

eMIR eMaritime Integrated Reference Platform

DEVELOPMENT AND VALIDATION MTCAS

– Maritime Traffic Alert and Collision Avoidance System –



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Project MTCAS

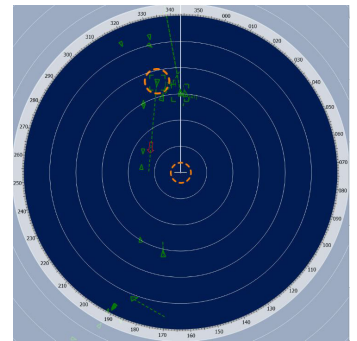
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MOTIVATION

Current technologies in maritime navigation systems (such as ARPA: Automatic Radar Plotting Aids) provide alarms like Closest Point of Approach (CPA) and Time to CPA (TCPA) to warn seafarers against critical situations or possible conflicts. However, this technology does not rely on the analysis of historical track data, planned routes, external information, knowledge databases or environmental databases. Nowadays prediction of CPA and TCP depends only on the currently observed dynamics of the ships (current position, speed and course). This can lead to false and useless alarms as the current dynamics can change before the predicted CPA, e.g. at the next planned way point. Furthermore useless alarms can be triggered by conventional navigation systems for e.g. conflicts on land or conflicts between tankers and/or containers on shallow water. While traditional technologies can trigger important alarms, in some cases they can be very delayed to have appropriate responses. In critical situations, fast and reliable information exchange between the navigators of the involved ships is essential. While often English as a second language is a linguistic barrier for navigators, which are confronted to manage situations with several ships via VHF radio or radio communication.

PROJECT OBJECTIVES

The objective of the Maritime Traffic Alert and Collision Avoidance System (MTCAS) project is to develop an intelligent maritime collision avoidance system with different alarm levels in respect of the hazard level. MTCAS adapts the concept of the Traffic Collision Avoidance System (TCAS) which already has been established in the aerospace domain. With MTCAS navigators can detect and avoid critical situations, whereby the collision detection makes use of all available information (historical tracking data, current observation data, planned routes, knowledge databases, external information and environmental information), in order to be able to detect reliably critical situations. The collision avoidance mechanism automatically generates a collision avoidance rule-compliant, safe and misunderstanding free manoeuvre recommendation to avoid possible collisions. That way valuable information will be provided to the navigators, which should agree to the maneuver before execution. MTCAS does not perform maneuvers automatically, thus local knowledge from seafarers, which is not available to MTCAS, becomes integrated into the collision avoidance process. On the shore side, Vessel Traffic Services (VTS) benefit from MTCAS' information exchange of the involved ships in dangerous situations, where the intentions of the involved ships is evident and can be captured faster and better, thus ensure a qualitative higher-value support for ship crews.



MTCAS integrated in a radar display: Detection of a dangerous target in a multi-ship situation with visualization of the MTCAS shields (orange)



MTCAS system evaluation, offshore in the Jade-Bay in July 2018, vessels FK Senckenberg and FB Zuse manoeuvre safely by using the new MTCAS.

RESEARCH RESULTS

Improved alarms through prediction technology

- Intelligent CPA with consideration of ship sensor data, resilient Position, Navigation and Timing (PNT) data, chart information, route information and historical track data
- Ultimate Action Alarm for the initiation of the last possible successful evasive manoeuvre activity initiations, based on the own current manoeuvring characteristics and the prevailing environmental conditions

Reduction of misunderstandings through negotiation

- Harmonisation of critical situations with integration of navigators expertise
- Maneuver negotiation and confirmation for multi-ship scenarios

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Supported by:

 Federal Ministry
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on the basis of a decision
by the German Bundestag

FKZ: 03SX405D