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mexHelmIvP for Rapid Behavior Development and Transition

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Develop a method for direct behavior sharing across internal development projects.

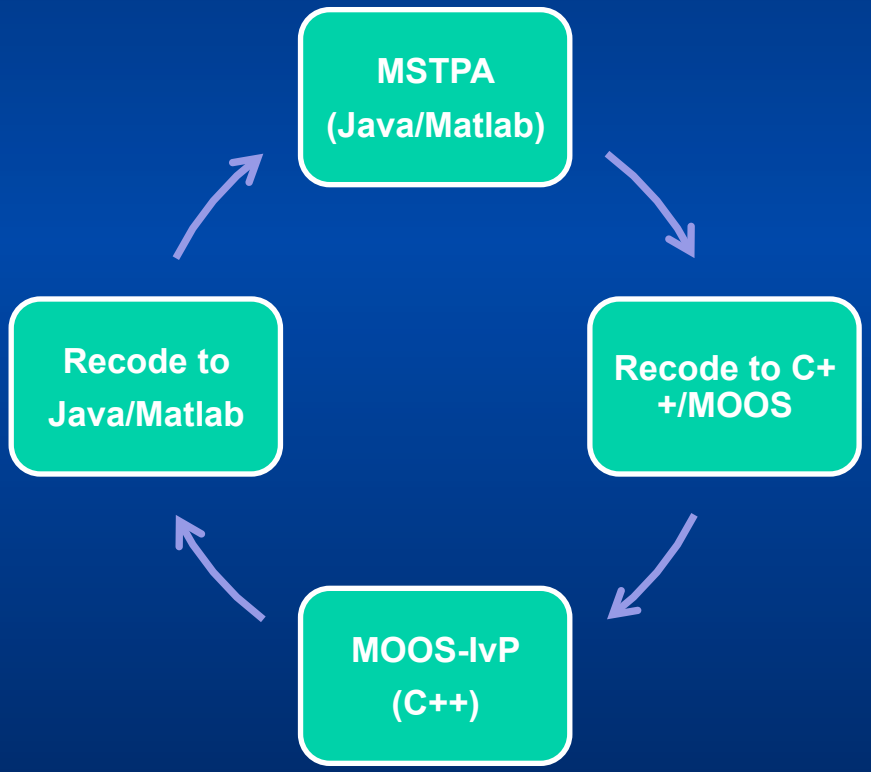
- Early development for behaviors at NURC often performed in Matlab
  - Quick, easy, simple testing
- Also some development in other languages
  - Decision Support Project: Simulation/Tactical Decision Aid development
  - Multistatic Tactical Planning Aide (MSTPA) – Java
- Translation into IvP functions (and vice-versa) is time consuming.
- Sometimes, details get "lost in translation".

Decision support project primary tool: Multi-Static Tactical Decision Aide (MSTPA)

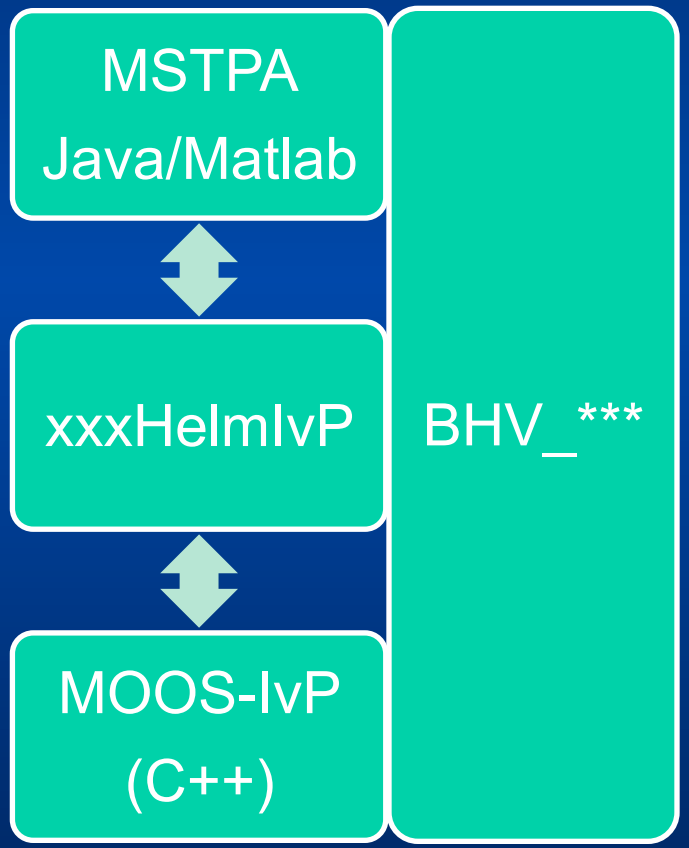
- High fidelity, efficient , model based tool for predicting system performance.
- Used to test and vet multistatic sonar fields.
- Ongoing improvement and development
  - Improved acoustic models
- Used in multiple operational excercises
  - Positive reviews around NATO

Bridge the gap between behavior development in decision support and littoral surveillance projects

Current Process:
Recoding behaviors



Intended Process:
Cross-utilize behaviors

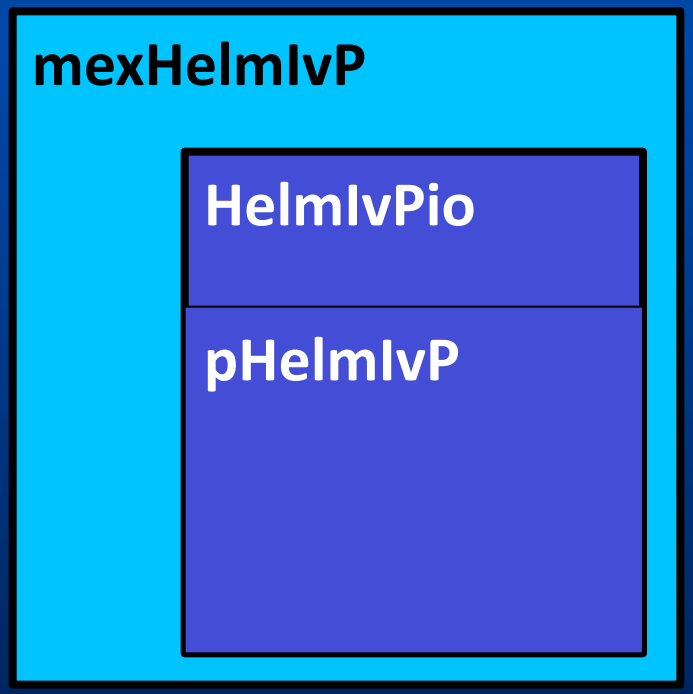


Superclass of pHelmIvP keeps "native" infrastructure, but replaces data I/O.

- Keep all of pHelmIvP MOOS infrastructure
  - Even though most will not be used
  - Keep .bhv file infrastructure for commonality/multi behavior testing

```
OnStartup()
OnConnectToSever()
OnNewMail()
Iterate()
```

- Mex interface populates InfoBuffer with input data.
- Mex interface calls modified Iterate once per step.
- Return Domain solution information
  - Maybe even utility functions later



Matlab mex call to replace MOOS database.

- Call looks like this:

```
[moosData]=mexHelmIvP(deltaTime, moosData);
```

Replace moosData with updated database from the mex call.

deltaTime is the time ellapsed from previous call to this one.

"moosData" variable is a trimmed down MOOSDB. Structure of name=value pairs.

Future Work: xxxHelmIvP

- mexHelmIvP serves as a study in how to reuse HelmIvP software
  - Serves as model for other developments
  - Direct javaHelmIvP for MSTPA
- Allows us to vet Behaviors in another way:
  - At Sea, MOOS simulations, or
  - Using well exercised Tactical Decision Aid
- Allows us to address “big questions” via modeling tools
  - How to autonomous systems compare to others when simulated on an even playing field?

Future Work/Conclusion

- Standardize behavior development between modeling/ simulation and seagoing test groups using HelmIvP as core behavior engine.
- Enable behavior sharing between groups.
- Enable more advanced monte carlo testing of behaviors with current simulation systems (TDA's)
- Enable benchmarking of autonomous behavior based systems vs. other simulated systems
  - Quantify differences

BACKUP

Proposed work flow based on decreased complexity in early development stages

Run Cost/ Complexity	Description	Purpose
Low	Matlab Sim	Quickly develop and tune behaviors and BHV settings
Medium	MOOS Sim	Verify developed BHV and settings in realtime
High	MOOS/HIL Sim	Verify data flow through complete system (incl. BHV)
Very High	Field Trial	Verify system in fielded system