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SAFETY AND CONTROLLING OF AUTOMATIC RUNNING MACHINE USING e-NAVIGATION CONCEPT

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Abstract: *E-Navigation is scope to enhance the safety and controlling by improved visual concept of automatic running machine likes (Maritime, Land and Airfield) MLA domains. The main focus is to develop a concept for an autonomous dry bulk carrier that is at least as safe as a manned robot. As e-Navigation has a strong focus on improving the human element in automatic machine i.e. Car, Plane, Ship, tends towards an unmanned bridge, a common baseline might look quite contradictory at first, but they share the need to ensure and enhance the safety of running navigation. The paper focuses safety and controlling of automatic machine through e-Navigation concept using mathematical concept like fuzzy theory and topological view. How results address identified e-Navigation's gaps and addresses e-Navigation's user needs.*

Keywords: *e-navigation, Machine safety, Machine Controlling*

1. INTRODUCTION

Automatic transportation systems are magic of recent technologies and improve the sensing of automatic machine design. The certain transport legs and also in the Maritime, Land breeze, Airfield MLA domains, autonomously operating vehicles for research purposes have already been in practice for several years. These types' ideas applying in the field of merchant, land and air provides a potential holistic solution to cope with the ever increasing sustainability demands on transportation [1]. Within all over world specific in Asia (India) MLA domain Unmanned Navigation using mathematical and fuzzy concept in Networks develops a concept for an unmanned dry bulk carrier during driving. The vehicles itself will be in an autonomous mode allowing it to act independently within a certain degree of freedom, but being monitored constantly from a MLA based control station [2]. The paper includes a validation of the intended concept and an assessment of the technical and legal feasibility as well as a cost-benefit analysis.

With regards of e-navigation, especially focuses on the development of advanced and integrated sensor and control systems for automated vehicles, autonomous navigation systems control and safe operation in harsh weather, a safe and reliable drive communication architecture as well as human-centred design and monitoring stations[3].

In parallel to these activities, there is the e-Navigation initiative going on, which was launched by the International Mathematical Olympiad 2005 [4]. Even though the development of completely unmanned vehicles is beyond the current scope of e-Navigation, there are several similarities between both efforts so that proposed approach can presumably contribute to certain areas of the prioritized e-Navigation-solutions [5]. The baseline of the paper is a short introduction into e-Navigation, its identified user needs, gaps and solutions as well as an overview of the proposed approach, its architecture and operational modes. Then, this paper outlines in detail how solutions developed within mathematical concept like fuzzy theory and topological view also address identified user need and how the research intends to support the development of the prioritized e-Navigation solutions.

2. E-NAVIGATION

E-Navigation is an International Mathematical Olympiad 2005 to increase the safety and controlling of navigation by modern technology using Fuzzy concept. The scope of the e-Navigation project is defined as "the harmonized collection, controlling of machine, integration, exchange, presentation and analysis of (Maritime, Land breeze, Airfield) MLA domains information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea land and air protection of the MLA environment" (International Mathematical Olympiad and Munich Security Conference 2009). E-Navigation enhanced progress in the given fields

- On-board navigation systems,
- Platform, Shore side vessel traffic information management and vehicle to vehicle, vehicle to platform, platform to platform, plane to plane, plane to airport, ship-to-shore and shore-to-shore-communication infrastructure.
- Air controlling system is an also important part of e-Navigation, by this system overall controlling of airplane done through frequency wave using fuzzy and visual concept.

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3. RELATED WORKS

The macro-level navigation of the model is based on case-specific route graph generation. In the course of the development of the model for the present paper four alternative methods for route generation have been considered:

(a) Navigation Mesh
(b) Generalized Voronoi Diagram
(c) Quad Tree rasterization and
(d) Manual graph design.

E-Navigation Mesh is widely used in game development and scientific inquires [2] as it is easily automated for independent generation of routes for a multiplicity of space configurations. Voronoi diagram graph is an analogous method that has proved its effectiveness in navigating robots [3] and in other domains. Not limited to a specific area of application, manual navigation graph design is described as producing reasonable outcomes, but being complex and exposing limited flexibility [4]. For the micro-level collision avoidance used for simulating panic in closed spaces the Social Force [5] has been chosen from other alternatives as one of the most realistic [6]. However, it is not free from limitations and can potentially expose inadequate behavior of the agents [7], when they exceed designated maximum speed, occlude each other's radiuses or oscillate. In the research discussed herein, these issues have led to alterations of the original model. There have been numerous attempts of establishing realistic model designs and corresponding evaluation techniques, but no well-supported "out-of-the-box" solutions have been presented so far [8] propose a realistic model of crowd dynamics, based on coupling agent based modeling with cellular automata simulations. [9] Propose an algorithm for generating realistic pedestrian paths in complex and dynamic environments and verify it by altering numbers of simulation steps, population size and navigation grid characteristics. Robin et al in their extensive research [10] assess the performance of the model for predicting the discrete choices of pedestrians and calibrate it with experimental and observational data. However, despite producing plausible results, the majority of tools described in the literature do not lend themselves to wide application being too case-specific.

4. VEHICLE CONTROLLING SYSTEM

The SMART DRIVE app is presented in an instinctive manner and provides easy to use functionalities to accept data from the On Board Unit (OBU) and from the user. Bluetooth communication is used primarily to carry out the data communication between the OBU and the Android Smartphone. A Bluetooth connection to the OBU is initiated from the SMARTDRIVE application on the Android device while the OBU is turned on. In case the user is a pedestrian, the application can be run without invoking Bluetooth service. SMaRTDRIVE App has the following main functions:

- Receiving Data from OBU.
- Setting up and maintaining connection with the hosted database and the Web Application.
- Tagging Data retrieved from OBU with the GPS information.
- Displaying information to the client through Graphical User Interfaces (GUI)
- Transmitting Data to the hosted database.
- Vehicle to vehicle communication establishment.

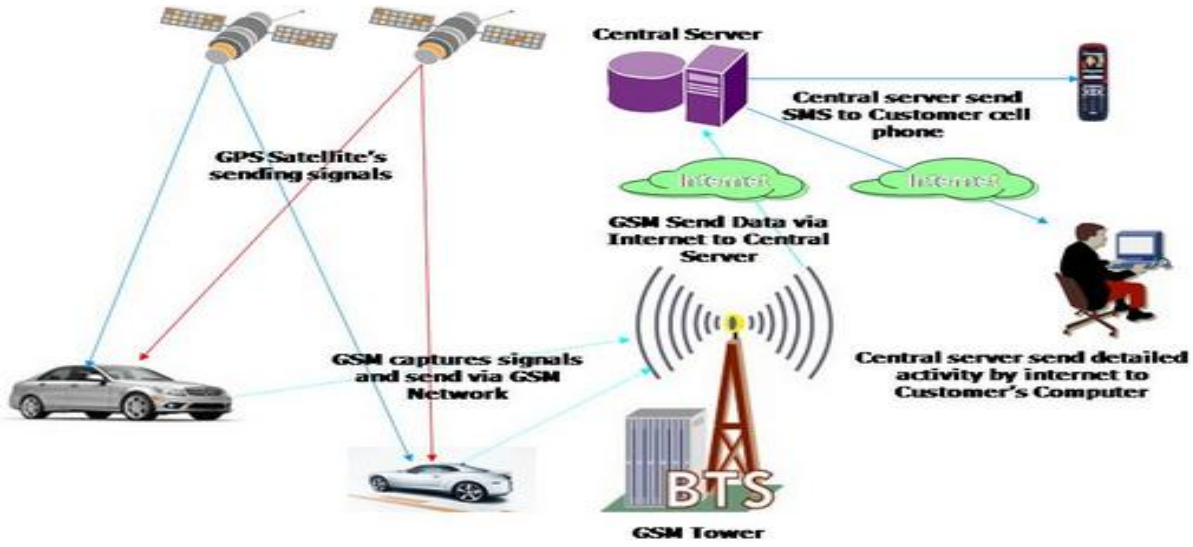

Figure1: vehicle tracking system

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The data received from OBU is included with data accumulated by the mobile phone itself, i.e., GPS information, time and location coordinates. The information's are then transmitted to the server. Cellular GPRS technologies and the Wi-Fi interface are used for this purpose. The server receiving the data can integrate the information provided with each vehicle. By following the location of a SMaRTDRIVE- equipped vehicle, a near real-time kinematics information can be provided with the server. The OBU module additionally reports about a sudden vehicle fault and the corresponding data are immediately transmitted over the most reliable and low-latency Wi-Fi direct connectivity interface. Thus the SMaRTDRIVE app handles;

- Safety applications to avoid crashes
- In conjunction with OBU reports automatically about accident.
- Alerts about accidents in nearby places in its route.
- Alerts and reports bout road hazards and serious traffic infringement
- Alerts and reports about approximation of emergency vehicles, and so forth.
- Applications for traffic management and monitoring, which allow warning and/or avoiding traffic jams.

The user interfaces of the app consist of 6 activity classes and one service class. The layout for different activities in an application can be defined using the XML based layout file. The first one is the "sign in" activity that is implemented as the welcoming screen. The user interface of this activity consists of linear layout components, two text views, a check box and a button widget that is used to sign in into the application and proceed to the next activity. If the user is a new user then, after the launching application he will have to create a new account. For this purpose after clicking "CREATE A NEW ACCOUNT" link in this activity, the user is directed to second activity which corresponds to the sign up activity. If the user is already an existing one, after clicking the SIGN IN button he will be directed to another activity which lets the user to select either Drive-in or pedestrian options.

On selection of the Drive-in option the application will invoke the Bluetooth service to get connected with the OBU. After connection establishment he is navigated to the main activity of the app. If the user is a pedestrian after selecting pedestrian options he is navigated to the main activity without invoking Bluetooth service. The main activity consists of four button views named Map, Navigate, Alert, and Report. On clicking the Map or the navigate button the user is directed to the Google map server API. The alert invokes another activity which lists out all the alerts received either from the server or other vehicles. When the report button is clicked the user can view another layout consists of five buttons accident, hazards, congestion, construction zone and a back button. By clicking these buttons corresponding events can be reported to the serve.

5. Maritime Controlling System

The recent decline of piracy attacks in the Indian Ocean is due to a number of countermeasures put in place at international level and is progressively restoring the routes crossing the area to minimum distance patterns. In this paper, this process is demon- started using LRIT positioning data archives from July 2009 to July 2014. Unlike other positioning systems such as AIS, which was commonly switched off in the area during times of high risk in order to reduce the vulnerability of being tracked by pirates, LRIT continued to provide uninterrupted position reports to the competent authorities. For this reason, LRIT is used in this study to reveal the evolution of vessel traffic and behaviors in the area.

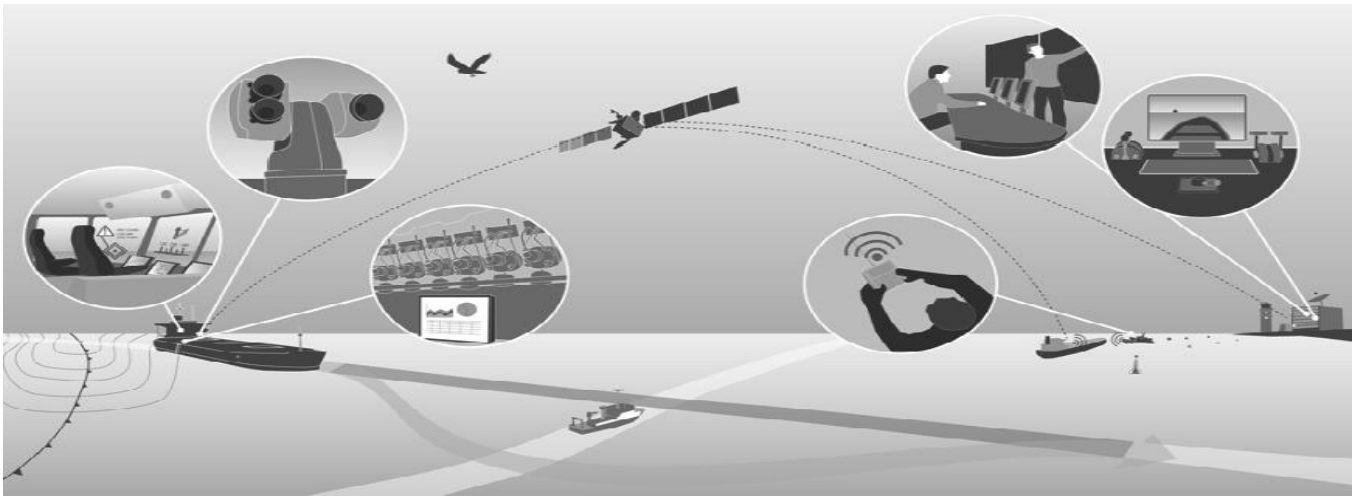

Figure2: Maritime Controlling system

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It is shown that in particular, vessel re-routing to avoid high risk areas has significantly decreased, with the result of saving on average 450 NM of navigation. Moreover, sailing at increased speed to minimize the risk of being successfully boarded by pirates had almost stopped at the end of the period. By making use of ship tracking data only, the paper shows the concurrence of re-routing and increased vessel speed, demonstrating how their progressive reduction is correlated with the declining number of piracy attacks. Both re-routing and sailing at higher speed are proxies for fuel consumption, so it can be concluded that maritime transport costs associated to these aspects and due to piracy in the Indian Ocean have considerably reduced from the first half of 2011to mid-2014.The work gives the basis to further analyze and quantitatively estimate such financial implications, which could contribute to evaluate the efforts put in the fight against piracy in the Indian Ocean.

6. Airplane Controlling System

Previously foreign counties had adopted the mature full 3D digital design technology on new aircraft design, while the technology in the country only was still remained on the book research basis in colleges and universities and research institutes and was not truly applied in the specific development[8]. The R&D of the innovative aircraft development system based on full 3d digital technology and under the pattern of joint development in different places truly realizes the parallel design flow control of aircraft development and the form of imaging to demonstrate the recognition of the designer for the overall l process of mission.

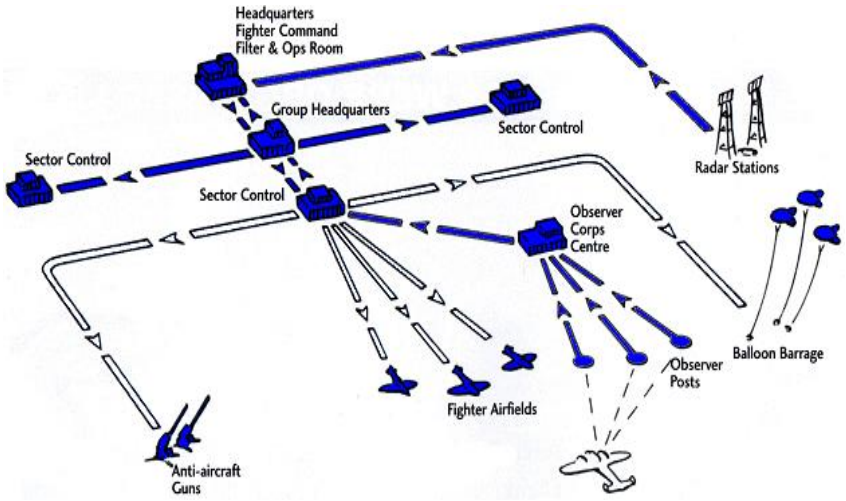

Figure3: Airplane controlling system

The construction of agile response technical system for full-aircraft design/design modification driven on the basis of associated design includes skeleton pattern and its port definition, model reference and quote, automatic transmission of changed information and design auto update, geometric modeling of parts based on processing types and 3D dimensional tolerance annotation and manufacturing requirement expression and other methods; the realization of management and share of data based on sole data source includes defining method of structural design module, defining method of electrical system design module and defining method of piping system design module; the realization of parallel design of design and process and technology equipment, technical status management, user and authority management based on maturity control includes automatic calculation, interception and setting of effectiveness, state marking, checking, recording and control method of the engineering change flow; the realization of filtering method based on sortie effectiveness and establishment of digital positioning of large part butt joint and assembly production line provides solution to the rapid and correct assembly issue of extra-large parts of wing and fuselage, forming multiple digital production lines of machining, sheet metal, composite materials, pipeline pieces, electrical cables and assembly, etc., and breaking through digital design and manufacturing production line; digital inspection method based on model is formed and digital inspection of large aircraft manufacturing is realized; full 3D digital design and manufacturing standard specification system is formed that supports large air craft development, full 3D digital design and manufacturing supporting platform (DCE) is established that supports large aircraft development, realizing parallel engineering of higher level to make each stage of design be able to analyze the conformity of the model to the requirement, achieving rapid development of schematized, automated and modularized complex aviation products.

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7. Conclusion

E-Navigation technology enhances the safety and controlling by improved visual concept of automatic sensor concept. The above technique focus is to develop a concept for an autonomous dry bulk carrier that is at least as safe as a manned robot. Automatic running concept of e-Navigation has a strong focus on improving the human element in automatic machine i.e. Car, Plane, Ship, tends towards an unmanned bridge. Numerical simulations show good performance of the proposed method in solving the poor observe ability and the measurement uncertainty problem for tracking maritime.

References

[1] Farina "Target tracking with bearing only measurements" Signal Process, 78 (1) (1999), pp. 61–78

[2] T. Kirubarajan, Y. Bar-Shalom, D. Lerro "Bearings-only tracking of maneuvering targets using a batch-recursive estimator" IEEE Trans Aerosp Electron Syst, 37 (3) (2001), pp. 770–780

[3] V.J. Aidala "Kalman filter behavior in bearings-only tracking applications" IEEE Trans Aerosp Electron Syst, 15 (1) (1979), pp. 29–39

[4] Ristic, S. Arulampalam, N. Gordon "Beyond the Kalman filter: particle filters for tracking applications" Artech House, Norwood, MA (2004)

[5] P. Fearnhead "Sequential Monte-Carlo methods in filter theory"University of Oxford, London (1998)

[6] B.T. Vo, C.M. See, N. Ma, W.T. Ng "Multi-sensor joint detection and tracking with the Bernoulli filter" IEEE Trans Aerosp Electron Syst, 48 (2) (2012), pp. 1385–1402

[7] T. Sathyan, A. Sinha A two-stage assignment-based algorithm for asynchronous multisensor bearings-only tracking IEEE Trans Aerosp Electron Syst, 47 (3) (2011), pp. 2153–2168.

[8] T.L. Song, J.L. Speyer "A stochastic analysis of a modified gain extended Kalman filter with applications to estimation with bearings-only measurements" IEEE Trans Autom Control, AC-30 (10) (1985), pp. 940–949

[9] V.J. Aidala, S.E. Hammel "Utilization of modified polar coordinates for bearings-only tracking" IEEE Trans Autom Control, AC-28 (3) (1983), pp. 283–294

[10] N. Peach "Bearings-only tracking using a set of range-parameterized extended Kalman filters" IEE Proc–Control Theor Appl, 142 (1) (1995), pp. 73–80.