

## PORT MANAGEMENT SOFTWARE

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**Abstract:** Port Management Software, is aimed at the improvement of efficiency in service management supplied by a Ports. It is software which can be used by several ports and which enables us to offer solutions to every client's demands and needs. Port Management Software, is an Integrated Port Operation Management System which is highly customizable and allows a port to optimize its maritime operational activities related to the flow of vessels in the port service area. Port Management Software monitors the movement of ships and helps to devise an effective Traffic Management System that guides the ships to berth in ports which in turn reduces fuel consumption of the vessels, thus reducing the CO<sub>2</sub> emissions levels in the ports, hence making the port environment eco-friendly.

**Keywords:** Carbon di oxide emission levels, Fuel Management, Port Management Software, Transport System, Traffics Management Software, Vessel Tracking.

### I. INTRODUCTION

Port Management Software (PMS), is a web application that aims to optimize the port activities. A web based application is a software package that can be accessed through the web browser. The software and database reside on a central server rather than being installed on the desktop system and is accessed over a network. PMS comprises different modules which operate together. The modules present are: Geotracking, Vessel traffic, Fuel Management system, CO<sub>2</sub> emission. The conventional system uses communication via radios between the port authorities and vessels for intimation of arrival of ships and for the request and allocation of berths. Once the request is received by the port the usual checking of the vessels and their permit documents takes place. After the verification process the vessels are allocated berths by the port. The tugs and pilots are also allocated for the vessels during berth allocation. This entire process takes place only through radio communication between the members of the port and the vessel which is a time consuming process. This method also doesn't provide effective traffic planning thus higher amount of fuel consumption occurs. The effect of higher fuel consumption of vessels is greater emission of CO<sub>2</sub> which pollutes the port environment. This time wasting, fuel consuming non eco-friendly process can be avoided by using Port Management Software.

#### A. Competitive Advantages:

- PMS provides complete Port Management Services online.
- Berthing and Deberthing operations can be carried out with much ease.
- Real time monitoring of Anchorage points, Berths,

Pilot points, Tugs and Pilots in the port area provides an efficient way to devise vessel routes.

- Fuel consumption is also monitored and the newly devised routes will result in reduction of fuel consumption, thus reducing CO<sub>2</sub> emission levels.

### II. EXISTING SYSTEM

The existing systems functions using human communication via radio or other communicating mediums between the port authorities and vessels for intimation of arrival of ships and for the request and allocation of berths. Once the request is received by the port the usual checking of the vessels and their permit documents takes place. After the verification process the vessels are allocated berths by the port. The tugs and pilots are also allocated for the vessels during berth allocation

#### A. Limitations:

- The existing system only offers static data about the vessel in anchorage points and berths.
- It does not offer real time monitoring of the vessel.
- No module for fuel management is provided in the existing system.
- The existing system does not offer efficient methods to optimize the port activities.
- CO<sub>2</sub> emission detection module is not present.

### III. PROPOSED SYSTEM

PMS offers efficient methods to optimize the port activities such as anchorage, berthing and tugging. It provides dynamic updates about the location of the vessels in bay, anchorage and berths. PMS provides modules for fuel management and CO<sub>2</sub> emission detection which helps the port to operate in an environment friendly manner. The software helps to computerize most of the important port activities.

#### A. Advantages:

- PMS offers efficient methods to optimize the port activities such as anchorage, berthing and tugging.
- It provides dynamic updates about the location of the vessels in bay, anchorage and berths.
- PMS provides modules for fuel management and CO<sub>2</sub> emission detection which helps the port to operate in an environment friendly manner.
- The software helps to computerize most of the important port activities.

### IV. SOFTWARE DESCRIPTION

Software Description is a technical specification of requirement of software product. This specifies the

environment for development, operation and maintenance of the product.

#### A. Technology Used:

To build the proposed system varies technology stacks where used. The important technologies and programming languages used are listed and defined below.

##### 1) PHP:

PHP is a server side scripting language designed primarily for web development but also used as a general-purpose programming language. Originally created by Rasmus Lerdorf in 1994, the PHP reference implementation is now produced by The PHP Development Team. PHP originally stood for Personal Home Page, but it now stands for the recursive acronym PHP: Hypertext Preprocessor. PHP code may be embedded into HTML code, or it can be used in combination with various web template systems, web content management systems and web frameworks. PHP code is usually processed by a PHP interpreter implemented as a module in the web server or as a Common Gateway Interface (CGI) executable. The web server combines the results of the interpreted and executed PHP code, which may be any type of data, including images, with the generated web page. PHP code may also be executed with a command-line interface (CLI) and can be used to implement standalone graphical applications.

##### 2) HTML:

Hyper Text Markup Language is the standard language for creating documents for the World Wide Web. An HTML document is a text file, which contains the elements, in the form of tags that a web browser uses to display text, multimedia objects, and hyperlinks using HTML; we can format a document for display and add hyperlinks to other documents. The user interface has been designed in HTML hence can be browsed in any web browser.

##### 3) CSS:

CSS stands for Cascading Style Sheet. These have been used to separate data from presentation. By using these style sheets throughout the project, a uniform look and feel can be maintained for all the HTML elements and tags that have been used in the project. If there is any revamp the way the content has been presented in the website, the changes can be made to the appropriate style sheet, which will be reflected across all the style sheets.

##### 4) JavaScript:

JavaScript is a high-level, dynamic, untyped, and interpreted programming language. It has been standardized in the ECMA Script language specification. Alongside HTML and CSS, JavaScript is one of the three core technologies of World Wide Web content production; the majority of websites employ it, and all modern Web browsers support it without the need for plug-ins. JavaScript is prototype-based with first-class functions, making it a multi-paradigm language, supporting object-oriented, imperative, and functional programming styles. It has an API for working with text, arrays, dates and regular expressions, but does not

include any I/O, such as networking, storage, or graphics facilities, relying for these upon the host environment in which it is embedded. Although there are strong outward similarities between JavaScript and Java, including language name, syntax, and respective standard libraries, the two are distinct languages and differ greatly in their design. JavaScript was influenced by programming languages such as Self and Scheme. JavaScript is also used in environments that are not Web-based, such as PDF documents, site-specific browsers, and desktop widgets.

##### 5) Bootstrap:

Bootstrap is a free and open-source front-end web framework for designing websites and web applications. It contains HTML- and CSS-based design templates for typography, forms, buttons, navigation and other interface components, as well as optional JavaScript extensions. Unlike many web frameworks, it concerns itself with front-end development only. Bootstrap is the second most-starred project on GitHub, with more than 105,000 stars and 47,000 forks.

##### 6) MySQL:

The name SQL stands for C. SQL is a data access language, like any other language, it is used for communication. SQL communicates with database manager. The database manager could be Oracle, Informix, DB2 and SQL database. SQL is easy to learn. Despite the fact that SQL is a computer programming language, it is much simpler than traditional programming language like COBOL, BASIC, FORTRAN or API. This is due to the fact that SQL is a non-procedural language. SQL is one of the Oracle facilities. It is important to understand in each case its differences, purpose and place in the Oracle family. SQL is the language used to access a relational database, including Oracle. SQL May be used with each of the Oracle tools, where access to the database is required.

##### 7) Android Studio:

Android Studio is the official integrated development environment (IDE) for Android platform development. It was announced on May 16, 2013 at the Google I/O conference. Android Studio is freely available under the Apache License 2.0. The first stable build was released in December 2014, starting from version 1.0. Based on JetBrains IntelliJ IDEA software, Android Studio is designed specifically for Android development. It is available for download on Windows, Mac OS X and Linux and replaced Eclipse Android Development Tools (ADT) as Google's primary IDE for native Android application development.

## V. METHODOLOGY

The methodology behind the working of PMS deals with four major modules of the system. These models compromise the integral working of the system. The modules are,

- Geotracking
- Vessel Traffic
- Fuel Management System

- CO<sub>2</sub> Emission

#### A. Geotracking:

Geotracking module is an android app which shows a live map window with graphical overview of Indian coastal areas. The vessels which enter the Indian Coastal area are tracked using their GPS coordinates and the live tracking details are displayed in the app. It also provides the details about the berths, anchorage points, tug boats and pilots availability. This detail can be used by the incoming vessels to plot the corresponding routes to their preferred berths. Thus helping in self planning of effective routes by the vessels for berthing. The GPS coordinates of the vessels are obtained during the registration process itself. When the vessel user logs into the app the registration details are fetched from the server and the GPS marker for the vessel is activated.

#### B. Vessel Traffic:

This module deals with all the operations involved in berthing and unberthing of the vessels from the ports. The vessel once near the anchorage points of the port can login to the system and view the available anchorage points. After deciding the preferred anchorage point an anchorage request can be made by the vessel. In the request form all the necessary details are retrieved from the vessel user. These details are then verified and if found to be true and satisfactory the vessel is allocated the requested anchorage point. Once a vessel is anchored it can move on to the next stage of the berthing process. The vessel user then views the berth availability and gives request for the preferred berth. The same steps are followed as in anchorage request for verification of the vessel details and then the vessel is allocated the berth. When the vessel is allocated the berth, the tug ships and pilot boat needed to manouvre the vessel into the port are also assigned to the vessel. Thus the berthing of a vessel is done in a very time, cost and fuel effective manner by using the PMS system. Vessel departure plans are also included in the PMS system. When a vessel wants to leave the port it sends a Deberth request to the system and the system admin after

#### C. Fuel Management System:

It gives the statistical data of approximate fuel consumption of vessels at anchorage point, pilot boats and tugs used for towing. The data is collected in a per hour basis and is analyzed. The final data is displayed to the user in a user friendly, easy to understand screen.

##### 1) Operations:

- Analysis of fuel consumed by vessels at anchorage points, pilot boats and tugs.
- Auto generation of statistical report on fuel consumption.

#### D. CO<sub>2</sub> Emission:

The main function of this module is to monitor CO<sub>2</sub> Emission in maritime areas and to display the emission details of the vessel, pilots and tugs to the user. Based on the fuel consumption data the CO<sub>2</sub> emission levels are calculated.

The generalized activity - based method uses the following formula (1) for calculating the CO<sub>2</sub> emission:

CO<sub>2</sub> emissions = Fuel consumption × Fuel emission conversion factor [Tones CO<sub>2</sub> emissions = liter x kg CO<sub>2</sub> per liter fuel /1.000] (1)

## VI. RESULTS

- Normally in a Port system, the authority communicates to vessels through radio which is time consuming and an ancient technique, but through our portal communication can be done in a digitalized manner.
- Requesting of anchorages and berths is done through our website and assigning of anchorages and berth is done by the admin through the website.
- Digitalization of berthing activities helps to devise an effective traffic system which helps to reduce fuel consumption.
- Monitoring of Fuel consumption by vessels, tugs and pilots is done which helps to calculate CO<sub>2</sub> emission levels in port areas which helps to devise effective plans to make the port environment eco-friendly.

## VII. DISCUSSION

Port Management software offers efficient methods to optimize the port activities such as Anchoring, Berthing and Tugging. It provides dynamic updates about the location of the vessels in bay, anchorage and berths. The software also provides modules for fuel management and CO<sub>2</sub> emission detection which helps the port to operate in an eco-friendly manner. The software mainly helps to computerize most of the port activities.

Future enhancements which can be done to the system are, tracking of vessels can be implemented by using AIS which is an essential system which all vessels must have according to International rules and standards. The planning feature of the system for now depends on the thinking of a human this can be changed by developing an Artificial Intelligence program for planning which takes into account all the factors needed.

## VIII. CONCLUSION

This project has given me an ample opportunity to design, code, test and implement an application. This has helped in putting into practice various Software Engineering principles and Database Management concepts like maintaining integrity and consistency of data. Further, this has helped me to learn more about PHP, HTML, JavaScript, MySQL, CSS, Bootstrap, Adobe Photoshop 7.0 and Android Studio.

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