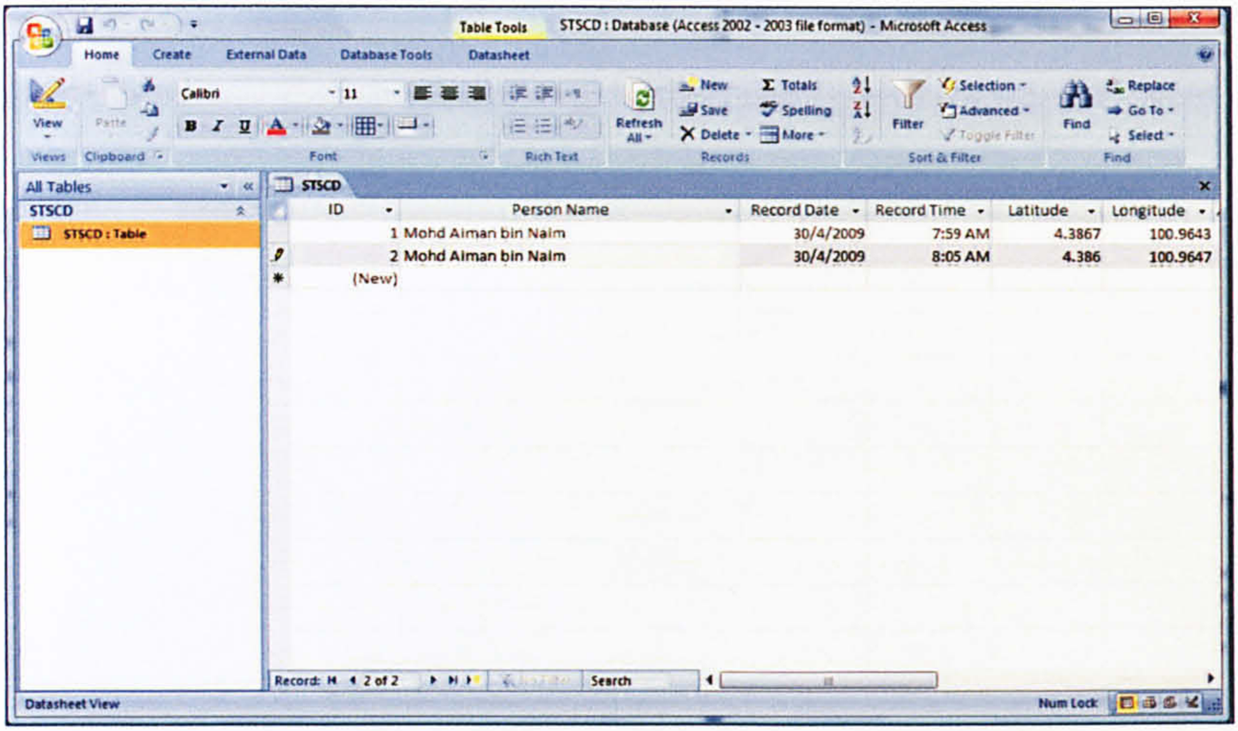


Figure 19: Microsoft Access 2003

Figure 20: Google Earth

4.2 Discussion

Designing the system is the most important parts of this project, where this system must show it is unique and different from the other system built with the same purpose. Known that this system must be reliable and efficient, it is designed from most basic parts for hardware and software application that can be compatible with Google Earth software.

Many problems and challenges were faced in this early part of this project. These problems had caused time delay in the development of the project but fortunately solutions for most of the problems have been identified and solved. Some of the problems are caused by lack of understanding of certain area but these mistakes bring new experience and knowledge.

The application system will translate and convert the NMEA GPS message into file formatted as Keyhole Markup Language (KML). This file format is important to show the current location of GPS data in Google Earth application. This file format will be generated by using visual basic in XML language.

The most crucial part of this project has been solved, on how to establish and integrate the connection and communication between software and hardware. The student also managed to learn and build understanding of both NMEA and AT protocols.

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The Smart Tracking System for Children Detection (STSCD) system is developed to help parents on monitoring and tracking their children from home or any place while they are far away from the children. This system also can help the authorities such as police to investigate the kidnapping cases easily. The system is working almost similar with car tracking system where the owner can track their car from control center.

STSCD system will provide effective and efficient security by applying tracking system for children's safety. In case of kidnapping happens, this system will notify the parents as well as authorities, to help them on tracking the location of the children.

This system is a prototype model that will represent the real system in the future. Although the similar system is already in the market, STSCD system is developed to prevent the children from being kidnapped and to acknowledge people the best solution to counter the kidnapping crime. This prototype will introduce the system in most convenient and useful way to all people.

5.2 Recommendations

This project has potential to be enhanced by attaching a sensor to detect the device if it is being detached from the children's body. Furthermore, the application also can be extended not only for Personal Computer (PC), but also for any current mobile devices such as hand phone and PDA those can support it.

This system can be extended to be applied not only in house, but also can be absorbed in authorities system to help them on solving the kidnapping cases.

On the project itself, the efficiency of the system inside the building can be extended by using wireless system, if GPS cannot reach through it. In the future, the wireless system will be one of the most important elements of communication link especially in this country. The battery also must be as small as possible and efficient enough to operate in a longer period.

REFERENCES

[1] Website refer to "http://www.unhchr.ch/html/menu3/b/k2crc.htm"

[2] Website refer to "http://cybertraveltips.com/asia/malaysia/Statistic-Of-Missing-Child-In-Malaysia.html"

[3] Article refer to Glenn Baddeley, 13th June 2007 "GPS-NMEA sentence information"

[4] Article refer to Mark Wade, "NavStar",

[5] Technical Journal refer to Ma Chou & Lin Ming, February 2003, "GPS-GSM Mobile Navigator"

[6] Presentation slide refer to Choi Chun Ting, June 2006, "Introduction to GPS Data Communications NMEA and RTCM"

[7] Journal Article refer to Journal of the Kuala Lumpur Royal Malaysia Police College, No. 4, 2005
'THE RISE OF CRIME IN MALAYSIA, An academic and statistical analysis'

[8] Website refer to "http://en.wikipedia.org/wiki/Global_System_for_Mobile_Communications"

[9] Website refer to "http://en.wikipedia.org/wiki/Global_Positioning_System"

[10] Article refer to Cheryl Pellerin, 03 February 2006, 'United States Updates Global Positioning Technology',

APPENDICES

APPENDIX A:

```
Public Class Application1
    Dim WithEvents serialPort As New IO.Ports.SerialPort

    Private Sub Form1_Load( _
       ByVal sender As System.Object, _
       ByVal e As System.EventArgs) _
       Handles MyBase.Load

        For i As Integer = 0 To _
           My.Computer.Ports.SerialPortNames.Count - 1
            cbbCOMPorts.Items.Add( _
               My.Computer.Ports.SerialPortNames(i))
        Next
        btnDisconnect.Enabled = False


    End Sub
    Private Sub DataReceived( _
       ByVal sender As Object, _
       ByVal e As System.IO.Ports.SerialDataReceivedEventArgs) _
       Handles serialPort.DataReceived

        txtDataReceived.Invoke(New _
                       myDelegate(AddressOf updateTextBox), _
                       New Object() {})
    End Sub

    Private Sub btnSend_Click( _
       ByVal sender As System.Object, _
       ByVal e As System.EventArgs) _
       Handles btnSend.Click
        Try
            serialPort.Write("AT+CMGF=1") '& vbCrLf
            'My.Computer.Keyboard.SendKeys({})
            ' serialPort.Read()
            'IF OK-NEED TO ADD COMMENT
            serialPort.Write("AT+CMGS=" & FirstApo.Text & UserNo.Text &
LastApo.Text) '& vbCrLf
            'send message
            serialPort.Write(txtDataToSend.Text)
            ' after that must click key "CTRL+Z"
            My.Computer.Keyboard.SendKeys("Z", True)

            With txtDataReceived
                .SelectionColor = Color.Black
                .AppendText(txtDataToSend.Text & vbCrLf)
                .ScrollToCaret()
            End With
            txtDataToSend.Text = String.Empty
        Catch ex As Exception
            MsgBox(ex.ToString)
        End Try
    End Sub
```

```
    Public Delegate Sub myDelegate()
    Public Sub updateTextBox()
        With txtDataReceived
            .Font = New Font("Garamond", 12.0!, FontStyle.Bold)
            .SelectionColor = Color.Red
            .AppendText(serialPort.ReadExisting)
            .ScrollToCaret()
        End With
    End Sub

    Private Sub btnConnect_Click( _
       ByVal sender As System.Object, _
       ByVal e As System.EventArgs) _
       Handles btnConnect.Click
        If serialPort.IsOpen Then
            serialPort.Close()
        End If
        Try
            With serialPort
                .PortName = cbbCOMPorts.Text
                .BaudRate = 9600
                .Parity = IO.Ports.Parity.None
                .DataBits = 8
                .StopBits = IO.Ports.StopBits.One

                ' .Encoding = System.Text.Encoding.Unicode
            End With
            serialPort.Open()

            lblMessage.Text = cbbCOMPorts.Text & " connected."
            btnConnect.Enabled = False
            btnDisconnect.Enabled = True
        Catch ex As Exception
            MsgBox(ex.ToString)
        End Try
    End Sub

    Private Sub btnDisconnect_Click( _
       ByVal sender As System.Object, _
       ByVal e As System.EventArgs) _
       Handles btnDisconnect.Click
        Try
            serialPort.Close()
            lblMessage.Text = serialPort.PortName & " disconnected."
            btnConnect.Enabled = True
            btnDisconnect.Enabled = False
        Catch ex As Exception
            MsgBox(ex.ToString)
        End Try
    End Sub

    Private Sub btnDialNumber_Click(ByVal sender As System.Object, ByVal
e As System.EventArgs) Handles btnDialNumber.Click
        serialPort.Write("ATDT " & txtPhoneNumber.Text & vbCrLf)
    End Sub
```

```
    Private Sub btnAnswerCall_Click(ByVal sender As System.Object, ByVal
e As System.EventArgs) Handles btnAnswerCall.Click
        serialPort.Write("AT*EVA" & vbCrLf)
    End Sub

    Private Sub UserNo_TextChanged(ByVal sender As System.Object, ByVal e
As System.EventArgs) Handles UserNo.TextChanged
        'UserNo.Text = FirstApo.Text & UserNo.Text & LastApo.Text
    End Sub

    Private Sub Button3_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button3.Click
        serialPort.Write("AT+CHUP" & vbCrLf)
    End Sub

    Private Sub btnAnswerGSM_Click(ByVal sender As System.Object, ByVal e
As System.EventArgs) Handles btnAnswerGSM.Click
        serialPort.Write("ATA" & vbCrLf)
    End Sub

    Private Sub btnDialGSM_Click(ByVal sender As System.Object, ByVal e
As System.EventArgs) Handles btnDialGSM.Click
        serialPort.Write("ATD" & UserNo.Text & ";" & vbCrLf)
    End Sub

    Private Sub ExitApp_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles ExitApp.Click
        ' Initializes variables to pass to the MessageBox.Show method.

        Dim Message As String = "Do you really want to exit?"
        Dim Caption As String = "Smart Child Detector"
        Dim Buttons As MessageBoxButtons = MessageBoxButtons.YesNo

        Dim Result As DialogResult

        'Displays the MessageBox

        Result = MessageBox.Show(Message, Caption, Buttons)

        ' Gets the result of the MessageBox display.

        If Result.Yes Then
            ' Closes the parent form.
            Me.Close()
        End If

        ' Application.Exit()

    End Sub

End Class
```

APPENDIX B:

```
#include <16F877A.H>
#include <stdlib.h>
#include <math.h>

#fuses HS,NOWDT,NOPROTECT,PUT,NOLVP
#use delay(clock=20000000)
#use rs232(baud=9600, xmit=PIN_C6, rcv=PIN_C7, stream=GPS, DISABLE_INTS)
#use rs232(baud=9600, xmit=PIN_D6, rcv=PIN_D7, stream=PIC16F87,
DISABLE_INTS)

//--------------------------GLOBAL----------------------------//
int k=0, com=0, flag=0;
signed long rud_pwm=142;
char tr1[6], LAT[11], LONGI[12];
char c;
//--------------------------GLOBAL----------------------------//

#INT_RDA
void gps_isr(void)
{
   c = fgetc(GPS);
   c = (char)c;

   if(c=='$') com=0;
    if(c==',') com++;

   if(com==3) // get latitude data (3)
   {
      if(c==',') k=0;
        else {LAT[k]=c; k++;}
   }

   if(com==5) // get longtitude data (5)
   {
      if(c==',') k=0;
        else {LONGI[k]=c; k++;}
   }

   if(com==8) // true heading (8)
   {
      if(c==',') k=0;
      else {tr1[k]=c; k++;}
   }

   if(com==9) flag=1;
}


void main()
{
   char afterDecimal[5];
   float currentLat=0.0, currentLong=0.0;
   float diff_Lat=0.0, diff_Long=0.0;
   float currentWayptLat=0.0, currentWayptLong=0.0;
```

```
   float waypointHeading=0.0;
   long trueHeading=0;
    signed long error=0;
   int Kp;
   int currentWaypoint=1;
   int addressHIGH=0, addressLOW=0;
   int i=0;


   currentWayptLat = 39.820891*Pi/180.0;
    currentWayptLong = 75.053864*Pi/180.0;

   output_high(LED); delay_ms(1500);
   output_low(LED); delay_ms(1500);

   // enable interrupts
   enable_interrupts(INT_RDA);
   enable_interrupts(GLOBAL);

   while(1)
   {
      afterDecimal[0]=0; afterDecimal[1]=0; afterDecimal[2]=0;
afterDecimal[3]=0; afterDecimal[4]=0;
      //trueHeading=0;
      waypointHeading=0.0;

      if(flag==1)
      {
         // latitude
         afterDecimal[0] = LAT[5];
         afterDecimal[1] = LAT[6];
         afterDecimal[2] = LAT[7];
         afterDecimal[3] = LAT[8];
         afterDecimal[4] = LAT[9];

         currentLat = (float)(atol(LAT)/100) + ((float)(atol(LAT)%100) +
atof(afterDecimal)/100000.0)/60.0;
         currentLat = currentLat*Pi/180.0;

         // longitude
         afterDecimal[0] = LONGI[6];
         afterDecimal[1] = LONGI[7];
         afterDecimal[2] = LONGI[8];
         afterDecimal[3] = LONGI[9];
         afterDecimal[4] = LONGI[10];

         currentLong = (float)(atol(LONGI)/100) +
((float)(atol(LONGI)%100) + atof(afterDecimal)/100000.0)/60.0;
         currentLong = currentLong*Pi/180.0;

         // true heading of aircraft -> measured CW from North (i.e. from
North to East) in degrees
         if(atol(tr1)==0) {trueHeading=trueHeading; output_low(LED);} //
prevent erroneous values when no satellites
         else {trueHeading=atol(tr1); output_high(LED);}

         // calculate heading to waypoint
```

```
        // pythagorean theorem - works for short distances...not enough
RAM to factor in Earth's curvature
        diff_Lat = currentWayptLat - currentLat; // latitude: +ve
direction is from north to south in USA
        diff_Long = currentWayptLong - currentLong; // longitude: +ve
direction is from east to west in USA

        // if within 30 feet of waypoint, switch to next waypoint ->
0.0000015deg*(180/Pi)*(60min/deg)*(6080ft/min)
        if((diff_Lat<0.0000015 && diff_Lat>-0.0000015) &&
(diff_Long<0.0000015 && diff_Long>-0.0000015))
        {
          if(currentWaypoint==1) // go to waypoint 2 (valleybrook
between fields)
          {
            currentWayptLat = 39.821416*Pi/180.0;
            currentWayptLong = 75.053367*Pi/180.0;
            currentWaypoint=2;
            // recalculate using new waypoint
            diff_Lat = currentWayptLat - currentLat; // latitude: +ve
direction is from north to south in USA
            diff_Long = currentWayptLong - currentLong; // longitude:
+ve direction is from east to west in USA
          }
          else if(currentWaypoint==2) // go to waypoint 3 (valleybrook
center of field 2)
          {
            currentWayptLat = 39.821382*Pi/180.0;
            currentWayptLong = 75.0527325*Pi/180.0;
            currentWaypoint=3;
            // recalculate using new waypoint
            diff_Lat = currentWayptLat - currentLat; // latitude: +ve
direction is from north to south in USA
            diff_Long = currentWayptLong - currentLong; // longitude:
+ve direction is from east to west in USA
          }
          else currentWaypoint=currentWaypoint;
        }

        waypointHeading = atan2(diff_Long,diff_Lat);

        // make clockwise direction positive (CCW is +ve as is)
        if(sin(currentWayptLong - currentLong)>0.0)
          waypointHeading = 360.0 - waypointHeading*180.0/Pi;
        else
          waypointHeading = -waypointHeading*180.0/Pi;


        error = (long)waypointHeading - trueHeading;
        Kp = 1;

        // keep error between -180 and 180
        if(error>=180) error = error - 360;
        if(error<=-180) error = 360 + error;

        rud_pwm = 142 - Kp*error; // typical neutral position (127) is a
little off on Magpie (142)
```

```
        // no ailerons on Magpie; have to limit rudder deflection
        if(rud_pwm<122) rud_pwm=122;   // turn right (neutral-20)
        if(rud_pwm>162) rud_pwm=162; // turn left (neutral+20)

        fputc((unsigned int)rud_pwm, PIC16F87);

        flag=0;
      }
   }
}
```