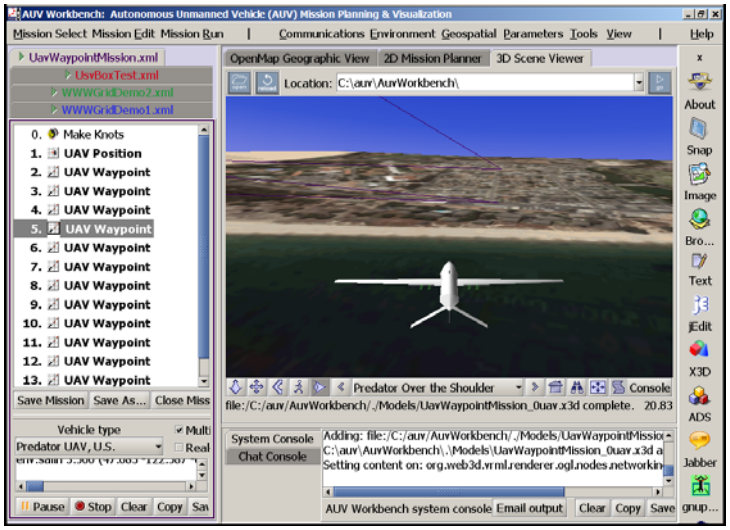
12 June 2007

NPS AUTONOMOUS UNMANNED VEHICLE (AUV) WORKBENCH

https://savage.nps.edu/AuvWorkbench

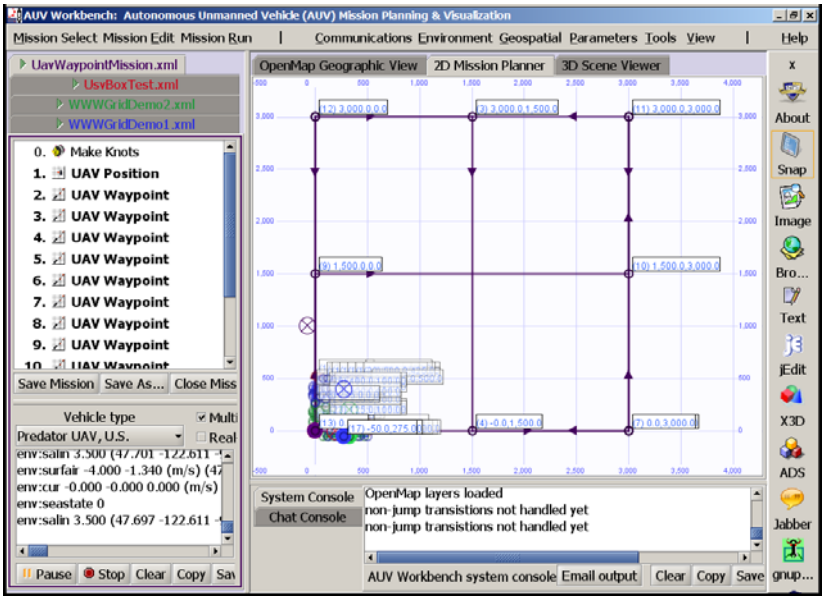
1. The NPS AUV Workbench supports physics-based modeling and visualization of autonomous vehicle behavior and sensors. Our "3 R's" are Rehearsal, Run-time control and Replay for air, surface and underwater robots.



- Animation based on high-fidelity vehicle-specific hydrodynamics & aerodynamics, configured to model arbitrary vehicles.
- Extensible 3D (X3D) graphics models for numerous kinds of robots
- Networking via the Distributed Interactive Simulation (DIS) Protocol allow visualization across networks utilizing custom or off-the-shelf web browsers.
- Virtual environments support control algorithm development, control constant testing, mission generation and rehearsal, and replay of completed missions in a benign laboratory environment.

2. Graphical mission generation provides:

- Automated generation of mission specifications in an XML-based command language supports mission scripting, vehicle-to-vehicle, vehicle-to-agent, and vehicle-to-human communications, as well as storage of runtime telemetry data.
- Can convert Autonomous Vehicle Control Language (AVCL) missions into different robot dialects and command languages.
- Efficient serialization and transmission of generated imagery, telemetry and report products using XML Schema-based Binary Compression (XSBC) and Forward Error Correction (FEC) techniques.
- Initial 3D sonar visualization capabilities.



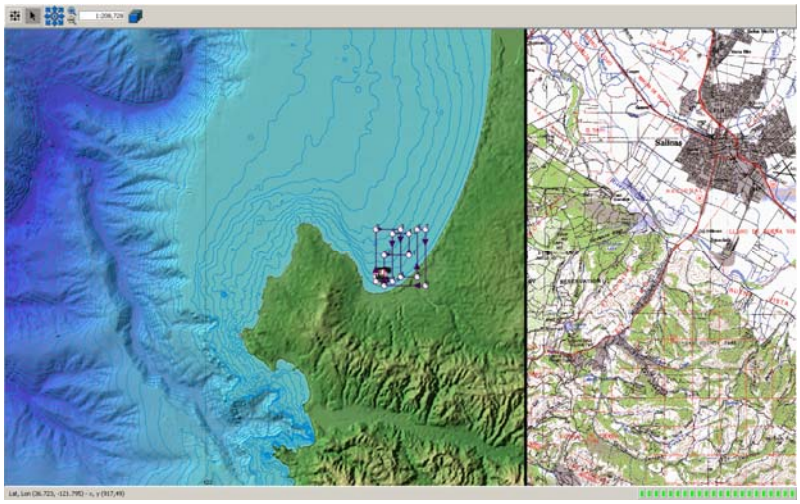
3. XML-based Tactical Chat (XTC) uses the open-standard Extensible Messaging and Presence Protocol (XMPP) for communications among remote vehicles and individual operators, either in the virtual or real worlds.

- Reliable asynchronous data transfer between AUVs, other vehicles, agents and human controllers.
- Automatic logging of all communications in a schema-constrained XML format that facilitates data retrieval for post-mission analysis and scenario reconstruction.

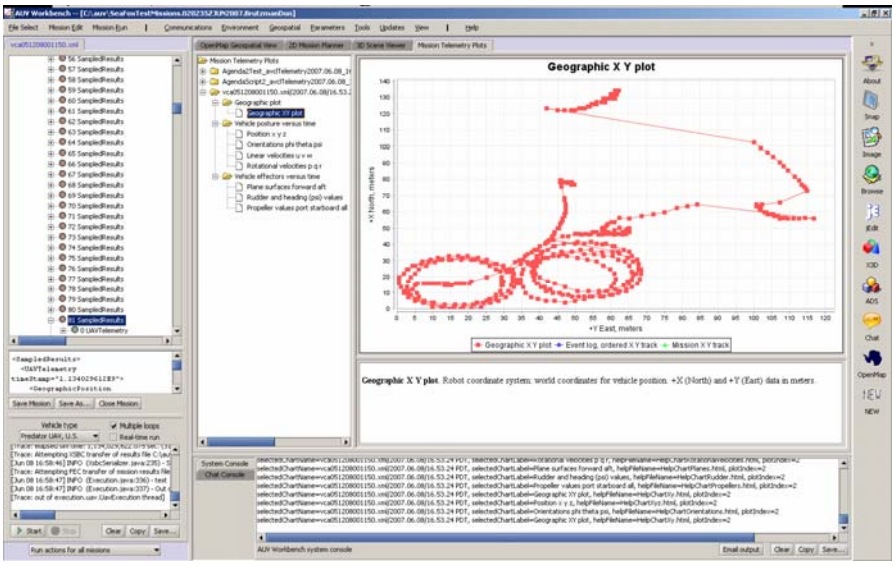
4. Nightly builds of the AUV Workbench codebase allows automatic updating of workbench software, keeping mission planners equipped with the latest technology to conduct full-scale mission planning, rehearsal, execution and playback for analysis of multiple robots. Open source license is royalty free for any use. Java source code and XML data files are under version control for team development. Mailing list available for help and contributions.

5. Geographic Information System (GIS) view, tactical 2D view and X3D view all coregister correctly and consistently align with top of the screen (with North == X3D +X axis). Three views facilitate physics-based mission planning and results evaluation with multiple geo-referenced views of the battlespace environment.

- Detailed GIS data for Monterey Bay and Panama City Florida
- Selectable geographic origin for background X3D scenes including Bremerton Washington and San Clemente Island California
- Convenient image snapshot ability, with support for free GNU Image Manipulation Program (GIMP) or other editing tools
- Online repository of GIS datasets which can be downloaded onto local machine for display



6. Planned and actual mission files are now organized as project directories, allowing easier modeling and maintenance of related missions. Project compression produces a single .zip file for easy sharing. Archive of project examples available online via https://savage.nps.edu/RobotTelemetry



7. Integrated telemetry plots allow direct inspection of relevant control data.

- New telemetry plot pane providing jFreechart graphs of state variables
- Import telemetry files from different robots into AVCL missions for SeaFox USV, Rascal UAV, Solar AUV and Scan Eagle UAV
- Mission metadata can be collected/annotated for each new mission run, or played back and further annotated for post mission analysis

8. AUV Workbench autoinstaller publicly available at https://savage.nps.edu/AuvWorkbench/install.htm

9. Upcoming tutorial at beginning of Unmanned Untethered Submersibles Technology (UUST) Symposium, 19-22 August 2007, hosted by Autonomous Undersea Systems Institute (AUSI) in Durham New Hampshire, http://www.ausi.org/uust/uust.html

10. Fifteen years of extensive published research papers, theses and dissertations included in help system. NPS graduate students now use the AUV Workbench in our Unmanned Systems survey course and master's degree. Research collaborations and partnerships with government agencies, industry and individuals are all welcome.

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