



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Ship Tracking and Monitoring System

The report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Faculty of Engineering Technology (FTK) Industrials Automation & Robotics) (Hons)

by

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DECLARATION

I hereby, declared this report entitled “Ship Tracking and Monitoring System” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrials Automation & Robotics) with Honours. The member of the supervisory is as follow:

.....
(Miss Suziana Binti Ahmad)

ABSTRAK

Kapal yang cekap mengesan sistem yang dirangka dan dilaksanakan untuk menjejaki pergerakan mana-mana kapal yang lengkap daripada mana-mana lokasi pada bila-bila masa. Sistem cadangan yang dibaik pulih menggunakan teknologi yang menggabungkan aplikasi telefon pintar yang dengan mikroproses. Direka bentuk ke dalam peranti kapal bekerja menggunakan sistem “Global Positioning System” (GPS) dan “Global System for Mobile Communication” (GSM) iaitu salah satu cara paling biasa untuk penjejakan kapal. Peranti telah termaktub di dalam sebuah kapal yang kedudukan yang dijangka akan ditentukan dan dikesan dalam masa nyata. Mikropengawal yang digunakan untuk mengawal modul GPS dan GSM. Sistem mengesan kapal menggunakan modul GPS untuk mendapatkan koordinat geografi pada masa ke semasa. Modul GSM digunakan untuk berkomunikasi dan kemas kini lokasi kapal ke dalam pangkalan data. Aplikasi telefon pintar yang juga telah dibangunkan untuk terus memantau lokasi kapal. Peta Google digunakan untuk memaparkan kapal dalam aplikasi telefon pintar. Oleh itu, pengguna akan dapat memantau kapal bergerak atas permintaan menggunakan aplikasi telefon pintar secara berterusan dan menentukan anggaran jarak dan masa untuk kapal tersebut tiba di destinasi yang tertentu. Untuk menunjukkan kemungkinan dan keberkesanan sistem, kertas kerja ini membentangkan keputusan kapal pengesanan sistem dan beberapa pengalaman pelaksanaan praktikal.

ABSTRACT

A productive ship tracking and monitoring system is planned and actualized for following the development of any prepared ship from any area whenever. The proposed framework made, greater utilization of a well known innovation that consolidates a cell phone application with a microcontroller. The planned into the ship gadget work utilizing Global Positioning System (GPS) and Global System for Mobile Communication (GSM) innovation that is a standout amongst the most well-known routes for ship following. The gadget is installed inside a ship whose position is to be resolved and followed continuously. A microcontroller is utilized to control the GPS and GSM modules. The ship following framework utilizes the GPS module to get the geographic directions in normal time interim. The GSM module is connected to convey and upgrade the ship area to a database. A Smartphone application is likewise created for constantly checking the ship area. The Google Maps and other related web page are utilized to show the ship on the guide in the cell phone application. In this way, clients will have the capacity to constantly screen a moving ship on interest utilizing the Smartphone application and decide the evaluated separation and time for the boat to touch base at a given destination. The end goal to demonstrate the plausibility and viability of the framework, this paper presents trial consequence of the ship following framework and some encounters on practical usage.

DEDICATION

I might want to dedicate my thesis work to the God for his adoration and favors. Particularly committed to my beloved guardians and relatives. Whose inspirational statements and conjointly for their endless love, consolation and support all through the entire time of finishing my studies. To my kind and supportive project supervisor Miss Suziana Binti Ahmad, who have ceaselessly constantly supported me and listens to my issues and who's her great illustrations have shown me to work hard for the things that I try to accomplish. I conjointly commit this work to all my regarded lecturers, particularly Mrs Nurdayana Izyan and my my fellow friend"s companions who have supported all the way, been giving consolations all through the thesis. I will have the capacity to ceaselessly welcome all they have done. I commit this work and gives uncommon in view of the considerable number of individuals that have helped all throughout the complete bachelor degree project in a direct or indirect way. Every one of them is my best team well wisher.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

AIS	-	Automated Identification System
AC	-	Alternate Current
AMVER	-	Automated Mutual Assistance Vessel Rescue
AUSERP	-	Australian Ship Reporting System
COSPAS-SARSAT	-	Osmicheskaya Sisteyama Poiska Avariynich Sudov- Search and Rescue Satellite-Aided Tracking
DC	-	Direct Current
EPIRB	-	Emergency Position Indicating Radio-beacon Station
GIMCOS	-	General Information Centre on Maritime Safety and Security
GMDSS	-	Global Maritime Distress and Safety System
GPS		Global Positioning System
GSM		Global System for Mobile Communication
IMO	-	International Maritime Organization
LCD		Liquid Crystal Display
LRIT	-	Long Range Identification and Tracking
SMS	-	Short Messaging System
SOLAS	-	Safety of Life at Sea
V	-	Voltage
STRAITREP	-	Straits Malacca and Singapore Reporting System
VMS	-	Vessel Monitoring System
VTS	-	Vessel Tracking System

CHAPTER 1

INTRODUCTION

These sections will cover the introduction of the project, the project objective, the problem statement, scope of work and the report layout.

1.1 Introduction of Ship Tracking and Monitoring System

This project referring to Ship tracking and monitoring system project which provide a wider system that used in marine navigation system where the ship location can be tracked. This project gives updates about the ship location by sending SMS through GSM module. These ship locations will be triggered every time to time by sending SMS through the GSM module. The SMS format consists of longitude and latitude of the ship position been declared. The main processing element will be the micro processing board. The micro processing board will get feedback of coordinate through GPS module and then send it in SMS test form. The GSM module used to send require data using this SMS format. GPS will be the main base of the ship being tracked. An example, when vehicle such as car been stolen it can be tracked by using GPS module. Then, if want track the position of a school bus at the time, it will be easy for the parents to use GPS module to detect their children. There are various kinds of situation these GPS modules can be used to position detect. The GSM module will be the remote processing for the position that being tracked by GPS module. To compute an accurate position has been tracked GPS needs satellite feedback. These GPS and GSM require only a single way to communicate with micro processing such as Arduino Uno, Arduino Mega and other than that. That shows data can only transmit to micro

processing module. GPS only receive location, position been triggered by satellite, but it does not send data to satellites.

1.2 Objective

Designing Ship Monitoring and Tracking System will be the aim of following these objectives:

- a) To describe ship location systems using GPS and GSM for positioning information.
- b) To develop prototype for Ship Tracking And Monitoring System by using GPS and GSM system.
- c) To analyze the functionality Ship Tracking And Monitoring System.

1.3 Problem Statement

As the ship goes through a high density region, the signal feedback will be weak and lost of signal. This will be a very weak communication signal to satellite and lost it [1]. To detect all ships in the region of high density, have also difficulty in integrating two or more data types because each send data at different time it will interrupt the signal [2]. These data of position are sent accordingly from ship to receiver center and display through mobile devices such as a smart phone system that will monitor the location time to time, so do the google map or other web browser [4]. Then the only location of the ship will emerge on the map through smart phone usage. Thus, it's capable to monitor ship, although in moving condition or can also predict the distance and accurate time to reach destination [6]. These safety modules being developed are difficult to implement and very expensive [8] Then the signal strength information about ship long-track displacement in the position of the ship [9].

1.4 Scope of work

This project consists of several main parts in these scopes of work. First the project mainly to build a ship area framework utilizing GPS for situating data of coordination for location and GSM for positioning information. Then to investigate a security framework that will trigger the SMS when there has been an interruption into the ship. Finally to create prototype of ship tracking and monitoring system.

1.5 Project Significance

This project will give benefit to use in a wide range of industries, especially for the maritime company. The maritime field company could develop and implement this project in order to provide better tracking and monitoring system performance and convenient for all users. This project is easy to implement and also low cost.

1.6 Report Layout

This thesis basically discussed about the design and development of Ship Tracking and Monitoring System. There will be five chapters that will describe and explain further about this project.

Chapter I will describe about project introduction. This topic describes the introduction of the Ship Tracking and Monitoring System and the main objectives of the project. Overall topics include the scope of the project, project methodology and the problem statement are included in this topic.

Chapter II will discuss Literature review topic. This topic focuses on the theory of every system related to Ship Tracking and Monitoring System. Resources obtained from journals, thesis and website containing all the information related to the project.

Chapter III will explain the methodology of the project. This topic presents the steps to implement the project from the initial design to completion. Strategy and timing, planning are shown in this topic.

Chapter IV will inform the analysis and project result. This chapter describes the analysis and the development that were done in order to get a better result to the project.

Chapter V will describe the conclusions of the topic, I to topic IV. The conclusion and recommendation will be concluded at the end of over all chapters.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Ships position information important because it creates an awareness situation and give response to any occurrence. Those days, data related positioning ship/vessel variations in many methods, such as Vessel Traffic Service (VTS) off shore region, Vessel Monitoring System (VSM) over sea region, Automatic Identification System (AIS) data collection region, Long Range Identification and Tracking of Ships (LRIT) distress area region and General Information Centre on Maritime Safety and Security (GICOMS) improvement region [3], [4]. Furthermore, there are emergency reporting systems being used for operating ship emergency. These operators of ship with different indeed. VTS main operation centers will detect ships and identify it through tracking [5]. These reporting systems of position and movement in ship in charge by VMS. Meanwhile, there is need of maritime traffic management in the port area, so VTS will take will take control in this region. VMS majorly in monitoring systems, AIS discover information and vessel position, LRIT function as collect and disseminate vessel position and GICOMS importantly for the improved safety function system for the vessel [6]. All over this chapter will discuss on the important element and the functionality system that use from those days for ship tracking and monitoring progress.

2.2 Background of Ship Tracking and Monitoring System

These numbers, of need transport in maritime region have been contributed to impacts on the rise of the risk of marine accidents. The ships designed and built to accordingly safety standards [7]. IMO known as the International Maritime Organization has been created for these safety purposes and security of the ship. Although this regulation had been implanted, there is no such decrease in accidents. This kind of accident is caused some error such as lack monitoring, less procedure management and no updating on weather, plus neglecting safety rules on board [8]. This fact shows human faults are main contribution to the accidents. Port area the most accident region due to high number of ships at a time within a small geographic area like an example the active cargo movements.

There are various system being used, Vessel Traffic Service (VTS) has been used to overcome traffic volume. These VTS using equipment such as radar, VHF radio and closed circuit television (CCTV) to detect the ship movement time to time [9]. When the ship triggers its position, I will direct to VHF radio, then the radar will detect ship movement to ensure a safe navigational for ship [10]. Various methods have been taken to improve sea security. Automatic Identification System (AIS) and Long Range Identification and Tracking (LRIT) are being implanted then can improve efficiency of navigation. The data between ship transmit each other due to reduce error in reporting system and information about ships in the senses of alertness. AIS has an advantage where can detect another ship in a situation the radar limited and cannot be detected. AIS is intended to enhance the nature of the data accessible and AIS would turn into a critical situation of sea activity data for national and local checking systems [11]. The disadvantage of AIS is where the performance are not in good demand and the data transmission not accurate, then also causing less efficiency system. The ship also uses Long Range Identification and Tracking (LRIT) where this type system used for detecting ship movement.

The e-Navigation created so that it decreases the number of accidents. The navigation systems to assist in improving systems for ship e-Navigation to enhance the safety regarding on management of information [12]. General Information Centre on Maritime Safety and Security (GICOMS) as shown in Figure 2.1 for improving the safety and security. All this system indicates the exist system that being used past days to this day.

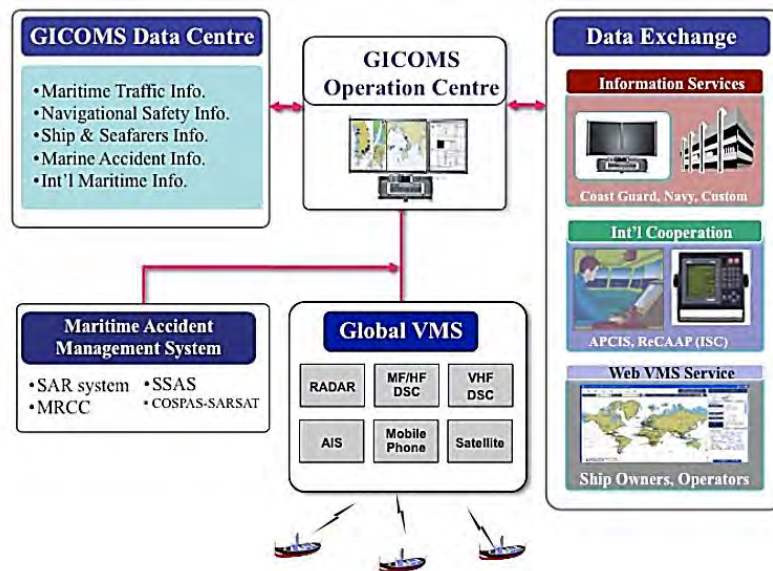


Figure 2.1 GICOMS Operation Centre

2.3 System

2.3.1 Vessel Tracking System

VTS known as monitoring system that used in maritime where mainly created for the vessel in the compact volume area. VTS are created to increase efficiency of safety navigation. These basic principles, VTS are stated in SOLAS regulation, related to safety improvement. These systems can solve with a compact volume ship region that developed with VTS. VTS can be divided into two types which is port/harbor and coastal. Port/harbor main function in traffic management, while coastal main function in monitoring ship. This both system can be worked in a time The Figure 2.2 indicates the system of VTS.

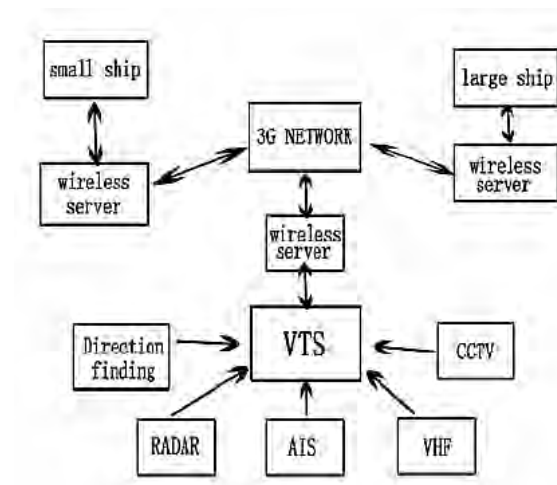


Figure 2.2 VTS data transfer system

Normally port/harbor provide service such as navigation, then costal be as data transmitter. When a ship enters certain area, VTS will track and monitor ship. Equipment such as VHF radio will be functionality in the VTS region [14]. VTS can detect danger situation and provide warning system. These areas of

VTS and its volume space that influence the maritime traffic as shown in Figure 2.3.

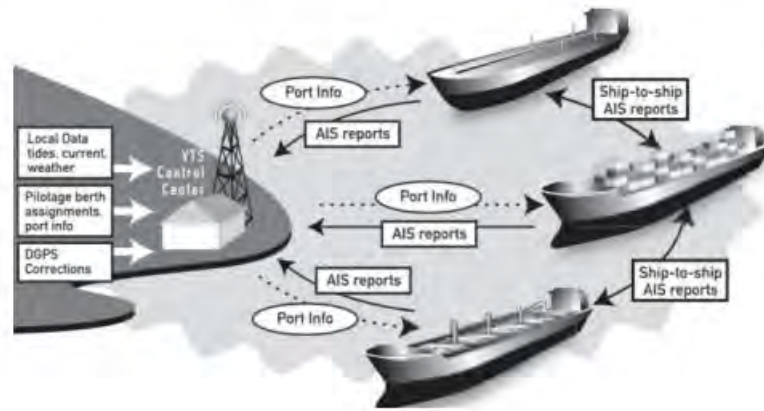


Figure 2.3 VTS indicate with VMS

2.3.2 Development of VTS

Normally, in port or harbor areas, ships commanded by a pilot where necessary, but other than that ships use some flags and sound signals as in Figure 2.4. These flag and sound signal are not working well in weather such as fog. An alternative way is using VHF radio and radar that will be more accurate in navigating. Use of radar and VHF radio as shown in Figure 2.5 will be precise in all weather conditions. VTS are a good function to avoid any occurrence of accident [15], [16].

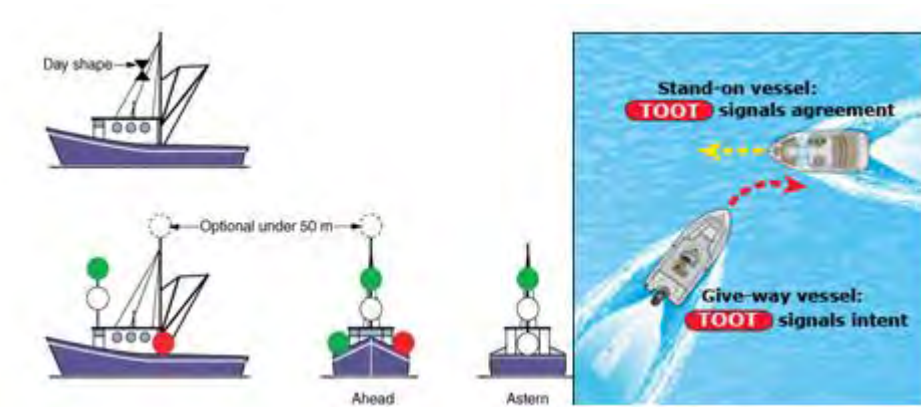


Figure 2.4 Flag and Sound Signal



Figure 2.5 VHF Radio

2.3.3 Safety and security system of ship

A system such as VTS is applying safety navigation with the SOLAS. These VTS contribute with SOLAS to maintain a safety and efficiency method in navigation purpose. VTS is a service that creates for a better solution in safety criteria. This would be problem solving for a marine traffic [17].