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Simulating Avoidance Actions and Evaluating Navigational Rules in An Expert System of Collision Avoidance

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ABSTRACT : *An expert system of collision avoidance developed by CLIPS and Visual C++ is continuously introduced in this paper. Further, a simulation function of collision avoidance is added to the expert system, the function can simulate the avoidance actions of own ship and a specific target of a period of future time. This function can help navigators to estimate collision risk and make proper collision avoidance actions in dangerous situations for navigational safety of ships. Furthermore, navigational rules can also be evaluated during the process of simulation.*

KEY WORDS : *Simulate, Collision Avoidance, Expert System, Evaluate*

1. Introduction

1.1 Background

Along with the fast development of shipping industry and large-sized and high-speed trends of ships, serious collision accidents of ships happened again and again. These accidents caused so much loss on lives and property of nations and individuals. So special attention is always paid to this problem by governments and research institutes of many nationalities. But because this problem refers to many factor ·····(omission)·····.

1.2 The Developed Expert System of Collision Avoidance

An expert is a person who has expertise in a certain area. In the field of navigation of ships, navigators who have abundant navigational experience are experts.····· (omission)·····((Joseph Giarratano, 1998)·····(omission)·····.

2. Adding A Simulation Function to The Expert System

According to the existing rules and specifically navigational situations, the suggestions of reasonable avoidance action can·····(omission)·····(Robert Savely, Chris Culbert, 2005)·····(omission)·····.

An expert system of collision avoidance has already been developed by using this approach(Jeong, T.G, Chen Chao, 2007)·····(omission)·····.

And a related research of navigational rules(Jeong,1997) ·····(omission)·····.

3. Evaluation of Navigational Rules

The simulation function of the expert system also provides a method to evaluate the navigational rules existing in the system. Users can hypothesize ·····(omission)·····

In Table 1, own ship and target's navigational information of 3 examples is shown·····(omission)·····.

Fig.7 shows the simulation result of meeting situation. As Fig.7 shows, own ship should alter course towards starboard when the distance between own ship and the target is less than 4 nautical miles.·····(omission)·····

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Table 1 Own ship and targets' situation

	Own ship	Target (Meeting)	Target (Crossing)	Target (Overtaking)
Distance (nm)	--	4.2	4.2	2.2
Bearing (∘)	--	3	25	355
Course (∘)	000	180	215	0
Speed (knot)	10	10	10	3

·····(omission)·····

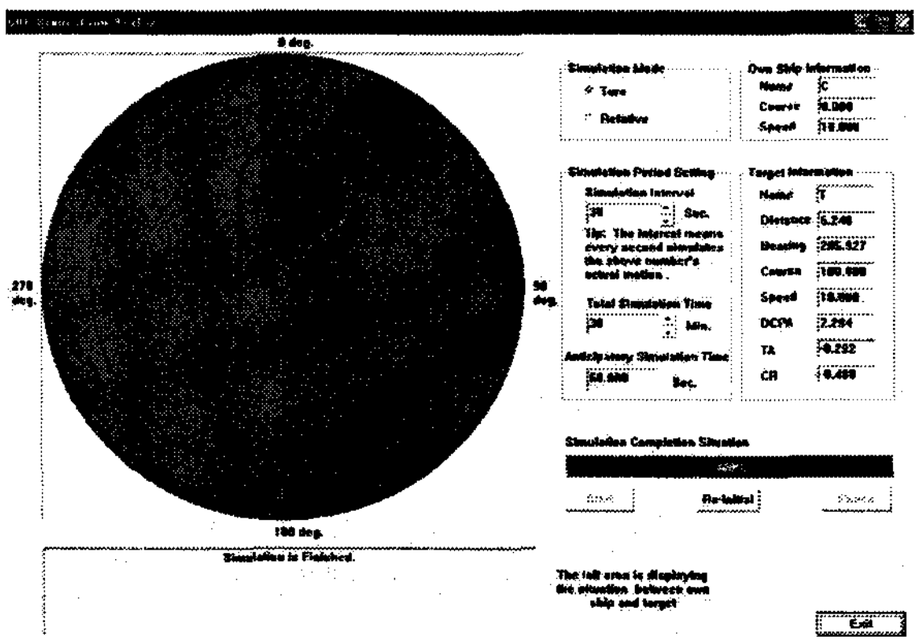

Fig.7 Simulation Example of Meeting Situation

·····(omission)·····.

4. Discussions of The Expert System

The simulation function of the expert system provides a better way to understand navigational rules and accumulate experience, but the expert system of collision avoidance is just an experimental product. Some problems and the developmental directions of the system are as follows: ····· (omission)·····.

5. Conclusion

Collision avoidance of ship is a difficult topic in the field of navigation of ships on the sea. Experience of navigators is one of the most important factor of this topic. An expert system of collision avoidance could help navigators of ship to keep navigational safety of ships. This paper is intended to add a new simulating function of collision avoidance to a developed expert system of collision avoidance. The specialities of the new function are as follows: ····· (omission)·····.

References

[1]Joseph Giarratano (1998), "Expert System Principles and programming", pp.1~556.

[2] Robert Savely, Chris Culbert(2005), "CLIPS Version 6.23 Advanced Programming Guide", pp.1~245.

[3] Jeong, T.G, Chen Chao(2007), "Using CLIPS to Develop An Expert System of Collision Avoidance"

[4] Jeong, T.G(1997),"Navigational AI Judgement Rules' Development and Collision Avoidance System's Research",pp.1~86.