

Research on the decision system of the ships evade bump based on the AIS

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Abstract. Automatic Identification System(AIS) is a way to transntificatifer large amount of information, overcoming barriers, resistance to weather influences, with ship shore, boat shipping information networking capacity and close global automatic identification system of the target display. Research directions only for the vast expanse of ship collision avoidance decision-making, but based on the mathematical model for ship collision risk of AIS information environment set up and the proposal of ship collision avoidance decision, present and even future intelligent automatic collision avoidance system for ships in the maritime sector a comprehensive research and development bring great practical value.

Introduction

In the late 1970 of the 20th century throughout the 90 's, automatic (smart or expert) collision avoidance system for highly valued by international maritime academic, has made some progress, but the collision problem has not fully addressed.

Ship collision accident statistics show the collision severity and urgency to the study on ship collision avoidance decision-making system. Therefore, "96 International Conference on preventing collisions at sea," pointed out that research of ship automatic collision avoidance decision-making system is the technical field of navigation the next 10 or even 20 years one of the main directions of research. With the 1995 amendments to the 1974 International Convention for the safety of life at sea introduction of ship automatic collision avoidance decision-making research is highly valued by the international community, as well as automatic (smart or expert) the core of collision avoidance systems.

Along with the mandatory installation of AIS on the ship based on AIS information related to environment avoidance of theoretical and applied research is very important. As AIS information in real time on the monitor automatically provides the target ship's name, position, course, speed and a variety of dynamic and static information, automatic plotting functions based on AIS information, provide two ship collision parameters such as DCPA, TCPA, not under the influence of weather, sea conditions, more accurate than automatic plotting of ARPA, more real time, more reliable. Therefore, based on AIS information environment and the development of automatic collision avoidance expert system will provide unprecedented information conditions. For, proposed "based on AIS information environment of ship avoidance touch decision system research" of subject, this subject as sea traffic management system VTMS of important part, subject of research will summary antibody predecessors research results, for next research provides reference direction; subject of research helps ship automatically avoidance touch decision system of research up to open thought of role, reduced or avoid human decision errors caused of collision accident; also for ship automatically avoidance touch decision system of established lay must of theory based, Achieve maritime safety transport intelligence, integration of ship and maritime information sharing, in order to guarantee navigation safety, improve shipping efficiency and for the purpose of protection of the marine environment.

AIS information environment for vessel collision risk degree determination

In ship collision avoidance and in the research of ship automatic collision avoidance decision-making system, determination of the ship's collision risk is very important. So navigation territories in the of many experts scholars for has many research, according to on yiqian research results of General and summary, ship collision dangerous degrees of quantitative research basically experience has four stage: first stage is based on traffic flow theory, to ship will met times, and specific waters history collision accident, to evaluation specific waters of collision dangerous degrees; second stage is from micro of angle according to human behavior learn and the psychology,, to ship field or moving territories to evaluation collision dangerous degrees; third stage in determine ship collision dangerous degrees Shi, Considering the DCPA and TCPA effect; phase IV is the DCPA and the TCPA to determine collision risk.

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Through a large number of practical observation and survey ship collision avoidance action can be obtained with the uncertainty of DC in a different distribution is shown in Figure 1:

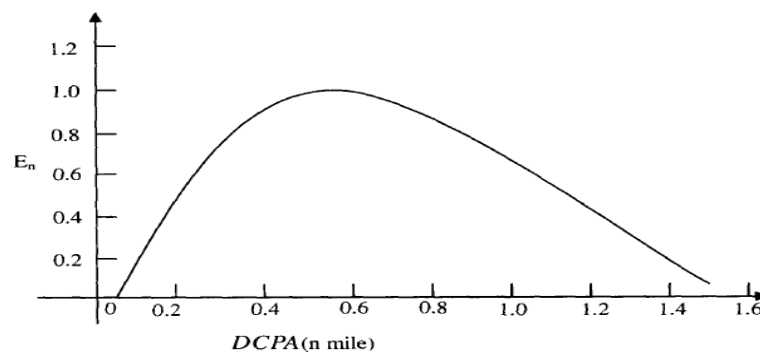


Fig . 1 Digital signal processing module structure and function block diagram

TCAP is defined by the current time reaches the time recently encountered, TCAP will determined by the distance and relative speed of the two boats, which describes the urgency of the situation. The figure 2 below shows that for TCAP value at some point, this time can be determined from Figure 2 TCAP is part of the comment membership.

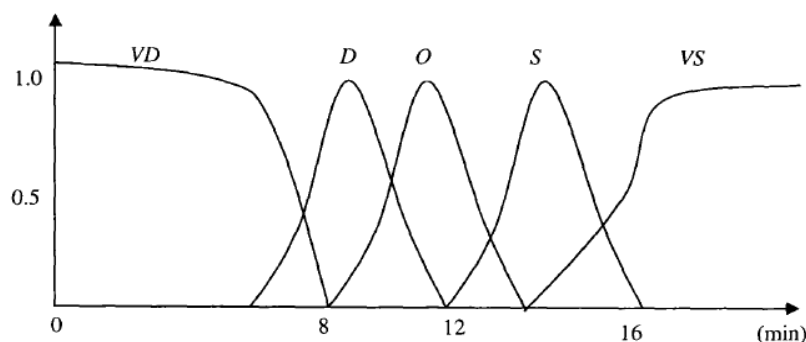


Fig . 2 TCAP comments to each membership function curve

Knowledge base design of ship collision avoidance decision-making system

Ship collision avoidance decision-making system based on AIS information environment research and application, and has great practical value for reducing ship collisions, is completely directed intelligence for future important parts of the ship. In recent years, maritime experts and scholars at home and abroad to make a lot of theoretical research, but practicality is still some distance from it. Collision avoidance decision-making system performance depends on the quality of collision avoidance knowledge base and quality also depends on the acquisition of collision avoidance knowledge base of knowledge in the field of quality and operability. Therefore, to define sources of knowledge in the field, on the risk of collision judgment, decision-making process and clearly the process is designed to measure the practical steps necessary for ship collision avoidance decision-making system.

Sailing duty officer looked through the gap found after the ship, ship movement information collected, static basic information including shipping vessel movement information, and analyze collected information. Then the driver to determine whether there is a risk of collision both vessels can safely through, if safe passage would not have to take any measures to avoid until the boat safely if two ship collision risk, that is not safely through, the driver will be determined according to the regulations for preventing collisions at sea ship to ship what we will encounter patterns and avoidance by defining their responsibilities. Make way if this ship for ship, determine what should be done to avoid measures and avoiding manipulation until passing makes clear, the vessel to recover the original course. The collision avoidance action in order to complete the process.

Figure 3 control principle diagram of collision avoidance, is this boat is located in the center of the operating principles, pointing out that when the vessel and the area to ship collision, the vessel to be manipulated. One by one the following instructions are for each region to ship the General avoidance of manipulation should be taken by the ship methods and principles.

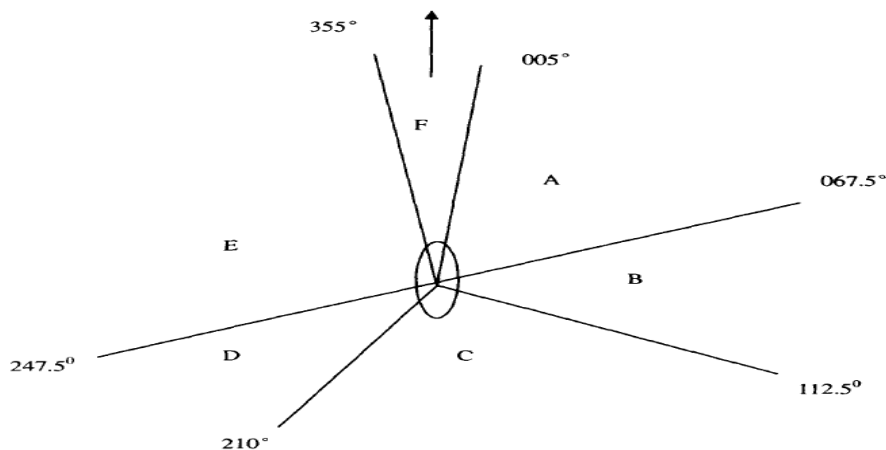


Fig . 3 Principles of ship collision avoidance maneuver

Design and implementation of the System

AIS replaced after the radar and ARPA, radar can function as a data source. Relative motion data including automatic radar plotting and calculating, dangerous judgment, and, finally, the collision avoidance decision making is given. Paper given by the collision avoidance decision-making programme and in accordance with this Protocol the initial ship collision avoidance decision making system is a consultative system. Implementation will be made in interactive mode, knowledge base provides collision avoidance manoeuvring that is established by the decision-making advice.

AIS this problem will solve the goal of automatic marking. Previously by means of radar and ARPA calculation methods in tracking the target ship's signal after a certain distance, you can calculate a variety of relative motion parameters. AIS devices can now provide dynamic ship motion data, as well as providing many ship static data, similar to the ship's name, call sign, ship's length,

width, the types of ships, ships start port and end port. This judgment has a lot of the early warning role.

Considering the risk of collision when the space ship collision risk synthesis method of collision risk and time is critical. In accordance with the relevant information on the practice of preventing collisions at sea to study statistics: risk of collision, the driver first of all note that spaces the size of collision danger, if the risk of collision is zero, you will not be considered time collision risk if not zero, considering time effect of collision danger.

Accept the target ship's AIS signal automatically by a computer, without a certain preset time interval for sampling, can achieve the goal of automatic computer plotting and data calculation of collision avoidance. This system involves the following functions to clarify a target ship collision avoidance method for calculating related data is shown in Figure3:.

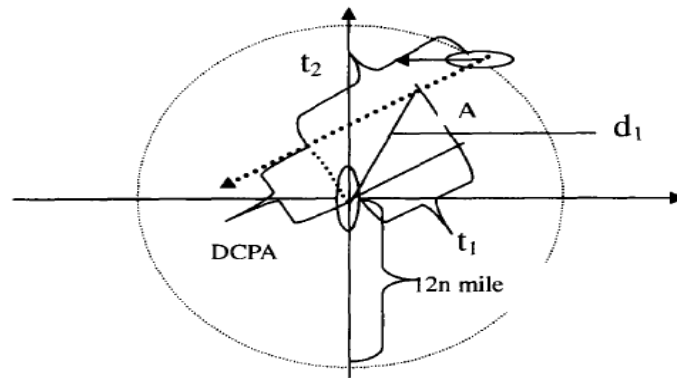


Fig . 4 Time collision risk map

The thesis design of ship collision avoidance decision-making system based on ASI information environment combines the ship with a single target ship collision situation analysis, provided by full use of ASI devices interact with the dynamic and static information, learn from each other as far as possible. The fundamental basis of the system is the international regulations for preventing collisions at sea, and the system of any collision avoidance measures are without prejudice to the premise of the international regulations for preventing collisions at sea.

ASI information environment-based ship collision avoidance decision-making system based on computer systems platform for data acquisition and analysis in order to achieve the purpose of automatic collision avoidance, with interactive features, which had the following features:

1. the manual entry method is used to simulate the system receives from the ASI device required for collision avoidance of all the ships and the target ship's navigation data and ship static data;
2. the use of ASI devices on the target ship information gathering, synthesis, through computer analysis, treatment and avoidance of collision avoidance knowledge base to search for the best practice recommendations.
3. using a computer monitor output, the output includes all the target ships data and collision avoidance scheme proposal for ship by the pilot;
4. to ARPA-like functionality to achieve Visual the vessel and target ship automatic plotting functions, including image cannot display ship identification simulation for the ARPA;
5. realization of different target simulation of ship data entry, the system will output different collision data and ship collision avoidance measures and automatic plotting of different images.

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