

Using X3D Graphics and Agent-Based Simulation for Analyzing Anti-Terrorist / Force Protection (AT/FP) Defense of Navy Ships

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Executive Summary

Despite the many advances achieved within both Modeling and Simulation and Information Technology over the past several decades, practical application of such technology remains under-utilized by operational units in the United States Navy. Furthermore, when such technology has been deployed in the last decade it has been to exercise operator proficiency, increased C⁴I battlespace awareness, but not for the warfighter to run ‘what-if’ scenarios to aid in development of tactical plans for employing published doctrine.

This research to-date presents an end-to-end tactical aid for developing AT/FP defensive plans against the surface-borne terrorist threat. An agent-based software tool replicating actual capabilities exercises both offensive and defensive capabilities of a picket boat against a hostile speedboat. Charts and 2D/3D graphics provide tactical insights and excellent situational awareness for ships force. Exhaustive repetition produces quantitative assessments of defense measures of effectiveness (MOEs), and also identifies unexpected outlier vulnerabilities. We successfully identify, develop, and deploy the necessary modeling and simulation technologies to demonstrate a prototypical planning tool usable by today’s warfighter. Next-step recommendations include officer training, CONOPS development for SPARTAN USV, and partnership with NAVFACENGSUPPCEN to add all other ports of call to create an AT/FP tactical decision aid.

Current Capabilities

To date, this research has resulted in several capabilities that can assist the warfighter or security professional:

- Allowing Combat Systems Officers and other shipboard force protection personnel to preview harbors before entering port.
- Ports incorporated to date: Pearl Harbor, Aden Yemen, Port Hueneme California
- Gain insight on pier layouts, port structure, spatial relationships, shadow zones, and possible sentry requirements before entering port.
- Assessing and visualizing effectiveness of picket boat intercept / interdiction tactics for own-ship AT/FP defense.
- Dynamic selection and configuration of scenarios of interest.
- Real-time simulation for surface threat defense.
- Statistical insight for defensive effectiveness.



Figure 1. Depicts a scenario in progress in Pearl Harbor, Hawaii

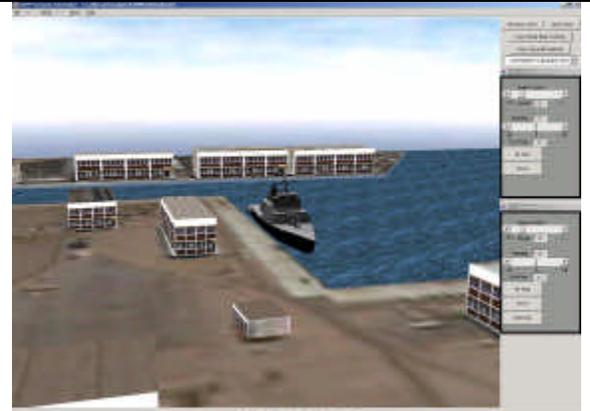


Figure 2. Shows a preview of the piers at Port Hueneme, California.

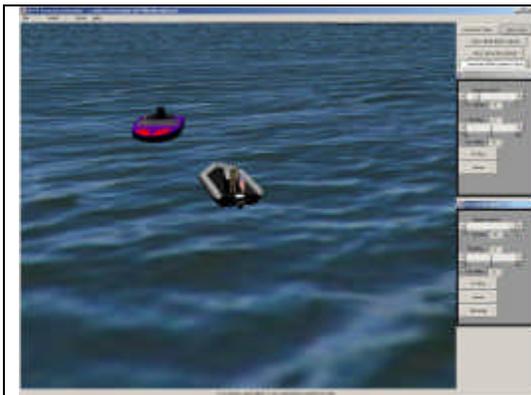


Figure 3. Depicts a real-time 3D scenario in progress.

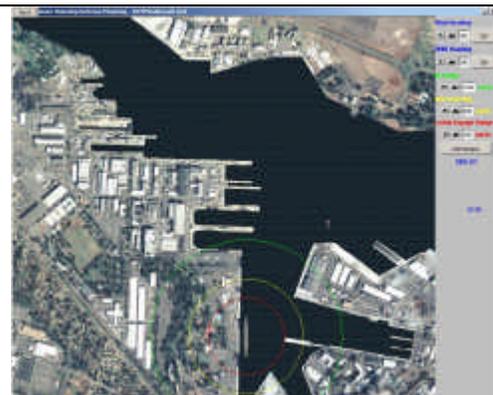


Figure 4. Depicts 2D Port visualization and defense configuration panel in the AT/FP scenario generation application.

Potential Capabilities

Next steps for this research initiative are:

- Work for incorporation of more ports
- Integration of more complicated and additional threat axis (air, snipers, sub-surface, more complicity for the existing threats.

This research is also capable of being extended for:

- CONOP development tool for the DARPA SPARTAN and NWDC Robo-Rhib projects.
- Integration into the naval force AT/FP training pipeline.



Figure 5. Depicts an example of running multiple scenarios to gain possible statistical insight on AT/FP plan effectiveness.

Conclusion

The result to-date of this work is a fully-integrated, prototypical, application that demonstrates how various Open-Source, web-based technologies can be applied in order to provide the tactical operator with tools to aid in Force Protection planning. Scenarios can be auto-generated, viewed, and manipulated by end users with little to no computer experience necessary beyond requirements for operation of a desktop personal computer (PC) in the Information Technology for the 21st Century (IT-21) environment inport or at sea.

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