Generating test cases for marine safety and security scenarios

Agent $\equiv \{\text{CargoShip}, \text{Zodiac}, \ldots\}$
Mode $\equiv \{\text{Approaching}, \text{Smuggling}, \ldots\}$
SmugglingMode $\equiv \{\text{Loading}, \text{Unloading}, \ldots\}$

universe $\text{Position}$ // Geographic coordinates
universe $\text{Operation}$ // Operations of a vignette

AgentPosition : Agent $\mapsto$ Position
Mode : Operation $\mapsto$ Mode
SmugglingMode : Operation $\mapsto$ SmugglingMode
BeachPoint : Operation $\mapsto$ Position
RendezvousPoint : Operation $\mapsto$ Position

Rendezvousing$(A_1, A_2 : \text{Agent}; Op : \text{Operation}) \equiv$
\[ \text{if } \text{Mode}(Op) = \text{Approaching} \text{ then} \]
\[ \text{MoveAgent}(A_1, \text{RendezvousPoint}(Op)) \]
\[ \text{if } \text{Mode}(Op) = \text{Smuggling} \text{ then} \]
\[ \text{if } \text{SmugglingMode}(Op) = \text{Loading} \text{ then} \]
\[ \text{MoveAgent}(A, \text{RendezvousPoint}(Op)) \]
\[ \text{if } \text{SmugglingMode}(Op) = \text{Unloading} \text{ then} \]
\[ \text{MoveAgent}(A, \text{BeachPoint}(Op)) \]

MoveAgent$(A : \text{Agent}; P : \text{Position}) \equiv$
NextPosition$(A, P)$, ...

// Incrementally generates a trajectory by computing intermediate agents positions
// depending on various factors, gradually moving an agent towards its destination.

Fig. 5 ASM model of a Rendezvous Pattern between two agents $A_1, A_2$ in Territorial Sea (a belt of coastal waters extending from the baseline of a coastal state): $A_1$ is of type CargoShip and $A_2$ is of type Zodiac.

A sample ASM model for a Rescuing Pattern among three agents is shown in Figure 6. In this SAR operation, a helicopter agent $A_2$ first searches and then identifies the location of the fishing boat agent $A_1$ in a distress situation. After locating the fishing boat, a coast guard vessel agent $A_3$ first extracts persons from the fishing boat and then secures the boat. The operation $\text{MoveAgent}(\ldots)$ is defined in the Rendezvousing example.

6 Applications

An operational prototype of the Vignette Generator has been designed and developed in Java based on the concepts presented in this paper. It is capable of generating a wide spectrum of vignette specifications for the INFORM Lab simulation environment. A screenshot of the Vignette Generator illustrating a complex SAR scenario is illustrated in Figure 7.

The Vignette Generator has the potential to interoperate with different simulation environments, namely those for which the corresponding interface configuration format is determined, due to the following features: