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# CHAPTER I

# THE PROBLEM AND ITS BACKGROUND

### Introduction

Philippines has a vast history about natural disasters. In a way or another, disasters help shape our country as it is now. Because the damage dealt is almost unpredictable, natural disasters always leave people devastated surroundings. Especially when strong storms and earthquakes hit the country, at worst-case scenario, fatalities may be found. There are always casualties reported in the news every time a strong storm will pass by. There are also cases of people getting trapped in their respective homes, causing them to suffocate and to lose their lives. The rescuers could not find them because of the drabbles caused by these disasters that are blocking the way. As counter action to this, people developed technologies to its maximum potential to aid in these circumstances. For example, there are mobile applications that can detect a person trapped underneath a collapsed building. There are also prototypes of amphibian rescue boats that can be used in immediate rescue missions. However, these solutions may not really be practical in life-threatening situations. Mobile applications require the user to use their device, and in real-time disasters, people may not have the time to unlock their phone when everything around them is in chaos. Mobile phones also have the power supply issue. Unless the victim has multiple power banks, most likely, their devices will not even last a day. The researchers studied the scenarios very well, and brainstormed to create a solution that will help these people. This led the researchers to develop Help Box: A Life and Body Locator System through a Designed TV Box and Mobile Application for Post-Disaster Rescue Mission in a City. The prototype is a small box that looks just like a Television Box. It is made compact so that it can fit almost anywhere. Help Box can assist the respondents to send signal to a rescue organizations which will also help the rescuers locate the respondents. The prototype has a GPS Module and a Wifi Module. Using the device, which will be called the Help Box, rescuers can locate victims using the location from GPS and then the coordinates will be sent using RF Transmitter. The researchers believe that by creating this device, casualties caused by natural disasters will significantly decrease.

### Background of the Study

The geographic location of the Philippines is rather unfortunate when it comes to natural disasters; there are plenty of storms that can hit the country and there are also storms from other countries that end up also hitting Philippines. It is also included in the Pacific Ring of fire, where 81% of volcanic activities in the world can be found. Therefore, the researchers came up with the study Help Box: A Life and Body Locator System through a Designed TV Box for Post-Disaster Rescue Mission in a City. The study will use the size of a TV Box. Because it is small, the device can be placed anywhere, but the researchers suggest the beneficiaries to place the Help Box to a convenient place, for example, they can place it near their TV Box. When it’s raining hard, people tend to shut off their Televisions because it might get damaged if the lightning hit the antenna. If they placed the Help Box near the TV Box, then they will be able to remember to press it when flood starts to elevate in a critical level. The proponents used GPS Module and RF Transmitter as the primary features of the box. When the button is pressed, the Help Box will send its location via RF Transmitter to the Central Command where the location of the box will be displayed in the dashboard. When the command to rescue the victims are given, the rescuers will go to the location of Help Box. With the help of the Wifi module, the rescuers will be able to identify the location of the box more accurately.

### Statement of the Problem

Adisaster is a sudden event that seriously affects the community or society and causes both human and environmental losses that exceed the community’s ability to cope using its own resources. Natural disasters like tsunami, earthquake, and typhoon often inflict heavy damages; because these disasters are inevitable and only predictable to some extent, the community is doing what they can to be prepared for these disasters.

Although the community is well prepared, there are times that these disasters lead to casualties. To minimize casualties, several organizations and councils such as NDRRMC and Red Cross help the people to evacuate in order to avoid the disasters. However, even with their efforts, when an unpredicted natural disaster occurs, there are still cases of residents found stranded, wounded, or dead. Rescue operation response time is crucial to decrease the number of casualties. When a victim is trapped or stranded in an area, the time it takes for the rescuers locate the victim is essential for the victim’s survival.

The rescuers do not know the exact location of these victims, so they tend to search every corner of the affected area, which prolongs the time it takes to locate a person in need of their help. By giving the residents a device that will transmit their location to the rescuers in times of emergency, the rescuers will be able to rescue the victim immediately. With this study that aims to easily relay the victim’s location to the rescuers, the rescue system in the Philippines will be improved.

// The yellow highlight is the old one. Not erasing it for references

In disasters, the most efficient way of reducing casualties is rescuing the stranded victims. Because disasters are very sudden, civilians are usually left in panic, and many people get stranded in their respective locations before a disaster wreaks havoc. In this case, the speed of rescuing is crucial so every second counts. The thing is, the rescuers do not know the exact location of these victims, so they tend to search the whole area which is very impractical. For example, NDRRMC also relies on the information given to them by the people present at the disaster area. When a person, for example a civilian, relays information to NDRRMC, the accuracy of information is questionable.

Gathering data for the study can be challenging since natural disasters are mostly unpredictable, except typhoons which has early signs. Due to this fact, the researchers chose to gather data where the effect of typhoon is immediate and has a greater effect. Based from these statements, Malabon City matches the criteria.

### Significance of the Study

The proposed study will be beneficial to the following, (1) The residents residing in disaster-prone areas, (2) Rescue-Oriented Organizations; primarily public, (3) the University where the study will be archived, and (4) the future researchers.

There are people who does not want to evacuate, and always end up getting stranded in their household. With the help of the device, they can be rescued safely. It can also be useful for victims of other disasters. The research will also benefit some sectors of the government like NDRRMC and local search-and-rescue groups. The study will also be of significance to the university, since the paper will be added to the roster of researches already done in the university, therefore expanding the knowledge and information available. The researchers will also benefit from the study where in the skill required to perform the paper and the prototype must be developed and enhanced.

### Theoretical Framework

GPS or Global Positioning Systems is a term that most commonly conjures up images of vehicle navigation systems, space-age satellite technology, and interactive maps for outdoors-types and sportsmen. However, the reality is that there are far more applications of Global Positioning Systems beyond GPS vehicle tracking or map navigation that everyday people like us can benefit from. (Dipak Patra, Editorial Today) .

The GPS tracking systems have been very useful for people to find their way on land and on water, in keeping track of people, vehicles, pets etc, in scientific studies, for map making, land surveying and countless other commercial uses. Everyday new applications are being found for the amazing NAVSTAR GPS commonly known as GPS systems. There are wide variety of GPS receiver models available suitable for a variety of applications. (Vanessa Jones, Ezine Articles)

Wherever you are on the planet, at least four GPS satellites are ‘visible’ at any time. Each one transmits information about its position and the current time at regular intervals. These signals, travelling at the speed of light, are intercepted by your GPS receiver, which calculates how far away each satellite is based on how long it took for the messages to arrive. Once it has information on how far away at least three satellites are, your GPS receiver can pinpoint your location using a process called trilateration. (Physics.org)

The separator in Lithium Polymer is made of a micro-porous polymer covered in an electrolytic gel that also serves as a catalyst that reduces the energy barrier in the chemical reaction between cathode and anode. Therefore, Li-Polymer batteries allow for a slight increase in energy density. However, this advantage is offset by a 10% to 30% cost increase. Therefore, because the same materials are used for cathode and anode, Li-Polymer batteries follow the same chemical process as Li-Ion batteries and so are not a distinct class. Because the solid polymer is flexible, it is possible to construct flexible batteries and batteries that can be easily formed into various shapes and sizes, even thin films. So you'll most often see Li-Poly used for batteries which are relatively thin (e.g. Nokia's 'hero' BP-4L battery used in a dozen devices) or oddly shaped (e.g. to fit round other components in a tightly packed phone). (Gilson, All About Symbian).

Many components contribute to the successful transmission and reception of RF signals and these are the key components. First, there is a transmitter which begins the RF communication. The transmitter takes the initial data and modifies the signal using a modulation technique to encode the data into the signal. The transmitter is also responsible for determining the power level of the wave, which is ultimately regulated by local domain authorities.

Next, an antenna collects the signal that it receives from the transmitter and directs the RF waves away from the antenna. As the RF waves move away from the transmitting antenna they move towards another antenna attached to the receiver, which is the final component in the wireless medium. The receiver takes the signal that it received from the antenna and translates the modulated signals and passes them on to be processed. (Gunther, Aerohive Networks)

A band of frequencies clustered around 2.4 GHz has been designated as unlicensed frequency band and is useful as the Industrial, Scientific, and Medical radio bands. "A lot of the unlicensed stuff — for example, Wi-Fi — is on the 2.4-GHz or the 900-Mhz frequencies, the ISM bands. You don't need a license to operate on them." That's Ira Kelpz, Deputy Chief, Office of Engineering and Technology at the Federal Communications Commission, explaining precisely why these ISM bands are attractive to gadget makers: They're free to use. If routers and cordless phones and whatever else are relegated to a small band 2.4 GHz, then their radio waves won't interfere with, say, cellphones operating at 1.9 GHz, or AM radio, which broadcasts between 535 kHz and 1.7 MHz. The ISM is, in effect, a ghetto for unlicensed wireless transmission, recommended first by a quiet little agency in a Swiss office of the UN, called the ITU, then formalized, modified and codified for practical use by the governments of the world. (John Herman, WIRED)

When referring to a *signal* in relation to wireless communications, it is an electromagnetic field with specific characteristics, being its oscillation frequency. When working with computer data, copper wires are used to send electrical signals; fiber-optic cables can send optical signals. If you want to send wireless signals, you use light waves for line-of-sight technologies (such as IrDA) or RF for non-line-of-sight technologies (such as Bluetooth). When you listen to a radio station in your local area, this radio station broadcasts its content over a radio-wave signal that operates at a base waveform or wave of a specific set of dimensions consisting of an amplitude, period, and phase. This wave can be modified through one of the modulation techniques to change its form, and thereby transmit information. (Edward Tetz, Dummies.com)

When referring to a signal in relation to wireless communications, it is an electromagnetic field with specific characteristics, being its oscillation frequency. When working with computer data, copper wires are used to send electrical signals; fiber-optic cables can send optical signals. If you want to send wireless signals, you use light waves for line-of-sight technologies (such as IrDA) or RF for non-line-of-sight technologies (such as Bluetooth). When you listen to a radio station in your local area, this radio station broadcasts its content over a radio-wave signal that operates at a base waveform or wave of a specific set of dimensions consisting of an amplitude, period, and phase. This wave can be modified through one of the modulation techniques to change its form, and thereby transmit information.(James Donovan, Commscope Training)

### Conceptual Framework

Knowledge in:

1. Rescue Operations

2. Mobile Application Development

3. Website Development

4. Electronics

5. Data Communications

Hardware:

1.Water Resistant Materials

2. GPS Module and 2.4 GHz Transmitter

3.Smartphone

4. Arduino Uno

5. RF Transmitter and Receiver

6. Raspberry Pi

Software

1. Android Studio

2. Arduino IDE

3. Java Programming Language

4. C++

Peopleware

1. Respondents

2. Rescuers

3. Researchers

Device

Activation

Transmission of Signal

Receiving the Signal to Command Center

Sending the Signal from the Command Center

Relaying the Location of the Help Box to the Rescuers

HELP BOX: A LIFE AND BODY LOCATOR SYSTEM THROUGH A DESIGNED TV BOX AND MOBILE APPLICATION FOR

POST-DISASTER RESCUE MISSION IN A CITY

USER MANUAL

**FEEDBACK**

*Research Paradigm of the Input, Process and Output of the Study*

The INPUT is the part where the proponents specify the knowledge, hardware, and software that is needed in producing the prototype. The PROCESS involves the analysis, design, development, and testing of the system. Lastly, the output will be the **Help Box: A Life and Body Locator System Through a Designed TV Box and Mobile Application for Post-Disaster Rescue Mission in a City** and its User Manual.

### Scope and Limitation

Because of its diversity, Help Box can be utilizeded in almost any situations that needs immediate action, especially disasters. Given that the researchers aim to create a device that is easily accessible to the users, the researchers believe that the device will help decrease the casualties caused by earthquakes, typhoons and other disasters. Upon using the device, it can transmit its location from GPS. The GPS signal will be stronger at open areas, so the signal will be greatly boosted outside. The RF transmitter will be used to send the device’s location to the Command Center. Each Help Box has an ID registered to the Command Center, and will also be transmitted when Help Box has been activated. This feature can be used when searching for a survivor in a destroyed and disaster-altered areas. In cases where the GPS Module cannot determine the location of the box, rescuers can rely on the last known location of the box. Using the WiFi module, rescuers can use the mobile app provided to detect the hotspot created. Help Box has GPS to locate the victim. Even without internet, Help Box will be able to communicate to the GPS satellite, making it a good source of location. It will be focused on areas with high risk of disasters, like earthquakes, tsunamis and storms. Help Box has a compact size that will be able to fit anywhere, and it also has its own battery, making it portable. It is easy to operate; one push of a button will immediately send a distress signal to the Command Center. It is also water resistant and shockproof, an essential feature of a device if it is expected to survive in a disaster.

The scope of the study will include the following:

* Help Box has GPS to get its location. Even without internet, Help Box will be able to communicate to the GPS satellite.
* Help Box has RF Transmitter to send its location to the Command Center.
* Help Box also has a 2.4 GHz Transmitter that will serve as a hotspot for additional functionality, adding more accuracy to the rescue operation.
* Help Box has a compact size that will be able to fit anywhere, and it also has its own battery, making it portable.
* Help Box is easy to operate; one push of a button will immediately send a distress signal to the Command Center.
* Help Box is water resistant and shockproof.

However, the study has limitations. Help Box cannot detect the state of consciousness of a victim. The 2.4 GHz Transmitter and GPS Functionality has its own limitations. The 2.4 GHz has a range of 8 meters, and the GPS can only receive data from satellites, and cannot transmit data back to the satellites. It will also not detect the location of the victim if they wouldn’t bring the device with them.

The limitations of the study are the following:

* Help Box cannot detect the state of consciousness of a victim.
* The 2.4 GHz Transmitter has a range of approximately 8 meters.
* GPS Receivers can only receive data from satellites, and cannot transmit data back to the satellites.
* In times of disaster, Help Box must be carried by the user upon activation in order for the device to update the Command Center of its latest location.

### Definition of Terms

**1. COMMAND CENTER –** The Command Center mentioned in the study several times is the headquarters of the system. This is where Help Box will first send the data, and then the Command Center will be the one to relay this information to the rescuers.

**2. DISASTER** – it is a sudden event, usually catastrophic, that causes great damage and has a great possibility of causing a loss of life of a person

**3. FREQUENCY BAND**- It is an interval in the frequency domain, delimited by a lower and upper frequency.

**4. GHZ (GIGAHERTZ)** – One gigahertz is equal to 1,000 megahertz (MHz) or 1,000,000,000 Hz. It is commonly used to measure computer processing speeds. *(techterms.com)* In this study, GHz is used as a measurement of frequency.

**5. GPS** – The Global Positioning System (GPS) is a U.S.-owned utility that provides users with positioning, navigation, and timing (PNT) services. (*gps.com*)

**6.** **HELP BOX –** Help Box is a life and body locator system through a designed TV Box for post-disaster rescue mission in a city. Upon pressing a button installed in the device, it will send a signal to the Command Center. It also has a 2.4 GHz Transmitter that will be used as a hotspot for additional accuracy of the victim’s location.

**7. MOBILE APPLICATION** – it is a program that is specifically made for mobile phones (usually smart phones) to be used by the user for specific purposes

**8. NETWORK –** A collection of computers, servers, mainframes, network devices, peripherals, or other devices connected to one another to allow sharing of data.(*Computer Hope)*

**9. RADIO FREQUENCY (RF)** – is a term called to the frequencies of specific range of 20 KHz to 300 GHz. In this research, RF is used as a synonym for radio and other uses of wireless communications.

**10. SIGNAL** - it is a detectable physical quantity or impulse (such as a voltage, current, or magnetic field strength) by which messages or information can be transmitted (*Merriam-Webster*)

**11. TRANSCEIVER –** A transceiver is a device comprising both a transmitter and a receiver which are combined and share common circuitry or a single housing. *(Cozlink)*

**12. TRANSMITTER** – is an electronic device that sends data (usually in the form of radio waves) to send data

**13. TV BOX –** TV Box is a commonly-known device that is used to connect the Television to different TV Networks. It is usually a small black box placed near the TV.

# CHAPTER II

# REVIEW OF RELATED LITERATURE AND STUDIES

This chapter will be discussing some literature and studies, both foreign and local, related to the study Help Box: A Life Locator System through a Designed TV Box and Mobile Application for Post-Disaster Rescue Mission in a City.

### Foreign Literature

According to Leigh-Ann Topfer in her article entitled “GPS locator devices for people with dementia”, Locator devices that use GPS (global positioning system) are assistive technologies that can help in promoting safe walking for people with dementia by alerting the caregivers that their patients wandered outside their designated area by giving geographic coordinates of the person so they can be found more easily. She also stated that because locator devices are a form of surveillance, they raise ethical and legal issues regarding privacy and autonomy, but they will be a great help to the caregivers and the potential benefits would outweigh the potential harms. The researches thought that this article is related to the study because of the concept that we will be applying on the Help Box such that we will be using GPS to rescue disaster victims within a certain area given

GPS World Staff stated in their article that the Galileo Search and Rescue(SAR) service was made possible by the Galileo satellite constellation is now active, and it is Europe’s contribution to a satellite-based search and rescue distress alert detection and information distribution system best known for detecting and locating emergency beacons activated by aircraft, ships and hikers in distress. They also said that with the Galileo, the time to identify the location of the beacon signal is reduced from several hours to minutes. The Search and Rescue transponders on Galileo satellites can pick up signals emitted from any 406-MHz distress beacon anywhere in the service coverage area and transmit this information to the dedicated ground stations. Since this article is an innovation for the convenience of search and rescue operations, the researchers thought that the concept would support the study to be conducted.

In an article by Defense IQ Press, they quoted Commander Sirio Faé’s statement with regards to the most challenging aspect in mass search and rescue operations which is communication. Communication among the rescuers are important to reduce the amount of redundant information; to route that data that is not strictly relevant to the operation to other areas in order to only focus on what is directly involved. The researchers thought that communication with the victims are just as important in order to make the rescue operation easier.

In an article by Emma Sloan, she lists some of the pros and cons of GPS phone tracking apps. One of the pros of GPS phone tracking apps she mentioned is in the case where you or anyone you know gets lost or goes missing, Law enforcement officers can use their own programs to track where the phone is of the individual they are looking for. As long as the GPS is turned on, the location will come up on a map in just a few minutes. Since this study is an innovation for search and rescue operations, the statement above supports the idea of using GPS for locating people.

According to an article in www.gps.gov regarding GPS accuracy, a GPS-enabled smartphones are typically accurate to within a 4.9 m (16 ft.) radius under open sky but their accuracy worsens near buildings, bridges and trees. Which is why high end users make use of dual frequency signal to boost GPS accuracy. With this in mind, the researchers thought of using a 2.4 GHz frequency transmitter in the Help Box to heighten the accuracy of locating people in search and rescue operation.

The researchers will be creating a mobile application for this study and decided to make use of the programming language Java. According to an article by Jamil Velji, Java is the most used app development language. Android OS is written in Java so if you learn Java, you will be able to create Android apps of all types and this will put you in the driving seat because you will be in control over the future of app technology. Java is the most suitable mobile app development language because it runs on all the platforms including the all-famous Android.

In another article by James Frew, he stated Java’s key features which are: it runs on nearly all platforms, object orientated language, open source libraries, strong community support for Java and Android, easy to learn, easy to read and powerful Integrated Development Environments (IDE) reduces errors and gives clear explanations and suggestions.

### Local Literature

“Project Kwago”, a drone made by a three-man Filipino team, Mac Eugenio, Ari Trofeo and Vince Villena can boost search and rescue operations, especially during disasters. The team said most drones used in search and rescue operations in the Philippines only take photos and videos of damages in disaster areas. Also, most can only be used during daytime. Kwago aims to provide more. It is also said to specialize at night operations, given that it was installed with a thermal camera that can detect heat signatures from the ground. It also has pattern recognition, auto take-off and landing, collision avoidance and sonars. "Since Kwago is an app-based system, we have the option to create other apps where we can use Kwago for other relevant purposes," Eugenio said. Also, the drone will make a high altitude thermal scan of the coordinates plotted using the Kwago App. The system marks an area once a thermal scan has been detected. A low altitude sweep will follow to get the exact location of the coordinates of the detected heat signature and also to get more detailed information of the subject. The coordinates would then be transmitted to the ground station or to the rescuer nearest to the location in real time.The Kwago operator can also hover and beam a light on the detected subject while waiting for aid or it can resume with the sweep.

According to COA, Philippines stands as one of the most disaster prone areas in the world. Over the last decade, the Philippines had a record of 565 disaster events with 69,724 fatalities. These disaster events affected around 186 Million people from 1900 to 2014. According to the Philippine Disaster Risk Reduction and Management (PDRRM) Act of 2010 and the Local Government Code of 1991, Local Government Units (LGUs) are expected to be at the frontlines in the aftermath of disaster events to provide immediate relief and assistance to those in need. Hence, the ability of the LGUs to respond to disasters plays a crucial role in the Disaster Risk Reduction and Management Framework of the National Government. With regards to this, Quezon City and Malabon City have integrated disaster risk reduction and climate change adaptation into its respective local development plans, programs and budgets. Both cities formulated medium term Disaster Risk Reduction and Management Plans. Quezon City’s Plan covers the period from 2014-2020 while Malabon City’s Plan covers 2014-2024. Both plans aimed at establishing and strengthening the capacities of communities to help them anticipate, cope, and recover from the negative impacts of emergency occurrences and disasters, consistent with the National Disaster Risk Reduction and Management Plan.

Disaster Risk Reduction requires planning for it to be effective. Disasters are serious disruptions on the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceed the ability of the affected community or society to cope using its own resources. Disasters are often described as a result of the combination of: the exposure to a hazard; the conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts may include loss of life, injury, disease and other negative effects on human, physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation. 1 Disasters can strike anytime, anywhere. It can cause irrevocable damage to life and property if the right measures are not put in place to avoid the same. This can also bring out the best and worst of human nature. The manner in which action is taken goes a long way to determine how people fair from the experience. Hence, there is need for disaster risk reduction and management (DRRM). DRRM is the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster. Prospective DRRM refers to risk reduction and management activities that address and seek to avoid the development of new or increased disaster risks, especially if risk reduction policies are not put in place.

According to Miguel R. Camus, an author at Business Inquirer, The National Telecommunications Commission (NTC) has released audit results on all assigned mobile frequencies, revealing that, while most companies complied with regulations, a good number have not been using or paying the requisite government fees for their spectrum holdings. The audit was in line with a crackdown on frequency “warehousing” that was launched by the NTC last year, under the direction of the Department of Information and Communications Technology (DICT). Radio frequencies are considered the lifeblood of the telecommunications industry. These allow the transmission of various forms of data, enabling phone calls, text messaging, and internet browsing on mobile phones.

The research also includes creating a mobile application. Currently, Mobile App Development in the Philippines is more accessible because of the internet. Programmers and aspiring mobile application developers can learn about this technology by downloading and viewing videos on their desktop or mobile devices. Internet and mobile marketing remains to be at the early stages in the business environment in the Philippines. The users of the two media in the country have grown enormously through the years, with internet users totaling 9 million or 9% of the total population. The era of mobile computing, dominated by Apple and Google, is driving among the greatest shifts in consumer behavior over the last forty years. On top of this enormously growing iOS and Android device installed base, roughly 40 billion applications have already been downloaded from the App Store and Android Market. Particularly, consumers are separating their time accessing services on the Internet from PCs versus doing so on mobile devices from apps. The analysis also shows that people are devoting ever more time in mobile applications. Time spent in apps and the web, combined, has grown as users lead a more connected life. This progress though has been driven entirely by applications.

### Foreign Study

The Help Box will feature a 2.4 GHz transmitter for additional accuracy. According to J M Lebreton et al, it is possible to create a robot that maps the signal strength of the surrounding Radio Frequemcy, specifically 2.4 Ghz. Although what he used was an autonomous robot, it still shows that it is very possible to map the signal of radio frequencies surrounding the area, especially for the 2.4 GHz frequency. The mapping can also detect different RF sources available in the environment.

According to the study of A. N. Idris et al, the successful of GPS observations are dependent on several factors between satellite vehicles and GPS receivers, where low GPS power levels have led to the threat of radio frequency interference (RFI) on the GPS signals. This study was conducted to evaluate the effect of RFI on the precision of positions of single and dual frequency receivers through relative positioning technique by taking into consideration the radius of GPS receiver from interference source, length of baseline and response of rejection. Several tests were conducted in real environment by simulating the interference signal towards GPS receivers in the nominated GPS L1 and L2 bands. Calculations were made to indentify the distance and interference signal power between interference source and GPS receiver in order to investigate the level of effect. To be able to study this effect on the precision of GPS positions, the 3D residual positions and geometric dilution of precision (GDOP) have been used. The findings of this study have demonstrated that a sufficient time for the GPS receiver to respond in particular interference signal power level and the radius from the interference source were made as compared to previous work. It was also indicated that the residual positions and GDOPs were affected proportionally when nearly to interference source but not similar for both days due to GPS coverage and other probable errors. Therefore, a good investigation on RFI towards GPS signals should be conducted in secured environment which can control the various GPS error parameters in order to obtain a reliable result on this effect.

A dashboard is often displayed on a web page which is linked to a database that allows the report to be read by the user. In other terms, dashboard is much like of a ‘status report.’ According to Cecile Mathijsen, author of the study “Possibilities of a dashboard fueled with location-based information for monitoring the decentralizations in the social sector”, a dashboard can also be used in monitoring a state of a society. By stating the society’s location beforehand, it can be used to watch any changes that might happen to that particular society.

According to Efrain Zanteno, since they appeared, wireless technologies have deeply transformed our society. Today, wireless internet access and other wireless applications demand increasingly more traffic. However, the continuous traffic increase can be unbearable and requires rethinking and redesigning the wireless technologies in many different aspects. Aiming to respond to the increasing needs of wireless traffic, we are witnessing a rapidly evolving wireless technology scenario. This thesis addresses various aspects of the transmitters used in wireless communications. Transmitters present several hardware (HW) impairments that create distortions, polluting the radio spectrum and decreasing the achievable traffic in the network. Digital platforms are now flexible, robust and cheap enough to enable compensation of HW impairments at the digital base-band signal. This has been coined as ’dirty radio’. Dirty radio is expected in future transmitters where HW impairments may arise to reduce transmitter cost or to enhance power efficiency. This thesis covers the software (SW) compensation schemes of dirty radio developed for wireless transmitters. As described in the thesis, these schemes can be further enhanced with knowledge of the specific signal transmission or scenarios, e.g., developing cognitive digital compensation schemes. This can be valuable in today’s rapidly evolving scenarios where multiple signals may co-exist, sharing the resources at the same radio frequency (RF) front-end.

### Local Study

According to a study conducted in LPU, the emergence of Global Positioning System (GPS) gives tracking units the sense of power and modification which helps one to identify the exact location, time and speed of a person, vehicle, pets and other things including one's assets to which the unit is attached to. Moreover, the development of a compact, portable and economical GPS device or receiver has made a lot of difference in today's living; aside from GPS devices, GPS can also be implemented in mobile phones and computers with Internet. When it comes to its value, GPS is a benefit to almost all areas -- agriculture, military, maritime, automotive, surveying, aviation and forestry, environmental and public safety. This can also be applied to mobile phones through the creation of Global Positioning System navigation via online applications such as Waze and Google Maps. Navigation and offline applications including iGo and Maverick. Also, the researcher defined that a mobile application is an application for mobile devices like smartphone or tablet. It varies from simple application to sophisticated application that contains a lot of functions. In order to develop an application, an Integrated Development Environment (IDE) is needed. The proponents developed the mobile application using Basic4Android IDE that uses Basic Programming Language instead of Java Programming Language.

The Philippines is the third country most vulnerable to disaster worldwide due to the frequency of calamities. Floods, which are usually caused by strong typhoons, heavy rainfall or tsunamis caused by earthquakes, are responsible for 40% of all natural disaster occurrences. The Philippines' drainage systems are inferior, it only takes a short stretch of flooded road to make a whole road impassable, especially by vehicles, according to the study of Katrina Ivy Mae Cabrera et. al. Also, an android app is a very efficient way to monitor a certain area with ease.

Although the study won’t use SMS, the research done by Ralph H. Balingasa et al. will make a good insight of GPS. There is no time in history that tracking has become a part and parcel of almost everyone’s lives than it is today. Due to the need of a device that enables easy access in locating a particular person, thing or vehicle, the proponents aim to develop a study which comprises of the communication between a distress signal tracker incorporated in a server through mobile communication (SMS) that contributes to public safety, delivers accurate location of the user to the corresponding recipients and provides a real-time monitoring system using VB.Net and MySQL. The method of research used in this study was experimental method which involves the identification of response time and availability of the network signal. A series of testing was performed in 30 different locations in Calamba, Laguna demonstrating the versatility and accuracy of the device and server under various circumstances.

### Synthesis and Relevance of the Study

For the study to become relevant, Disaster Risk Reduction Management in every city must be prepared for disasters. It is because they will be the backbone of search-and-rescue operations. This is why the proponents also created a dashboard that will serve as a status report that will be flashed on the monitor.

GPS is also a very important factor in the study. Without GPS, the rescuers won’t be able to pinpoint the coordinates of the device. The study also uses Radio Frequency as the medium of transmission of the data. The studies mentioned above serves as reference and proof that Help Box is indeed feasible and helpful to its beneficiaries.

# CHAPTER III

# RESEARCH DESIGN AND METHODOLOGY

This chapter presents the research methodology on how the data gathered will be analyzed and how the concepts will be related to the project. These includes the Research Design, Research Methodology, Locale of the Study, Sample and Sampling Techniques, Description of the Respondents, Research Instruments, Data Gathering Procedure and Statistical Treatment.

### Research Design

The researchers will be utilizing the experimental research. The methods of research stated above are applicable for this study given that the researchers will be integrating different kinds of major functions onto our prototype. The descriptive research will be implemented in the research in such case that we will also be conducting the study to analyze and determine the effectiveness of the Help Box. By gathering all the needed modules and materials, we will be making Help Box.

### Locale of the Study

The researchers chose CaMaNaVa as their target area since this is where the disasters are often congested. Out of the four areas, the researchers chose Malabon because of its small area and geographically, it is near Manila Bay. The city of Malabon recorded a total population of 365, 525 as of August 1, 2015 based on the 2015 Census of the city. The researchers will be conducting the research on every barangay at Malabon.

### Description of Respondents

The respondents of the research focuses on the residents of Malabon. The respondents must be residing long enough to have experience several disasters that have occurred so that the researchers will be able to gather precise data for the study.

### Research Instrument

The researchers will use survey questionnaires for data gathering and collecting. Each item in the questionnaire corresponds to how the Help Box will be in terms of reliability and effectiveness. The researchers will use tally, checklist scales, and computation for quantitative observation of the research while in the qualitative side, the proponents will use observational and stoichiometric device.

### Data Gathering Procedure

The researchers will be utilizing necessary steps to gather the data needed for the study.

* The proponents will gather additional data through references like books, journals, thesis, articles, dissertations, etc. from different libraries like UP Diliman College of Engineering Library, PUP college of Engineering Library, Online Public Access Catalogs of different schools. Aside from that, the researchers gathered electronic references from the internet.
* The researchers coordinated with NDRRMC, a Local Government Unit (LGU) to be able to gather data regarding the information of the Locale of the researcher’s study.
* A request letter will be presented to the respective target population of the researchers.
* The data will be collected from the respondents using the questionnaires made by the respondents. The data will be collected from the respondents using the researcher’s questionnaire and it will be tallied.

### Statistical Treatment

The researchers will be utilizing Likert scaling in the survey. In terms of computing results or the data in the survey part of the study, the researchers will be using Weighted mean. Weighted mean will be applied and shall be computed by summarizing the product of frequency, multiplied by the weight assigned to it and then divided by the total number of respondents.

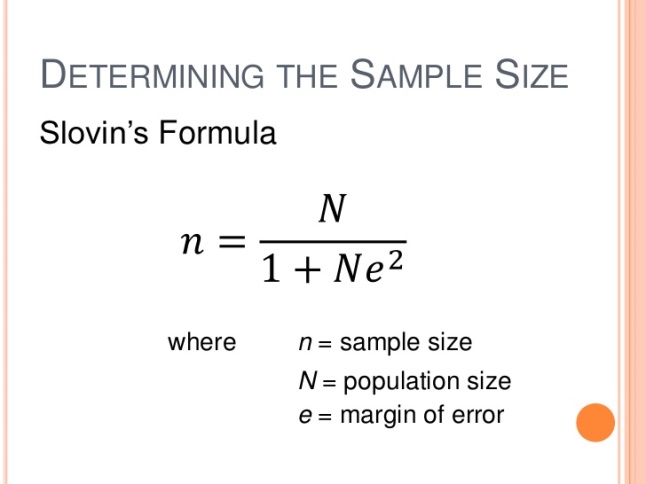
∑x = W1x1 + W2x2 + ….Wnxn

W1 + W2 + … + Wn

Where ∑x is the weighted mean, W for the weighted frequency of respondents and x for the value of the scale. In terms of testing the effectiveness of the study, the researchers will be using the Analysis of Variance (ANOVA) formula. Analysis of variance (ANOVA) is an analysis tool used in statistics that splits the aggregate variability found inside a data set into two parts: systematic factors and random factors. The systematic factors have a statistical influence on the given data set, but the random factors do not (Investopedia,2017). The researchers will use the analysis of the variance test to determine the result that independent variables have on the dependent variable.

### Sample and Sampling Techniques

The sampling technique that will be used is Judgment Sampling in which the researchers will select the respondents considered to be in the best position, or most knowledgeable to give the needed information. Since Help Box will be designed for disasters, the respondents must be knowledgeable and have enough experience when said phenomena occur. The main source of the data for this study will come from chosen respondents or participants. As of the 2015 Census, Malabon currently has a recorded population of 365, 525 residents. The sample size of the respondents will be determined through Slovin’s formula:



Where N stands for population size, n for the sample size, e for the margin of error (0.05)

For the computation to determine the sample size of the respondents:

= = =

The proponents will randomly choose 400 respondents from the municipality of Malabon.

# Appendix

### Appendix A

Appendix A

Costing of the Device

**COSTING**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| QUANTITY | ITEM NAME/PARTS/COMPONENT | UNIT PRICE | AMOUNT | ITEM DESCRIPTION |
| 1 | **Adafruit FONA 808 Mini Cellular GPS GSM Breakout** | ₱2,609 | ₱2,609 | GSM and GPS Module |
| 1 | **Lithium Polymer Battery 2200mAh** | ₱650 | ₱650 | Power Source |
| 1 | **GPS Antenna** | ₱247 | ₱247 | Antenna |
| - | **Electric Components** | - | ₱500 | Circuit Components |
| 1 | **Raspberry Pi 3B + Case and Fan** | ₱2500 | ₱2500 | Server |
| - | **Aluminum Casing** | ₱3000 | ₱3000 | Casing |
| 1 | **ESP8266 WiFi Module** | ₱350 | ₱350 | WiFi Transmitter |
| 1 | **Arduino Uno** | ₱400 | ₱400 | Microcontroller |
| 1 | **RF Transmitter and Receiver** | ₱100 | ₱100 | RF Module |
| Total: ₱10,356 | | | | |

### Appendix B

Appendix B

Benefits of Making the Study

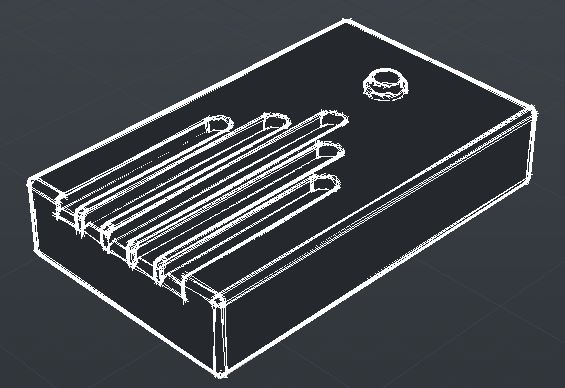
**Benefits of Making the Study**

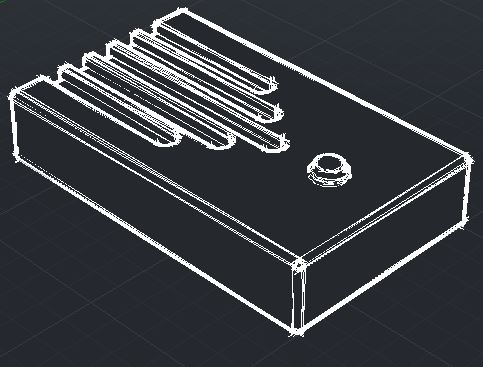
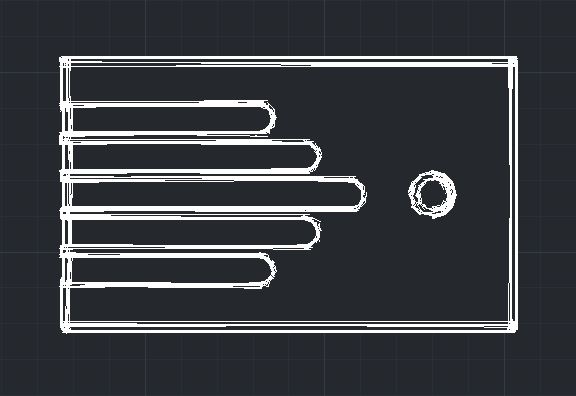
The device is only one of the parts of the study. It also consists of a dashboard and a mobile application. In addition, the transmission method from the device to the Command Center is one of the main functions of the system. By conducting this study, the researchers are proposing different methods in transmission. Researching different methods of transmission will not only help the future researchers but also the whole community of engineers who seek out different functions of radio frequency. Although it has been often used as transmission of data, RF is still not being used in sending a distress signal, which the study does. The study will also benefit the DRRM of a city. Since the Help Box will send its location to the dashboard via Radio Frequency, the DRRM with its search and rescue operation will be able to respond quickly.

### Appendix C

Appendix C

Prototype Design

**PROTOTYPE DESIGN**



### Appendix D

Appendix D

Survey Questionnaire

### PRE-TEST:

**HELP BOX: A LIFE AND BODY LOCATOR SYSTEM THROUGH A DESIGNED TV BOX AND MOBILE APPLICATION FOR POST-DISASTER RESCUE MISSION IN A CITY SURVEY**

Bilang bahagi ng aming pananaliksik saPoliteknikong Unibersidad ng Pilipinas, kami ay nagsasagawa ng pagsisiyasat tungkol sa pananaw ng mga residente sa mga kalamidad at pagbaha na nangyayari sa kanilang barangay. Labis na makakatulong sa aming pananaliksik ang inyong pananaw at pagkumpleto ng mga sumusunod na talahanayan. Ang anumang impormasyon na may kaugnayan sa pag-aaral na maaring makakakilala sa inyo ay mananatiling lihim.

5- Lubos na sumasang-ayon 4.Sumasang-ayon 3- Walang katiyakan

2- Hindi sang-ayon 1- Lubos na hindi sumasang-ayon

|  |  |
| --- | --- |
| Pangalan (Opsyonal): |  |
| Edad: |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mga Tanong | Scale | | | | |
| 5 | 4 | 3 | 2 | 1 |
| Sa iyong tingin, ligtas ba ang inyong lugar kung magkakaroon man ng iba’t ibang sakuna kalamidad? |  |  |  |  |  |
| Natitiyak mo ba ang iyong kaligtasan sa tuwing may sakuna? |  |  |  |  |  |
| Mabilis bang bahain ang inyong lugar? Kung hindi, tukuyin ang kalamidad na madalas mangyari. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  |
|  |  |  |  |  |  |
| May nakikita ka bang hakbang na ginagawa ng mga opisyal sa inyong lugar para mabawasan ang mga epekto ng kalamidad? |  |  |  |  |  |
| Mabilis bang makarating ang tulong sa inyong lugar sa oras ng sakuna? |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| Kung mayroong device na magbibigay ng lokasyon mo sa mga rescuers, gagamitin mo ba ito? |  |  |  |  |  |
| Sa tingin mo ba makakatulong ang device na ito para mabawasan ang mga taong namamatay at nawawala dahil sa mga kalamidad? |  |  |  |  |  |
| Sa iyong palagay, makakatulong din ba ang pagbibigay ng lokasyon ng isang tao sa mga rescuers sa iba't ibang kalamidad katulad ng paglindol, pagbaha at iba pa? |  |  |  |  |  |
|  |  |  |  |  |  |

### POST-TEST QUESTIONNAIRE:

Sa Mga Magsasagot,

Ang mga nakatala ay mga estudyante na nagaaral ng Bachelor of Science in Computer Engineering sa PUP at kasalukuyan kaming gumagawa ng pag-aaral na tinatawag naming “Help Box: A Life and Body Locator System through a Designed TV Box and Mobile Application for Post-Disaster Rescue Mission in a City”. Maari po sanang sagutan ninyo ang mga tanong ng tapat at totoo. Makasisigurado kayong kahit na anong impormasyong ilathala ninyo ay aming itatago at gagamitin sa pag-aaral na ito lamang.

Maraming salamat po!

Mga Mananaliksik,

Alas, Katrina Isabela A.

Gerolaga, John Paul Simon A.

Magno, Marx Lenin P.

Peralta, Camille M.

SURVEY QUESTIONNAIRE

1. Impormasyon Tungkol sa Magsasagot:

Panuto: Paki-sagutan lamang ang mga hinihinging impormasyon.

Pangalan (opsyonal): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Edad: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Barangay: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Pagiging Epektibo ng Pag-aaral:

Panuto: Pakilagyan lamang ng tsek [ / ] sa espasyong binigay para sa pag-mamarka ng pagiging epektibo ng pag-aaral. Gamitin ang 5 na pinakamataas at 1 para sa pinakamababa.

CRITERIA:

5- Napakahusay 4- Mahusay 3- Sapat lang 2- Hindi Mahusay 1- Walang kahusayam

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mga Batayan | Scale | | | | |
| 5 | 4 | 3 | 2 | 1 |
| Usability | | | | | |
| Ang device ba ay angkop sa pangangailangan ng mga residente? |  |  |  |  |  |
| Angkop at madali ba itong gamitin? |  |  |  |  |  |
| Magagamit ba ito ng tama ng user sa oras na pangkagipitan? |  |  |  |  |  |
| Efficiency | | | | | |
| Nagagamit ba ng maayos ang device? |  |  |  |  |  |
| Sa oras ng kalamidad, mahusay ba ng kapasidad ng device? |  |  |  |  |  |
| Ang pagtugon ba ng device ay nakakatulong sa mga operasyong pagliligtas ngayon?  (Is the response time of the device efficient in today’s rescue operations?) |  |  |  |  |  |
| Functionality | | | | | |
| Ang device ba ay gumagana ng maayos?  Is the device functioning well? |  |  |  |  |  |
| Angkop ba ang mga tungkulin ng device sa pagpapadali ng pagpapatupad ng mga tinukoy na gawain at layunin?  (Are the functions of the device appropriate in facilitating the accomplishment of specified tasks and objectives?) |  |  |  |  |  |
| Ang device ba ay nagbibigay ng tamang resulta sa kinakailangang antas ng katumpakan?  (Is the device providing correct results with the needed degree of precision?) |  |  |  |  |  |
| Sustainability | | | | | |
| Nagagawa ba ng device ang layunin nito nang maayos? |  |  |  |  |  |
| Makakatagal ba ang device nang hindi makaka-tagpo ng kahit anong kamalian?  Will the device last long enough without encountering any error? |  |  |  |  |  |
| Naaayon ba ang mga tungkulin ng device sa paggawa ng mga partikular na gawain? |  |  |  |  |  |
| Reliability | | | | | |
| Ang device ba ay nakakatugon sa mga pangangailangan ukol sa pagiging maaasahan tuwing normal na operasyon?  Did the device meet the needs for reliability under normal operations? |  |  |  |  |  |
| Ang device ba ay gumagana at naa-access kapag kailangan gamitin?  Is the device operational and accessible when required for use? |  |  |  |  |  |
| Ginagawa pa ba ng device ang kanyang tungkulin kahit na ito ay nakakakitaan ng kamalian sa hardware at software?  Is the device operating as intended despite the presence of hardware and software faults? |  |  |  |  |  |

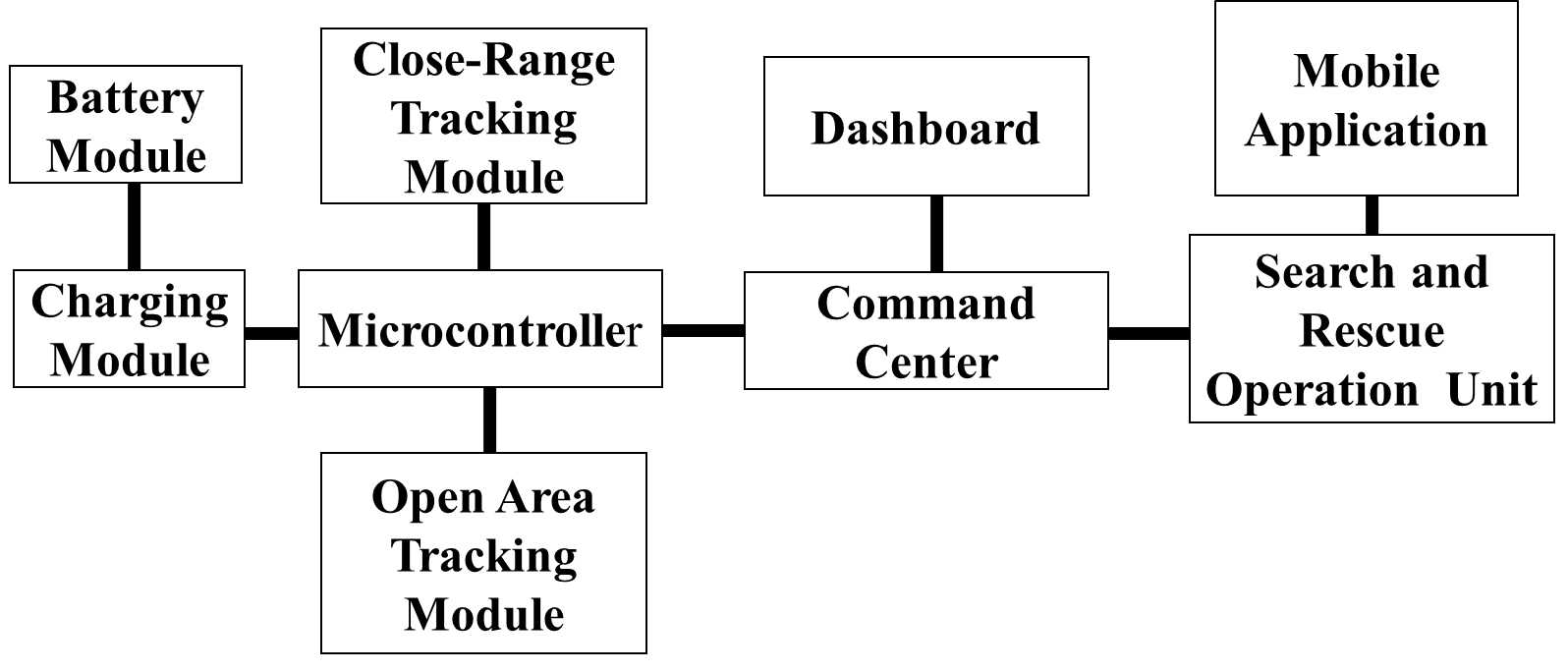
Suggestions/Recommedations:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

### Appendix E

Appendix E

Block Diagram



Block Diagram

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