What's Up MÄK

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Simulating Unmanned Vehicle Systems

In virtual environments you can do what you're not allowed to, shouldn't, or can't do with real systems.

Develop new autonomous control algorithms and see how they affect system behavior. Play out scenarios and develop tactics to defend against unmanned vehicles used as weapons. Train the use of control stations without actually deploying any real vehicles. Plan flight patterns to optimize surveillance coverage areas.

Simulation is a well-established tool to improve outcomes in large-scale systems development – now those technologies are scaled down for a perfect fit with the development of unmanned systems.

MÄK tools can help you simulate, research, and test unmanned vehicles in any virtual environment – air, land, sea, and underwater.

VR-Forces is our engine for flexible scenario generation that models many aspects of the virtual world, including humans, vehicles, terrain, weapons, and communications systems. VR-Vantage, MÄK's image generator (IG), simulates daylight, electro-optical (EO), night vision, and infrared (IR) sensor feeds. Our new RadarFX SAR Server enhances our sensor package by providing Synthetic Aperture Radar (SAR) images that see through atmosphere and vegetation. Use VR-Vantage and RadarFX to simulate video sensors, emulate ISR capabilities, or create powerful 2D and 3D visualization applications that incorporate mission information, real-time maps, sensors, and camera views. VR-Link and the MÄK RTI allow you to connect your UVS simulation across local or wide area networks so you can interoperate with other UVS simulations, manned simulations, computer generated vehicle simulations, and servers that simulate people. The MÄK Data Logger captures measures-of-performance and measures-of-effectiveness for analysis and design evaluation.

The diversity of Unmanned Vehicle Systems (UVS) makes modeling and simulation critical in testing new ideas, advanced technologies, operational concepts, and system effects. MÄK products provide the robust M&S environment and scenario-creation capability required for UVS simulations. Keep reading to see how we've used our tools to build our own UVS demo simulations.

INSIDE THIS ISSUE

UVS Simulation In Practice

Stimulating a Ground Control System (GCS)

MÄK built a simulation to demonstrate how virtual environments can be used to stimulate a ground control station. The demonstration has three parts: a UAV simulation built with MÄK's VR-Forces, a sensor simulation built with MÄK's VR-Vantage, and a very simple GCS application, built using a GUI development framework from our partner DiSTI.

The UAV simulation models the unmanned vehicle's autonomous navigation and accepts control messages up-linked from the ground station to control the flight and sensor pointing angles. The sensor simulation uses the vehicle's position and sensor pointing angles to render a full motion video of the virtual environment to model day-light, night vision, or infrared sensors. The life-like video stream is down-linked back to the GCS along with telemetry metadata.

This system can be tailored to feed simulated video to real ground control stations or used as a testbed for experiments with UAV operations.

Creating a Virtual Environment for Tactics Development

To illustrate how virtual environments can be used to study concepts of operation and tactics development, we created a swarm of UAVs in our Hawaii environment. VR-Forces models the UAVs; each one is given a somewhat chaotic flight plan to mimic a human operator flying by radio control. The swarm flies over a populated area created using VR-Forces and DI-Guy human character models. This demonstration shows how scripting and artificial intelligence work together within a virtual environment to make scenarios for analysis, test & evaluation, or demonstration.

Want to see these demos in person? Curious about how MÄK tools can help you simulate UAVs in your virtual environment? Got general questions about our technology?
Don't be shy - get in touch with us today.

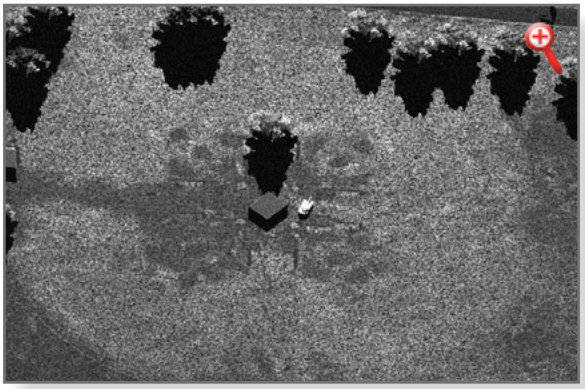
M&S After Action Review

After completion of an M&S project, what did you learn? How could a piece of simulation software used be improved to help future projects? Any sparks of inspiration from real-world events?

Join our new discussion group "M&S After Action Review" on LinkedIn to share your stories, give your feedback, and work together to create a stronger Modeling & Simulation future.

Tips & Techniques

Adding Synthetic Aperture Radar (SAR) to Your UVS Simulation's Intelligence Reconnaissance surveillance (ISR) Capability



At MÄK, we help our customers simulate unmanned vehicles in a lot of ways, depending on what part of the system architecture the customer is addressing. Some use VR-Forces to simulate the UAV's mission plans and flight dynamics. Some use VR-Vantage to simulate the EO/IR sensor video. Of those, some use VR-Vantage as the basis of their payload simulation and others stream video into their ground control station (GCS) from a VR-Vantage streaming video server.

All of our customers now have the opportunity to add a Synthetic Aperture Radar (SAR) to their UAV simulations — and here's how to do it. SensorFx SAR Server comes as two parts: a client and a server. The server runs on a machine on your network and connects to one or more clients. Whenever a client requests a SAR image, it sends a message to the server, providing the flight information of the UAV and the target location where to take a SAR image. The server, built with VR-Vantage, then uses the JRM Technologies radar simulation technology to generate a synthetic radar image and return it to the client.

The SAR Server renders SAR images taking into account the specified radar properties, the terrain database, and knowledge of all the simulated entities. The radar parameters are configured on the server in advance of the simulation. The terrain database uses the same material classification data that is used by SensorFX for rendering infrared camera video so your sensor package will have the best possible correlation. The server connects to the simulation exercise network using DIS or HLA so that it has knowledge of all the entities. It uses this knowledge to include targets in the SAR scenes and so that you can use a simulated entity to host the SAR sensor.

We provide a client SDK and the example client code for those of you who want to build a software simulation of a ground control station. With it you can request that SAR images be taken from any of the entities in the simulation, like your UAV, which may be simulated with VR-Forces or your UAV flight simulation, or any other networked player. If you are using a real ground control station, we can work with you to customize the messages to match the request/response protocol of your GCS, then you can connect RadarFX SAR Server in place of the SAR on a real system.

I hope this helps you see your way to adding a SAR to your UAV system. As always, let us know if you need anything. We're here to help.

MÄKer Spotlight: Tim George

Senior 3D Graphics Engineer

What better month to spotlight Tim George than one with a focus on our visual and sensor quality and capability? Tim George, Senior 3D Graphics Engineer at MÄK, spends his time ensuring top-notch visual quality of our simulated scenes, while focusing specifically on improving and enhancing the SensorFX plugin for VR-Vantage. His end goal is to continually improve the performance and realism of electro-optic (EO) and infrared (IR) sensor simulations.

Before coming to MÄK, Tim worked with JRM Technologies, Engiumsing, and Rockwell Collins as a Senior Software Engineer. He graduated from the University of Utah with both his Bachelor of Science and Masters degree in computer engineering.

In addition to being a superior engineer, he is also a superior pet owner. Tim, with the help of his wife, care for a variety of pets including a 5 foot long ball python, a veiled chameleon, a cat, and a beta fish. Previously, they were the proud owners of another cat, a rabbit, a gecko, and several different types of fish. When he's not tending to his pets, you can find Tim taking advantage of the Utah environment - hiking, snowboarding, camping, you name it.

We hope we've piqued your interest in getting to know the MÄK team! Stay tuned to our blog and twitter to get the latest on MÄK happenings!