

Automated Decision Making for Operations within a Traffic Separation Scheme Using MOOS-IvP

by

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Abstract

This thesis proposes a set of practical applications that utilizes the sharing of intent information and intended courses between marine vehicles operating in the vicinity of a Traffic Separation Scheme in order to reduce risk of collision for vehicles with intentions to join in accordance with Rule 10 of the COLREGs. The proposed set of applications also creates a method to digitally represent a Traffic Separation Scheme in MOOS-IvP simulation software using a structure modeled after Title 33 of the Code of Federal Regulations. Two types of Traffic Separation Scheme intents are communicated: traffic lane compliance, in which the vessel in the traffic lane is within the lane and on a compliant vessel heading in accordance with Rule 10.b, and compliant lane approach/traffic crossing, in which vehicles with lane crossing intent or intent to enter are on a compliant heading in accordance with Rule 10.c. Incorporating inter-vehicle communications to share intended courses allows for discrete extrapolation of future positions, determination of risk conditions, and ultimately a recommendation for an early speed maneuver to reduce risk conditions. Communications between shore and vehicle are also used to allow the vehicle to populate a Traffic Separation Scheme instance onboard which will enable future flexibility and minimize pre-loading of data for harbor operations. Simulation experiments demonstrate the feasibility of the proposed Rule 10 method in terms of both vehicle safety and proper traffic lane operation.

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