ABSTRACT

This report basically discusses on the Airbag stimulated Auto-dialer and the implementation in the car industry. This project is a prove of concept indicating that the airbag only does ensure reduction in fatal rate due to accidents. This is proved by the statistics from government stating that more than 371059 accidents occur yearly and 65% of it are cars that contains airbag yet the fatal rate is high. The prime objective of this project is to add more efficiency to the response time of medic team and police during accidents. On the literature review, mention on details the architectural, design and application component. Besides that, findings and readings on the crash sensor, GSM module and GPRS module are also included. On the methodology part touches on the timeline and period how the project being carried out. Attached together the Gantt chart and key milestone of the project.

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CHAPTER 1: INTRODUCTION

1.1 Background of Study

In Malaysia, rate of road accidents, casualties and deaths have been increased year by year. This case involved many people's life without knowing their ages from the young until the old. There are lot of factors that cause road accidents such as driver's attitude, geological factor, vehicles malfunctioning, weather condition, and so on, During festival season, the rate of accident is the highest especially during school holiday, Hari Raya, Christmas, and so on.

Due to evolution of technology, airbag system was introduced. An **Airbag** is a vehicle safety device. It is an occupant restraint consisting of a flexible envelope designed to inflate rapidly during an automobile collision, to prevent occupants from striking interior objects such as the steering wheel or a window. Modern vehicles may contain multiple airbags in various side and frontal locations of the passenger seating positions, and sensors may deploy one or more airbags in an impact zone at variable rates based on the type and severity of impact; the airbag is designed to only inflate in moderate to severe frontal crashes. However, despite having such device the fatal rate due to car accidents were high. This was because airbag at times gives impact to the passengers that are severe.

Besides that, some accidents are too severe that needs immediate medical attention which we fail to give due to delay in information transfers regarding the accident. Not all the time accidents are noticed by public or the driver is able to make call to ambulance or police. Therefore, in order to curb to this issue I came up with the idea of inventing airbag stimulated auto-dialer which will be triggered as the airbag releases and immediately send a voicemail to police ambulance and even your insurance agent regarding your accident consisting of your number plate number and GPS location of your car. So, ambulance and police can reach on time and give medical attention to casualties.

1.2 Problem Statement

The problem statements to this project are:

1) Current car accident rate is fluctuating
2) Fatal rate due to delay in medical support.
3) Time taken to inform ambulance regarding accident is long.

Although airbag technology is present, it still does not curb the increasing car accident fatal rate. Delay in giving medical attention to casualties somehow cause dead even though the injuries are not too severe. This is because of blood clog, bloods lose for a long period and so on which may not be serious but if not given immediate attention it will be fatal. Besides that, some drivers especially lady drivers tend to get panic during accidents and if their car were damage badly they do not know how to handle or whom to contact. Plus, an average time taken for the information regarding the accident to reach the ambulance and police are usually long which causes delay in giving medical attention to casualties.

1.3 Objective and Scope of Study

The prime objective in this project research:

1) To reduce car accident fatal rate by reducing delay in giving medical attention.
2) To help drivers to handle accident situations.
3) To reduce the time taken for information regarding accident to reach police or medic team.

With the introduction of the airbag stimulated auto-dialer technology in the car industry, it would mutually benefit both parties. Car users can feel more save when travelling as situation during accident will be receiving quick reactions from involving parties and on the other hand government can reduce fatal rate, plus police can be more efficient in the job. Other than that, using the auto dialer, insurance agent of the car as well will be informed immediately as accident occurs through voicemail regarding the car and location. Therefore, toe trunk can be send immediately to scene of accident.

CHAPTER 2: LITERATURE REVIEW

2.1 Airbag System

Figure 1: Airbag demonstration

Marshall Brain in his paper "HowStuffWorks" discussed about the fundamentals of airbag. Since model year 1998, all new cars sold in the United States have been required to have airbags on both driver and passenger sides. He states that statistics show that airbags reduce the risk of dying in a direct frontal crash by about **30 percent**. Later, a new set of airbag was introduced which are the seat-mounted and door-mounted side airbags. Today, some cars go far beyond having dual airbags to having six or even eight airbags. He claims that an airbag wants to do is to slow the passenger's speed to zero with little or no damage. The constraints that it has to work within are huge. The airbag has the space between the passenger and the steering wheel or dashboard and a fraction of a second to work with. Even that tiny amount of space and time is valuable, however, if the system can slow the passenger evenly rather than forcing an abrupt halt to his or her motion. Therefore, he concludes that an airbag's duty is not actually to provide cushion for driver or passengers but also to reduce the momentum of impact and eventually reduce injuries.

The Economic Times however come up with some shocking discussion regarding failures of airbags and recalls of cars by huge manufacturers which was not convincing for users. On May 4, 2010, Nissan recalled more than 130,000 of its Infiniti G35 model sedan and coupes over concerns about the vehicle's airbag system. Besides, the site also claimed that on a small percentage of the potentially affected vehicles, a harness connector issue could cause the passenger air bag to shut off. It was also discussed that General Motors Co. was recalling almost 100,000 vehicles to fix two problems that could cause the rear axle to lock and the passenger-side airbag not to work. Plus, Honda announced that it will recall about 273,000 vehicles sold in the US to replace the driver's airbag inflator. The affected airbag inflators may deploy with too much pressure, which can cause the inflator casing to rupture and could result in death or injury. Lastly, Volvo was recalling 11,119 S60 and XC60 cars to fix a wire harness under the front seats which might interfere with the car's airbags. In a nutshell, faulty airbags were causing injuries to drivers and passengers which eventually require immediate attention from medic team at occurrence of accidents. Therefore, airbag was not good enough to give drivers the confidence that they are save during driving.

2.2 Auto-dialer (GSM Module)

Figure 2: GSM modem outlook

M-Indya, a forum discussed that a GSM modem is a **specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator**, just like a

mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, such as the Falcom Samba 75. Therefore, this device will be used to generate auto-dial.

Dave Roos in his paper examines that auto-dialer an example of **computer telephone integration (CTI)**. He also claims that by Using special software and a modem, a computer can be programmed to automatically dial a long list of phone numbers. Depending on the software's sophistication, the computer can detect whether a live person answers the phone and then hand the call over to a human operator. The computer can also be programmed to play a recorded message, leave a message on an answering machine, or provide a menu of options to the person who answers. The GSM network can be divided into three broad parts. The Mobile Station is carried by the subscriber; the Base Station Subsystem controls the radio link with the Mobile Station. The Network Subsystem, the main part of which is the Mobile services Switching Center, performs the switching of calls between the mobile and other fixed or mobile network users, as well as management of mobile services, such as authentication. As a conclusion, in his paper he discussed on the working elements of the auto-dialers.

EngineersGarage was a site where several engineers discussed the architecture of GSM module. **Himanshu Choudhary, Jaipur, India** in this article stated that **GSM/GPRS module** is used to establish communication between a computer and a GSM-GPRS system. **Global System for Mobile communication (GSM)** is an architecture used for mobile communication in most of the countries.

Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces such as RS-232, USB and so on for computer. They agree that modem is the soul of such modules. The engineers examined that

wireless modems are the modem devices that generate, transmit or decode data from a cellular network, for establishing communication between the cellular network and the computer. The devices are manufactured for specific cellular network (GSM/UMTS/CDMA) or specific cellular data standard (GSM/UMTS/GPRS/EDGE/HSDPA) or technology (GPS/SIM). Wireless MODEMs like other modem devices **use serial communication** to interface with and need **Hayes compatible AT commands** for communication with the computer.

Sequoia Technology Ltd wrote an article on "**GSM / GPRS Signal Strength Testing for Remote and Telemetry Applications".** In this article, it was discussed how the company tests the reliability of the signal strength of the GSM module. It is claimed that Modern data loggers and remote telemetry products for information gathering is often fitted with GSM or GPRS cellular equipment. This enables information collected to be sent wirelessly via the cellular networks, which offers a low cost, reliable communications means, which is densely rolled out across Europe and other major parts of the world. The main problem facing installers and suppliers of this equipment is ensuring a reliable cellular signal is available in the vicinity of the site so that information can be transmitted or received as cellular connectivity can be patchy when used in buildings or in remote areas. The site presented that the Signal Strength Tester / Meter is fitted with a GSM/GPRS radio engine (commonly used in mobile phones) which enables operation on the 4 worldwide GSM/GPRS operating frequencies. These frequencies are recognized as 850, 900, 1800 and 1900MHz. 900 and 1800MHz is used predominantly throughout Europe, the Middle East, African and Asia. 850 and 1900MHz are predominantly used in the Americas and in parts of Japan. The SWGPRS023 Signal Tester / Meter can be used with or without a Subscriber Identity Module (SIM) card.

The SIM card allows connection to a cellular network operator so that information can be sent by voice, data or text. However as no information is sent but only received by the Signal Tester / Meter, it is mostly used without a SIM card as it allows the user to view all networks available within the area of test. The Signal Tester / Meter allows a survey to be carried out by the installer or engineer and will display the results via the display and record them to the

on board memory. The information displayed is user configurable as either basic or advanced information detailing information about each cell site detected by the Signal Tester / Meter.

2.3 Crash Sensor

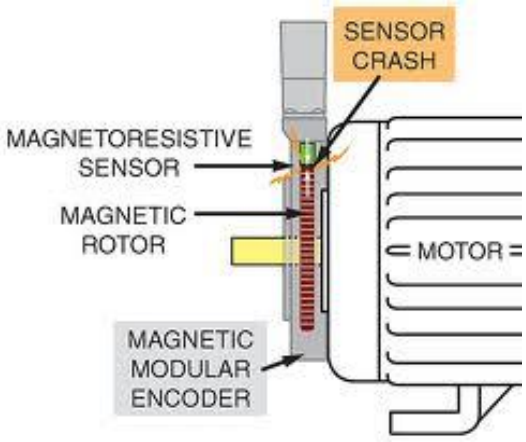


Figure 3: Pressure sensor interior

Gina Roos in her article in **EE Times Asia** discussed that **crash sensor improves automotive safety testing.** She focused on a device model **7264D** which was introduced by Endevco Corp. It is said to have high resonance crash accelerometer for automotive safety testing applications including vehicle barrier and sled testing and anthropomorphic test dummies. The 7264D device is based on the 7264B and C series of transducers and provides an extended "flat" frequency range and resonant frequency of more than 40,000Hz. This resonance characteristic is said to solve a typical problem found in automotive crash test events that often induce resonances in a sensor during extremely short duration shock pulses. In **vibration and shock measurement**, the 7264D is also said to deliver the widest possible frequency range without inducing signal phase shifts found in other competitive products which can "muddy" the data and result in hidden inaccuracies that may render expensive test data useless, said the company. The accelerometer is J211 compliant maintains the un-damped characteristics desired by test engineers, and provides data records that are true and accurate over an extended frequency range.

Frederic Meyer in his article "**Crash sensor increases warehouse safety"** presented that crash sensor does contribute in other industries other that automobile area. Shelves in warehouses have to be able to withstand some punishment. They are frequently hit by forklift trucks when the staff has to maneuver goods through the narrow aisles quickly. For this reason, their stability needs to be checked regularly. Inspection rounds, however, take a lot of time and only provide a snapshot of the situation. Researchers have now developed a wireless sensor-based system that monitors the state of the shelves continuously. Even minor collisions can destabilize the shelves' struts over time – the worst case would be collapse of high shelving. The struts are usually covered with a type of protective airbag to absorb the impact of a collision. "We have integrated sensors into this protective device that measure the pressure inside the airbag," explains Frederic Meyer, project manager at Fraunhofer IMS. If an airbag is run into, the sensor registers the change in pressure and reports it via radio to a central control station. Repeaters installed at various locations in the warehouse forward the reports from the sensor nodes to the control station seamlessly.

An article publish by **Dealernews.com** entitled **"GPS crash sensor wins the Dealer Expo Kickstart new product contest"** discussed regarding the industry's first GPS crash sensor which won the grand prize in the fourth annual Kickstart New Product Contest held in conjunction with Dealer Expo. **The GPSO Motorcycle Crash Sensor** won the Dealer's Choice Award. The sensor is a GPS tracking device that allows the owner to view the bike's location, speed, distance, stops and starts. The sensor's Biker Down feature alerts 911 when a crash occurs. The impact of a crash sends an alert to a 24-hour monitoring center, which then calls the rider's cell phone. If there's no answer, it will automatically activate the 911 system to send emergency medical services to the latitude and longitude of the crash.

2.4 Pressure Sensor

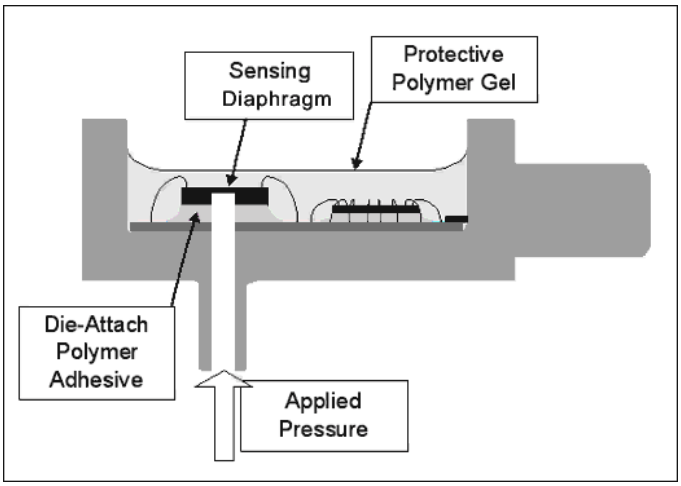


Figure 4: Pressure sensor design

An article by www.sensorland.com entitled "Pressure Sensor: How They work?" states the functionality and the operation it takes as a pressure is exerted on it. With the steam age came the demand for pressure measuring instruments. Bourdon tubes or bellows, where mechanical displacements were transferred to an indicating pointer were the first pressure instruments, and are still in use today. Pressure metrology is the technology of transducing pressure into an electrical quantity. Normally, a diaphragm construction is used with strain gauges either bonded to, or diffused into it, acting as resistive elements. Under the pressure-induced strain, the resistive values change.

Pressure sensing using diaphragm technology measures the difference in pressure of the two sides of the diaphragm. Depending upon the relevant pressure, we use the terms ABSOLUTE, where the reference is vacuum, GAUGE, where the reference is atmospheric pressure or DIFFERENTIAL, where the sensor has two ports for the measure of two different pressures. This type of pressure sensor consists of a micro-machined silicon diaphragm with piezoresistive strain gauges diffused into it, fused to a silicon or glass backplate. The resistors have a value of approx. 3.5 kOhm. Pressure induced strain increases the value of the radial resistors (r), and decreases the value of the resistors (t) transverse to the radius. This resistance change can be high

as 30%. The resistors are connected as a Wheatstone Bridge, the output of which is directly proportional to the pressure. Refer below.

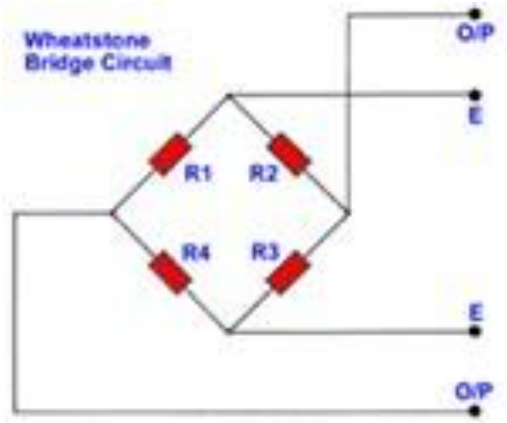


Figure 5: Whetstone Bridge Circuit

2.5 GPRS module

Figure 6: GPRS modem outlook

K. Ashok Babu and R. Vinoth in their article **Windows CE 6.0 GPRS connectivity through dial-up networking** examined that Windows CE provides two ways to obtain connectivity with a GPRS modem: by using the "cell core" function, and using "dial-up networking." They claim that modems have recently become quite complex, particularly due to the need for an internal multiplexer along with the device drivers required to support it. Today's cellular modems must support multiple interfaces, such as USB, shared memory,

UARTs and so on. Even when the modem is using a simple UART interface, if the interface has been configured for data, there is no way for an AT command to be passed through the interface to get status.

They state that to abstract the developer from all this complexity of handling AT commands for multiplexing, Microsoft has introduced **Radio Interface Layer (RIL)** drivers that interact with the radio hardware. RIL provides proxy devices or COM ports to handle each device inside the modem.

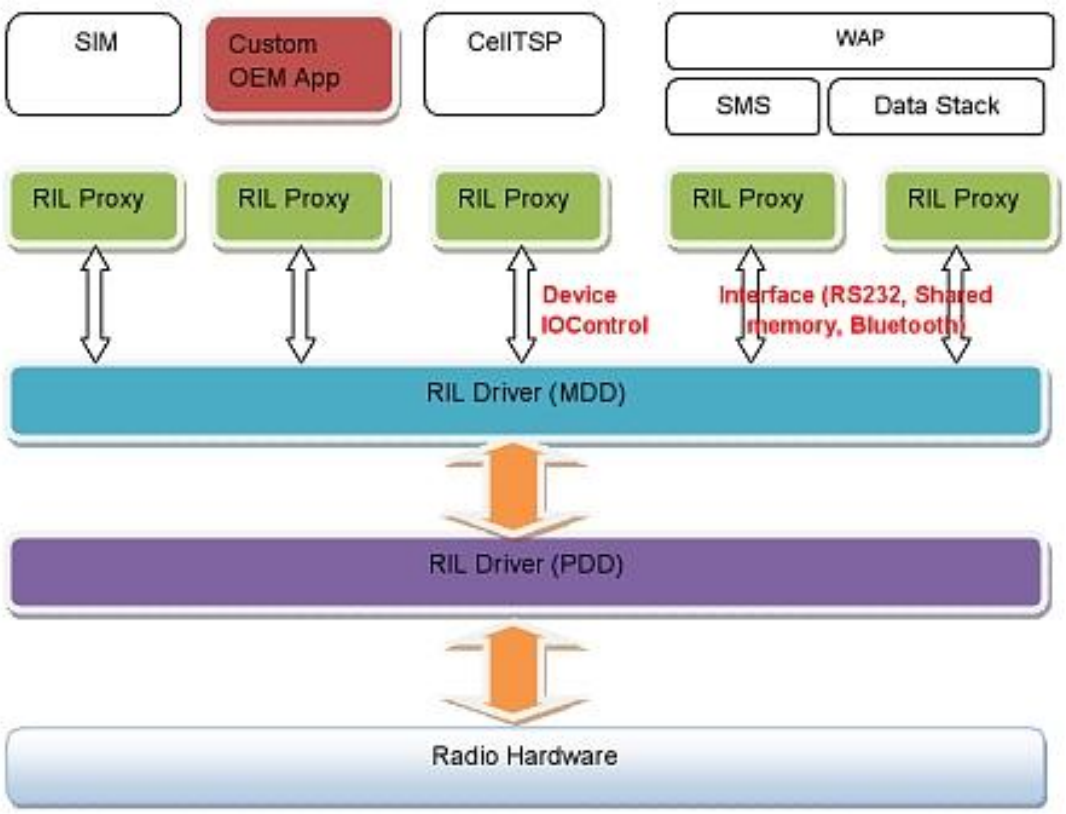


Figure 7: How GPRS works

GPS Tracker with SMS Message an article by **Submit Auto introduced** a dual-band product working on the frequencies of 900MHz and 1800MHz. It will able to track and

object from a remote location using ordinary GSM SMS messages with the handy GPS tracker device. It suitably uses including asset protection, plotting routes and keeping track of children, the older and pets. The small lightweight device houses a SIM card and battery, and is able to be used anywhere GSM and GPS coverage. In this article, the features of the dual-band product are also discussed. There are:-

- Main Function: GPS Tracker
- GSM: Dual Band 900MHz, 1800MHz
- GPS Sensitivity: 159dB
- GPS Frequency: L1, 1575.42 MHz
- GPS Positional Accuracy: 5m-25m
- Velocity Accuracy: 0.1m/s
- Velocity Limit: 515 m/s (1000knots)
- Altitude Limit: 18000 Meters (60,000 Feet)

2.6 Auto-dialer integrated Systems

An article by DAKCS entitled "Award Winning Integrated Predictive Dialer Software" speaks about the new invention by DAKCS firm. The firm claims that the system has evolved into a leading edge product mix that has revolutionized and simplified the overall debt collection process. The technology by creating a graphical dialog designer that is client server based and accessible from the desk top, DAKCS has developed an easy to use system that allows managers the flexibility and ease of building multiple dialer dialogs with multiple branches based upon specific user requirement.

Utilizing both "text to speech" and voice files, managers can create dialogs inbound and outbound campaigns. They can create their own dialer messaging messages and scripts, which could include the critical verification of Social Security Numbers for right party connects as well as the simplification of credit card transactions.

This is an advertisement by Voicent Company on their new Voice Broadcasting Auto Dialer. Voicent's BroadcastByPhone is an auto-dialer that uses your computer to deliver personal calls or leave answering machine messages in your own voice or a computer-generated voice. Its features include live-call transfer, automated messages, touch-tone opt-out options and an easy-to-use, Excel-like interface. Below is how it looks like:

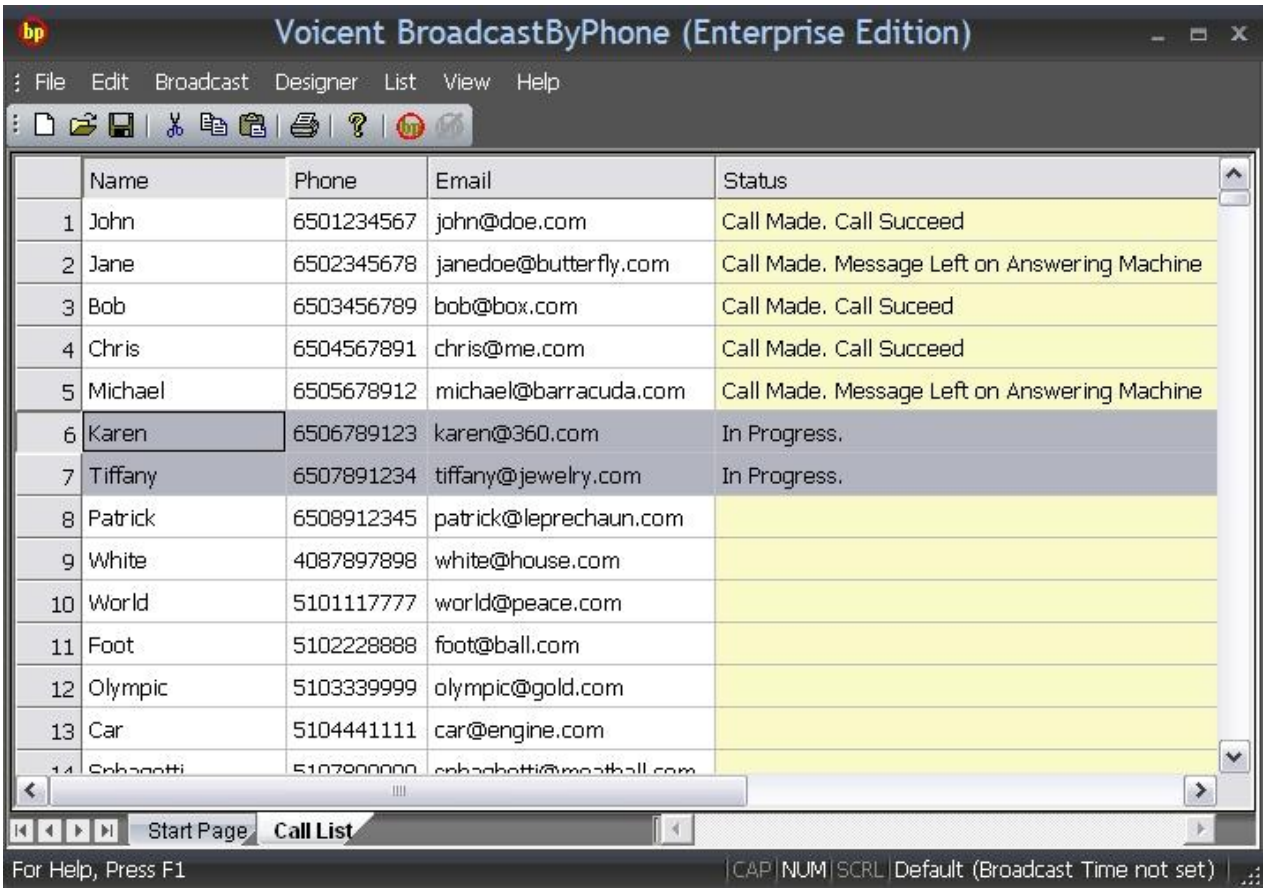


Figure 8: Computer Telephone Intergration (CTI)

This Windows-based software uses VOIP technology to make calls through your computer. The calls are delivered either through a VOIP channel, such as SIP or Skype, or through your regular phone lines.

BroadcastByPhone offers an incredibly rich set of features. It is ideal for the communication needs of businesses, faith communities, NGO/nonprofits, political campaigns, schools, or government offices. Below are the functions of the system:

- Automated dialing with a single click
- Live call transfer to any phone (yep, that's right. If your message recipients want to speak to someone right away, they can press a number and get transferred to a live operator or leave a message for you.)
- Interactive touch tone response (press 1, press 2, ...) or even voice-activated command and response capabilities
- Voice message recording by phone, by computer or by studio
- Computer-generated voice (optional); Save/restore call list, import or copy-paste call list
- Detects human pick up, answering machine, busy, no answer, disconnected line
- Automatic retry for busy line or no answer
- Daily, weekly, monthly, and yearly recurring calls
- Call until confirm (for emergency alert escalation)
- Automatically schedule call for next day if calls are not finished
- Multilingual Text-to-Speech (optional) for customizing each phone call

Another advertisement of a product named "Wireless Security Home alarm System Auto-Dialer" by lelong.com site discusses regarding the new item that secure the house during breaking into house. Below is a description on what the system does:

- CALL YOU (and other 7 sets of telephone number - total 8 sets of number) when being triggered, you can record a message which will be played to the person who receive the call, for example your name and address so that your relatives whom you have set as one of the alert recipient can take necessary actions, you can check which zone is being intruded when receive the alert calls, listen through the phone if any unusual noise at the guarded venue, and perform various other actions through you phone/hand phone when being called;

- You will be able to ARM THE ALARM REMOTELY THROUGH TELEPHONE if you forget to do so before leaving house/office;
- ALARM WILL BE TRIGGERED WHEN TELEPHONE WIRE IS BEING CUT,
- And a host of other functions

A project by Victor Kwah Zai Shyong entitled "**GSM BASED REMOTE TERMINAL UNIT OF THE FLOOD WARNING AND CONTROL SYSTEM**" is designed to give early flood warning where the water level of a certain place is monitored remotely. The water level data is then sent to the flood monitoring station via SMS. At the monitoring station, the warning will be given once the water level has achieved different level. This system is named "Alerter". By implementing one of the GSM technologies which is SMS, "Alerter" can be used by anyone at anywhere and anytime to monitor whatever you want on-time remotely, water level in this case.

This project enlightens the people how advance technologies are especially in communication that every single motion of everything can be monitored through GSM technologies. It proves no boundary to communicate between two different devices at two different places at the same time. This project had very much similarity with my ASAD project but the only difference is that the indicator is water level and mine is the pressure sensor.

"**Method of Freeway Incident Detection Using wireless Positioning**" by Li Chuan-zhi and Hu Ru-fu is a very similar idea with my project work. On one hand, when running vehicles break down or find other vehicles met with traffic accidents, they can observe for a while or immediately press the alarm button on in-car device, which can give an alarm to Transport Management Center (TMC) via wireless communication network, such as Global System for Mobile Communications (GSM) and General Packet Radio Service (GPRS). On another hand, when vehicle encounters the shake, incline or collision, the in-car sensor can detect the situation of vehicle automatically, comparing detecting data with thresholds (it can receive other in-car equipment's feedback information, for example, when airbag ejects, the in-car sensor will estimate that the vehicle may get involved in an incident) and estimates if the vehicle has been involved into an incident. If incident is affirmed, the in-car system will sent a default alarm message to TMC via GSM.

CHAPTER 3: METHODOLOGY

3.1 Research Methodologies

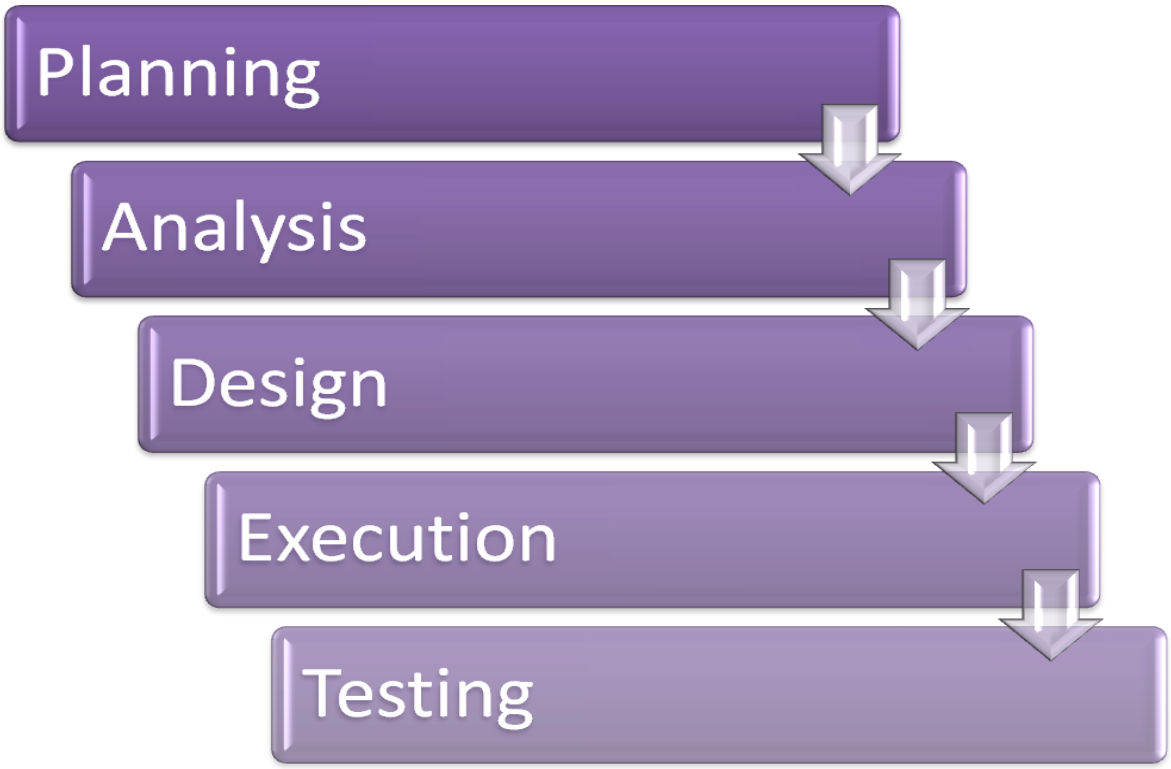


Figure 9: Methodology flow

As presented above by the figure 3.0 this project is solely refers to waterfall model as the tasks are conducted step by step. The Waterfall method also known as “traditional” is a rigid step-by-step approach to project management. Once you have completed each step within the project, you cannot go backwards. With waterfall, the entire project is planned at the beginning with each phase being given a fixed deadline. Each phase has a distinct goal. In this model each phase has a well defined start and end point, with identifiable deliverables from one phase being passed to the next phase before it can begin. Waterfall is a well documented method, with documentation being produced at every stage and it is also a much disciplined approach to a project. Specification of the task will be discussed in detail in Project Activities and Key Milestones section.

3.2 Project Activities

- Planning
  - ❖ Project functions
    - Deciding the functionalities of the end product. Additional features preferred to be added along the product designing.
  - ❖ Constraints (cost & achievability)
    - Considering the cost factor and matching with features that are preferred. Looking into the reliability and achievability of the features in short period of time.
- Analysis
  - ❖ Requirement Gathering
    - Gathering information on tools required, software needed, hardware's and so on.
  - ❖ Data Mining/Research
    - Making research on other identical projects or products on market and compare with the current idea to make improvement or adjustment.
- Design
  - ❖ Original Architecture design
    - Planning the complete idea or architecture of the original design proposal. More of commercial value added and cost is not a factor when coming up with this design.
  - ❖ Prototype design
    - The actual end product for the proof of concept purpose. Here cost, manpower, knowledge and time is taken into consideration and a simpler version of design is proposed.
- Execution
  - ❖ End product
    - The process of producing the end product to proof the concept and achieve the objective.

- Testing
  - ❖ Signal Strength Test
    - Conducting test on the signal power of the product as it involves voice messaging/sms service.
    - Testing the acceptance of car users on ASAD.
  - ❖ Presentation
    - Presenting the result and prototype to stakeholders/evaluators.

3.3 Key Milestone

The key milestones of the project are as followed:

Deliverables	**Target Date**	**Responsibility**
Planning & Analysis	Week 1-3	Project function Constraints Requirement Gathering Data mining/Research
Design	Week 3-7	Original Architecture Design Prototype design
Execution	Week 8-12	End product
Testing	Week 12-13	Signal Strength Test Presentation

Table 1: Key milestone

3.4 Gantt Chart

Activities/Weeks	1-3	3-7	8-12	12-13
Planning & Analysis				
Design				
Execution				
Testing				

Table 2: Gantt Chart

CHAPTER 4: FINDINGS & RESULTS

4.1 Prototype description

The auto-dialer systems thus require the most basic component for airbag which is the crash sensor as it will act as the triggering factor of the system. In a usual car that contains airbag system, the crash sensor will be directly connected to the airbag. Therefore, upon a hit on the crash sensor it will cause the airbag to automatically work. Below demonstrates the connection between crash sensor and airbag:

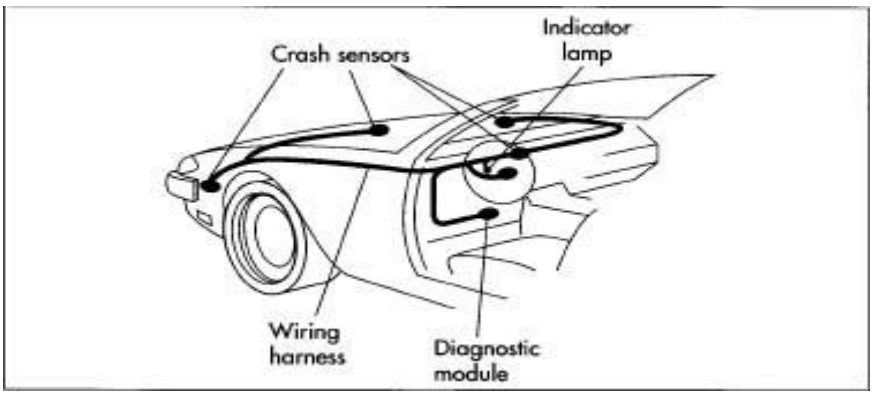


Figure 10: Airbag architecture

However, this system will make a little modification to the connection where the direction between crash sensor and airbag is maintained but an extra connection between crash sensor and pressure will be fixed. The reason this is done is to avoid the any form of failure in auto-dialer to directly affect the airbag function. Why connect crash sensor to pressure sensor? This is done to ensure only a tested amount of pressure that ensures the accident is severe enough and definitely will require medical and emergency attention. We do not want calls coming in to ambulance and police due to minor accidents such as the driver hit on a cat or hit on the house gate while reversing which has not harm anyone including the driver. Below is the pressure sensor's basic design.

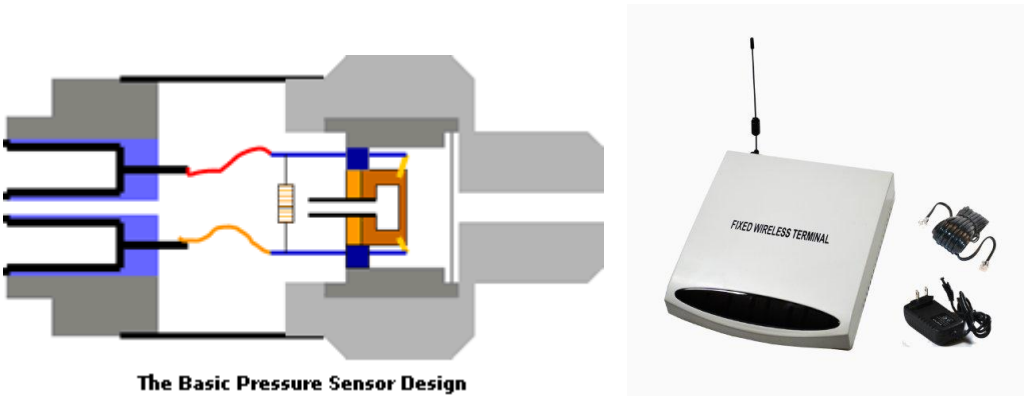


Figure 11: GSM archtecture

The pressure sensor has been set at is tested amount of pressure. Once, the pressure of hit exceeds the fixed pressure level then it will automatically trigger the system to make call. Now, the system on the other hand is a integrated system between GSM and GPRS module. GSM acts as the auto-dialer which is capable of sending out several calls, sms, voice massages at the same time to the particular numbers that has been set initially in the system. GPRS will eventually locate the position of the system or in this case the car and send those via message or voice message to those particular numbers. In the perspective of the phone operator receiver, the website of this system will display on their computer screen which will record time, number plate number and will show the location in Google map automatically to make ease for the operator to contact the nearest hospital ambulance. The signal does uses dual sim card system so that for example if there is a low signal for Digi line in a particular area it automatically switches to Maxis or Celcom line that has higher signal. Plus, even if that area has bad phone line, government has allocated a particular bandwidth for emergency calls only. Therefore, the emergency call number in the system will still work but only the usual numbers such as family member's number and so on might not be able to contact. However, the systems main aim is to aid a faster medical attention to the victim, so as long the emergency call can be made, this objective will be met. In addition, this system will be equipped with black box protection which hinders it from getting damaged due to accident. So, users do not need to fear, even how severe is the accident the system will be in good shape to conduct its function as a auto-dialer. Since, it is using phone line a data plan subscribing is not required. Plus, the user does not need to carry

any phone for the auto-dialer to work as an in-build auto-dialer is used. Below is the rough design of the flow of the system.

4.2 Hardware for system completion

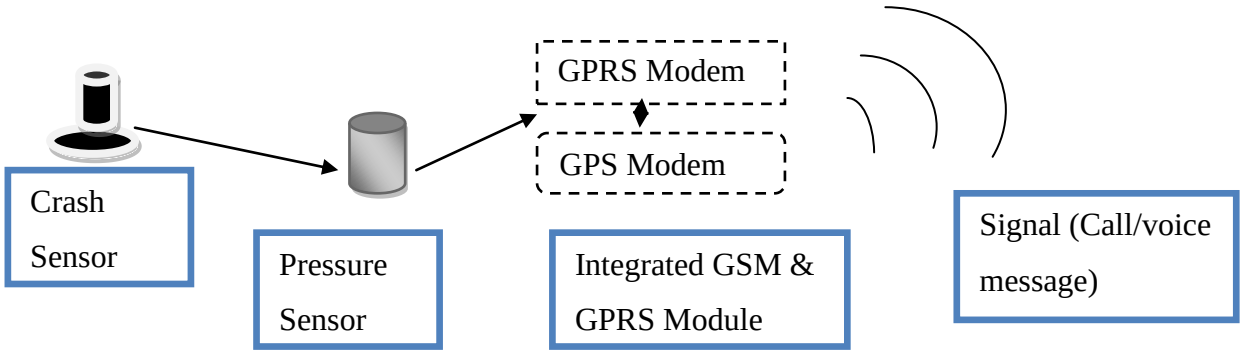
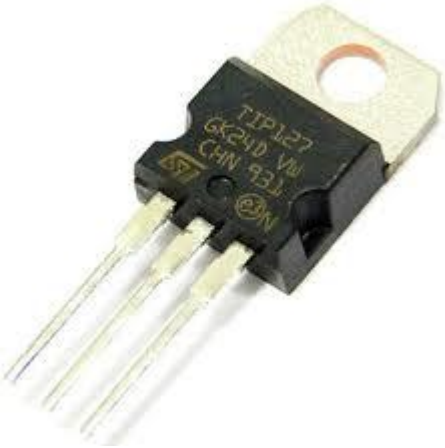


Figure 12: System architecture

The major part of the project involves circuit building which means I have to work with electronic items. As the step in progressing with my project, I collected the required items for circuit building. Below are the items and the look of it:

Items	Pictures
PIC 16F877A Referred to "Peripheral Interface Controller". Their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability.	

Clock 20Mhz Clocks such as a sample timebase clock and the 20 MHz timebase clock mark the passing of time or are used to align other signals in time. Clocks usually do not cause actions in the sense that triggers do. The names of clocks usually do not refer to actions.	
10pf capacitor Many types of capacitors are available commercially, with capacitance ranging from the picofarad, microfarad range to more than a farad, and voltage ratings up to hundreds of kilovolts. In general, the higher the capacitance and voltage rating, the larger the physical size of the capacitor and the higher the cost.	
voltage regulator VR7805 Voltage regulators are electromechanical components that maintain a consistent output of volts, which are units of electromotive force. Electric or electronic components are often made to accept certain maximum voltages and can be badly damaged by power surges. Regulators keep the voltage within the range that the components can safely accept and use to function properly.	

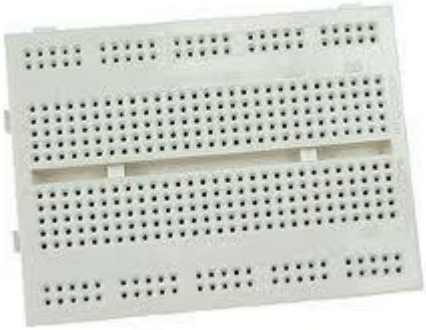
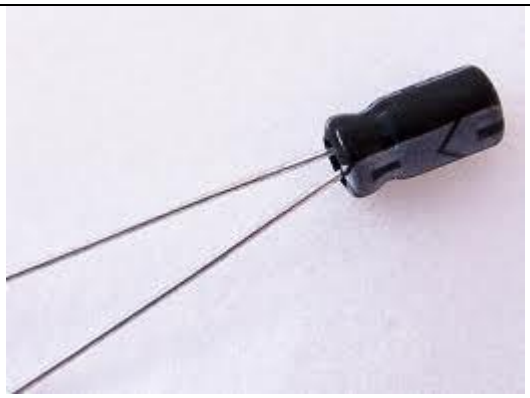
Breadboard A breadboard (protoboard) is a construction base for prototyping of electronics. The term is commonly used to refer to solderless breadboard. Solderless breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design.	
Switch A **switch** is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another.	
100nf Capacitor They are used with resistors in timing circuits because it takes time for a capacitor to fill with charge. They are used to smooth varying DC supplies by acting as a reservoir of charge. They are also used in filter circuits because capacitors easily pass AC (changing) signals but they block DC (constant) signals.	

Figure 13: Components

4.3 The Circuit drawing

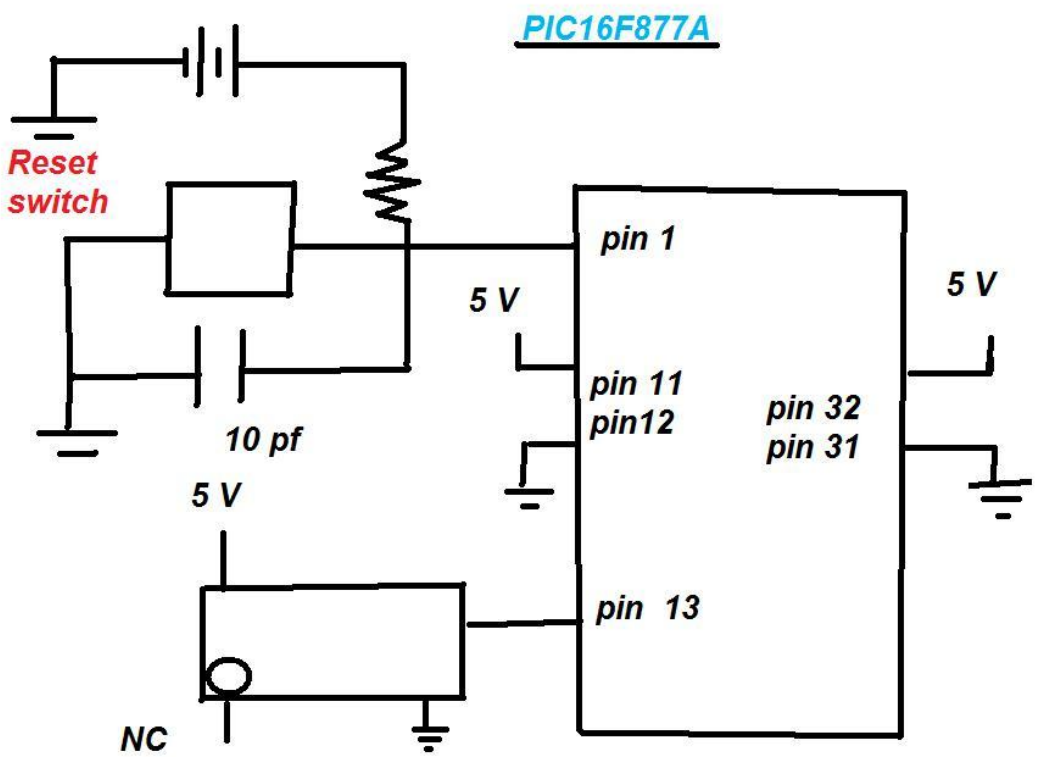


Figure 14: Switch circuit

The drawing explains that the circuit requires 5V battery to power it. Therefore, the pressure sensor used will also have to be capable of handle 5V and not requiring extra charge because if more voltage is exerted will cause the circuit to burn. However, the pressure sensor seems to be costly and currently I am looking for other cheaper options like using shock sensor or switch to represent the pressure sensor. Currently I am still working on the hardware fixing and I am facing a little problem on it. Also I am trying to search for cheaper model of pressure sensor. Another, circuit will be needed in this process which is the voltage regulator VR7805. The purpose of using voltage regulator is in order to regulate the high voltage batteries to the desired voltage in this case 5V. Below is the drawing of the circuit.

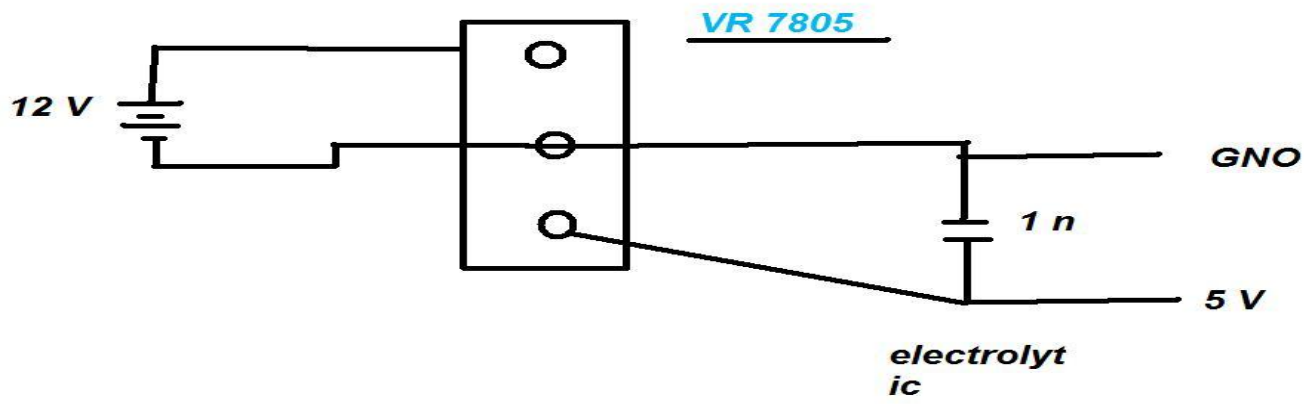


Figure 15: Clock circuit

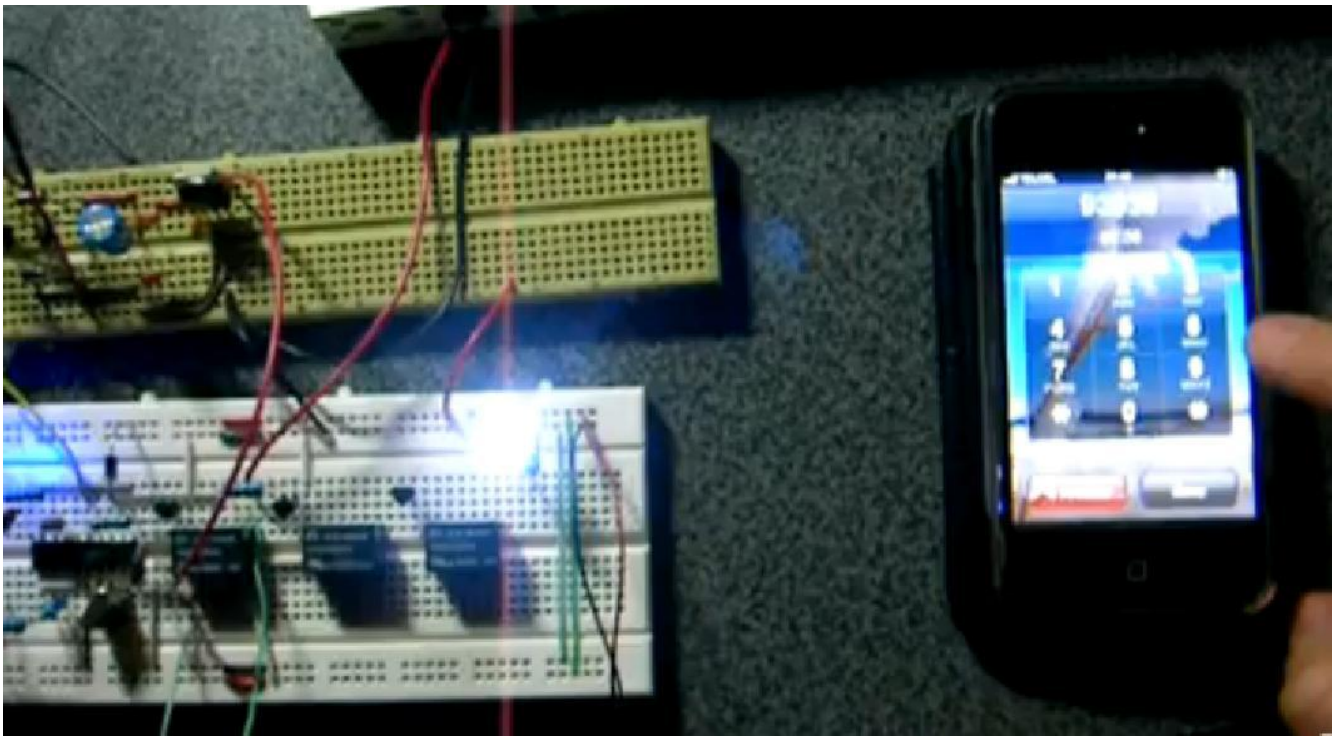


Figure 16: Original system architecture

The initial idea is to come up with a complete circuit system that connects directly to a phone. This phone will be place in a black box and inbuilt it into a car. However, due to cost, time and lack of manpower factors I had to simplify the system into a prototype version.

4.4 Result of Prototype

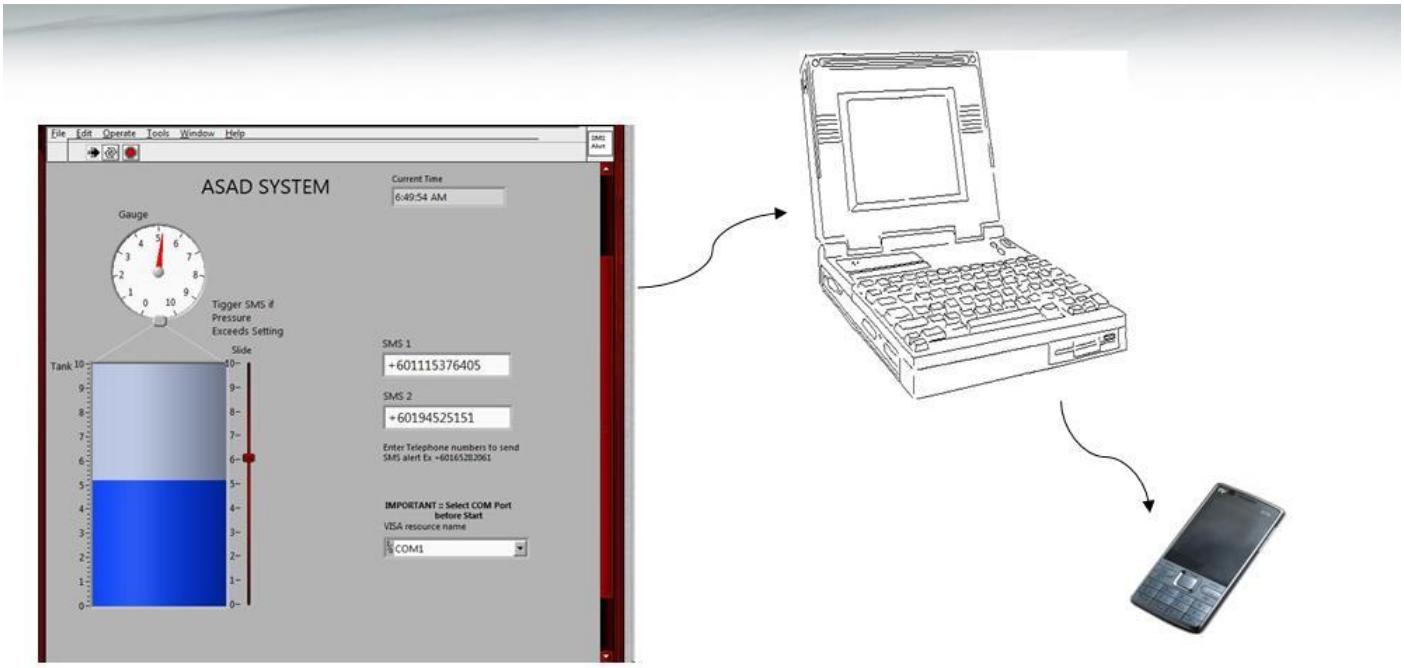


Figure 17: Prototype architecture

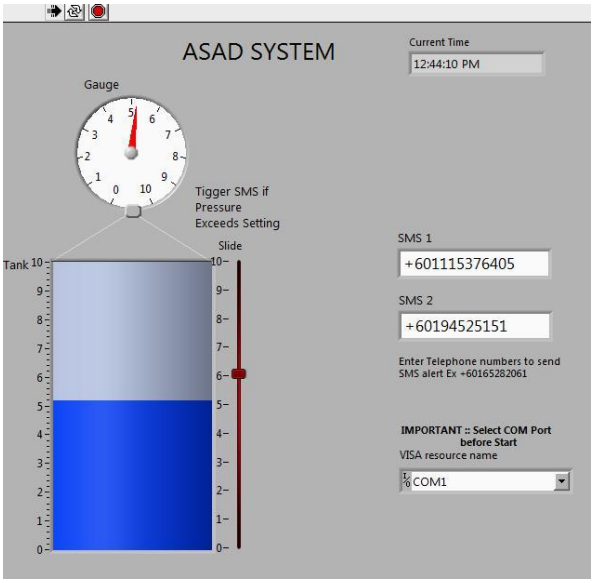


Figure 18: Initial stage

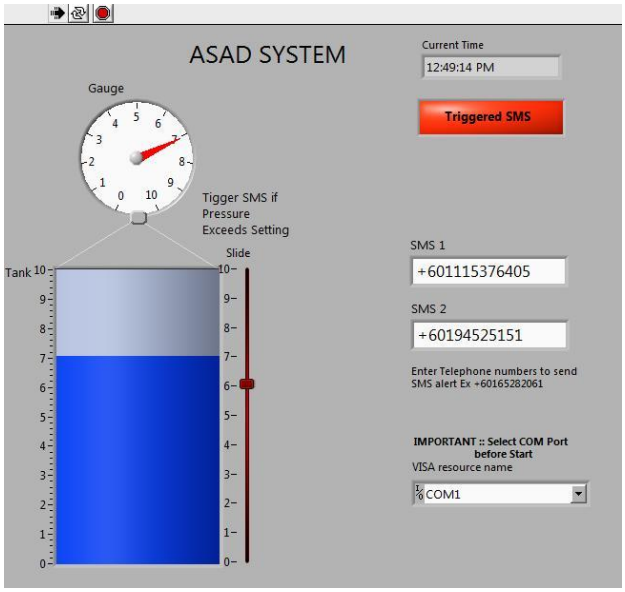


Figure 19: Pressure above level

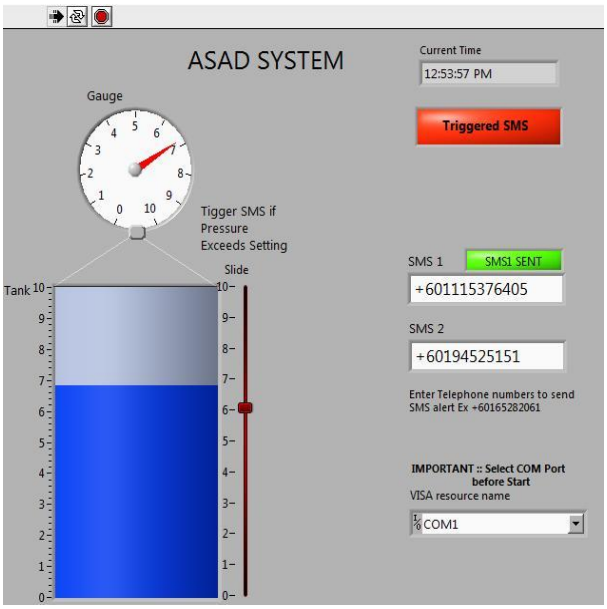


Figure 20: SMS 1 send

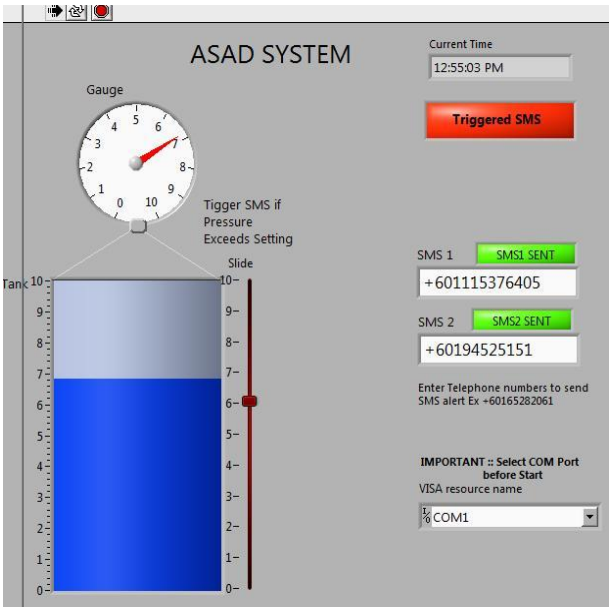


Figure 21: SMS 2 send

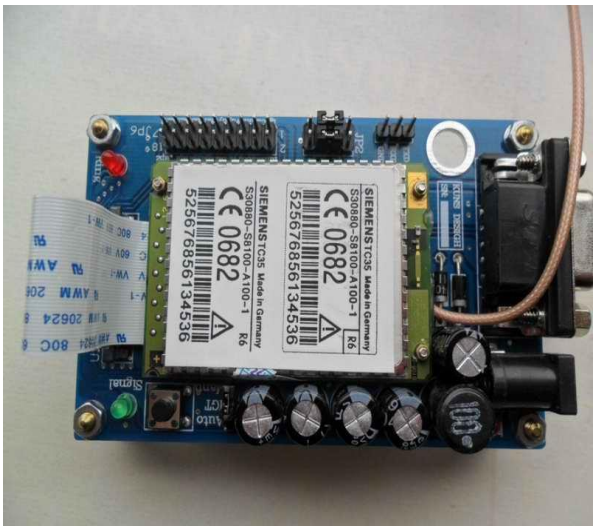


Figure 22: GSM modem

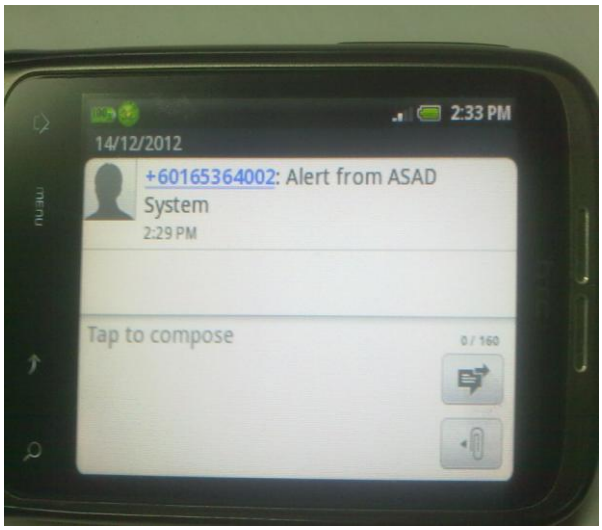


Figure 23: SMS screenshot

4.4 How to send AT Commands to a GSM/GPRS Modem

To use MS HyperTerminal to send AT commands to your mobile phone or GSM/GPRS modem, you can follow the procedure below:

Put a valid SIM card into the mobile phone or GSM/GPRS modem. You can obtain a SIM card by subscribing to the GSM service of a wireless network operator.

Connect your mobile phone or GSM/GPRS modem to a computer and set up the corresponding wireless modem driver. You should find the wireless modem driver in the CD or disk that was provided by the manufacturer. If the manufacturer does not provide such CD or disk with your mobile phone or GSM/GPRS modem, you can go to the manufacturer's web site and see the wireless modem driver can be downloaded there. If the wireless modem driver cannot be found on the web site, you can still use Windows' standard modem driver.

Run MS HyperTerminal by selecting *Start -> Programs -> Accessories -> Communications -> HyperTerminal*.

In the *Connection Description* dialog box, enter a name and choose an icon you like for the connection. Then click the *OK* button.

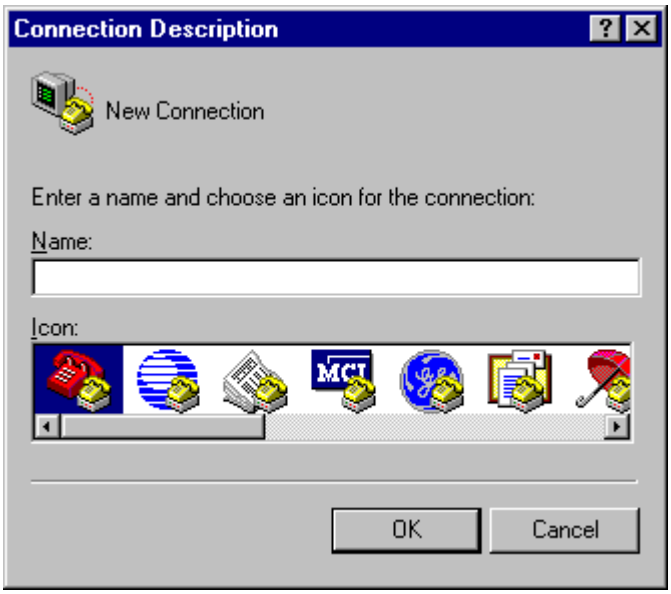


Figure 24: The screenshot of MS HyperTerminal's Connection Description dialog box.

In the *Connect To* dialog box, choose the COM port that your mobile phone or GSM/GPRS modem is connecting to in the *Connect using* combo box. For example, choose COM1 if your mobile phone or GSM/GPRS modem is connecting to the COM1 port. Then click the *OK* button.

(Sometimes there will have more than one COM port in the *Connect using* combo box. To know which COM port is used by your mobile phone or GSM/GPRS modem, follow the procedure below:

In Windows XP:
Go to *Control Panel -> Phone and Modem Options*. Then click the *Modems* tab. In the list box, you can see which COM port the mobile phone or GSM/GPRS

modem is connected to.)

Figure 25: The screenshot of MS HyperTerminal's Connect To dialog box.

The *Properties* dialog box comes out. Enter the correct port settings for your mobile phone or GSM/GPRS modem. Then click the *OK* button.

(To find the correct port settings that should be used with your mobile phone or GSM/GPRS modem, one way is to consult the manual of your mobile phone or GSM/GPRS modem. Another way is to check the port settings used by the wireless modem driver that you installed earlier.

To check the port settings used by the wireless modem driver on Windows 98, follow these steps:

a. Go to *Control Panel -> Modem*.

b. Select your mobile phone or GSM/GPRS modem in the list box.

c. Click the *Properties* button.

d. The *Properties* dialog box appears. The *Maximum speeds* field on the *General* tab corresponds to HyperTerminal's *Bits per second* field. Click the *Connection* tab and you can find the settings for data bits, parity and stop bits. Click the *Advanced* button and you can find the setting for flow control.

To check the port settings used by the wireless modem driver on Windows 2000 and Windows XP, follow these steps:

a. Go to *Control Panel -> Phone and Modem Options -> Modems* tab.

b. Select your mobile phone or GSM/GPRS modem in the list box.

c. Click the *Properties* button.

d. The *Properties* dialog box appears. Click the *Advanced* tab and then click the *Change Default Preferences* button.

e. The *Change Default Preferences* dialog box appears. The *Port speed* field on the *General* tab corresponds to HyperTerminal's *Bits per second* field. You can also find the setting for flow control on the *General* tab. On the *Advanced* tab, you can find the settings for data bits, parity and stop bits.)

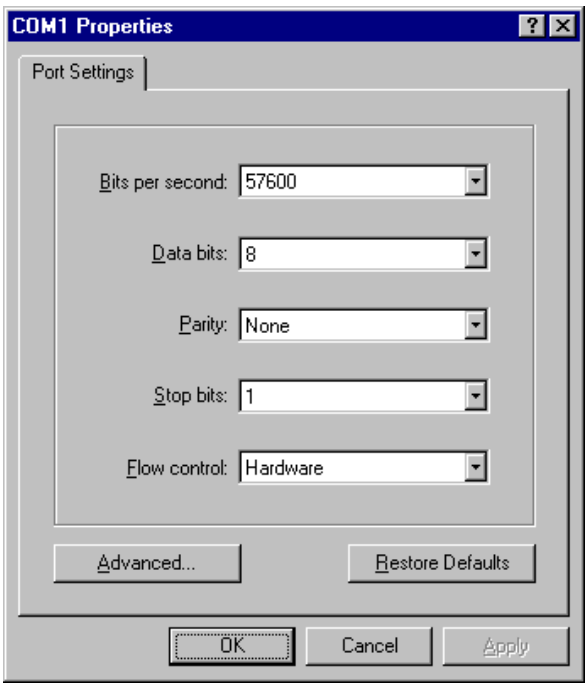


Figure 26: The screenshot of MS HyperTerminal's Properties dialog box.

Type "AT" in the main window. A response "OK" should be returned from the mobile phone or GSM.

Type "AT+CPIN?" in the main window. The AT command "AT+CPIN?" is used to query whether the mobile phone or GSM/GPRS modem is waiting for a PIN (personal identification

number, i.e. password). If the response is "+CPIN: READY", it means the SIM card does not require a PIN and it is ready for use. If your SIM card requires a PIN, you need to set the PIN with the AT command "AT+CPIN=<PIN>".

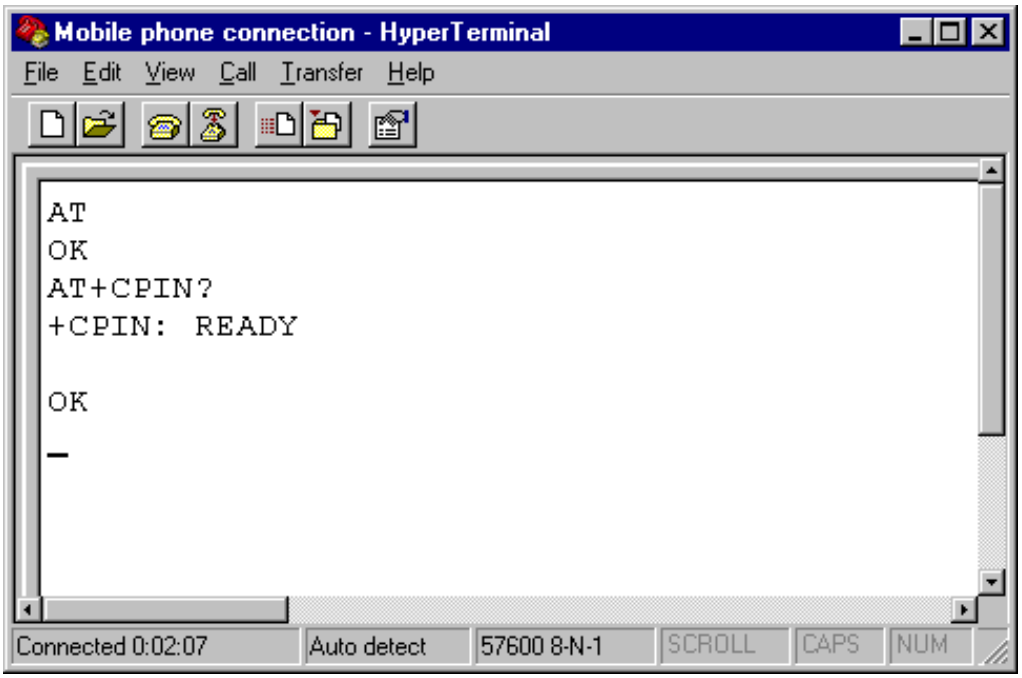


Figure 27: The screenshot of MS HyperTerminal's main window in Windows 98

If you get the responses above, your mobile phone or GSM/GPRS modem is working properly. You can start typing your own AT commands to control the mobile phone or GSM/GPRS modem.

The computer program in this case uses the attached device to communicate with the GSM network. If a message is sent by the application running on the computer it is first sent to the attached GSM phone, and as a second step the GSM phone transmits the messages to the SMSC of the GSM service provider through a wireless link. When a message is received, the GSM phone stores the message in its memory or on the SIM card and sends a notification to the PC. When the program running on the PC receives this notification, it reads the appropriate memory cell and deletes the message from the phone to make room for the next incoming message.

4.5 Alternative Solution: Setting up Ozeki Server for mobile phone

Ozeki Message Server 6 is a powerful, flexible SMS Gateway application that enables you and your applications to send/receive SMS messages to mobile devices with your computer. It has an easy-to-use user interface, and an excellent internal architecture. The application can use a GSM mobile phone attached to the PC with a phone-to-PC data cable or IP SMS technology to transmit and receive the messages. Ozeki Message Server works on Microsoft Windows XP, Windows Vista, Windows 7, Windows Server 2003 and Windows Server 2008 operating systems.

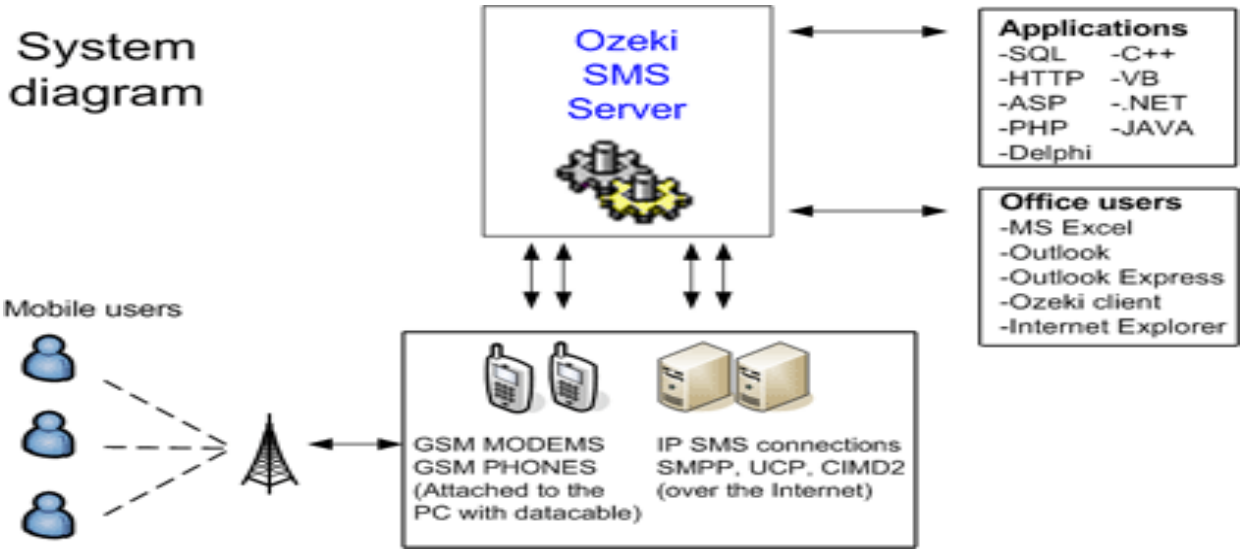


Figure 28: Ozeki SMS server architecture

CONCLUSION

Basically to come up with airbag stimulated auto-dialer, it requires certain device such as crash sensor, GSM module, GPRS and mobile phone. As discussed earlier, each of these devices has its important role which is required to be integrated in my device. Crash sensor plays the role as detector of the accident occurrence which will be placed in several different positions in the car. Only with a decent amount of impact will the sensor be triggered. This is to avoid unnecessary auto call made to police for very minor hits. GSM module acts as the most crucial component which will play the function as automatic caller. However, GPRS device will be required to ensure the location of the car where the accident has occurred.

Questions would asked whether this idea have implemented before, actually a more advance idea is been used in luxury car in USA such as Ford. That device has a webcam in the car and USA government has created a Road safety care department to assist driver through webcam during moments of accidents. However, just imagine if Malaysia's local cars were to implement such idea. It will be very costly to be implemented, firstly because we need to set up a Road safety care center and recruit employees for that. Then, the device itself would be costly as it will require wireless connection for webcams. Imagine due to this device if local cars increase the selling price, it will affect the sales of local cars. Therefore, my idea would be a cheaper way to safe guard drivers and passenger and the device is not very costly. Hopefully, this invention would help reduce the time taken for police or ambulance to receive information regarding accidents and eventually improve the response time from medic team.

RECOMMENDATION

Based on research, I believe that this project can be taken to another level by making more enhancements to it. For the FYP purpose I am only using a very basic GSM and GPRS modules. However, for future I recommend better and advance components to be added into my project. One of the ideas is to add alarm in the device so that when accidents occurred, people around would notice and at least a little first aid help could be given before the medic team arrives. Plus, modules with higher signal power can be used for a more reliable voice message sending. In my FYP I am not conducting Signal Strength Testing as I do not have the Telemetry equipment as well the expertise for conducting it. Thus, in future I would recommend a proper signal test be conducted for more reliable device efficiency. Last but not least, I would prefer the device to be marketed in local car industry such as PERODUA and PROTON as this device can give them customer satisfaction and competitive edge above other foreign brands.

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