Adapting the RoboCup Simulation for Autonomous Vehicle Team Information Fusion and Decision Making Experimentation

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RoboCup

▼ International research and education initiative

- AI and Robotics Research
- Standard problem where many technologies can be examined
- Soccer is the primary domain

▼ RoboCup Soccer

- Simulation League: 2D, 3D, etc.
- Small and medium size leagues
- 4-legged league
- Humanoid league

▼ Other RoboCup Domains

- @Home
- Dance
- Rescue

Our Goal

▼ Develop a challenge domain that researchers could use that would reflect some of the decisions required for the military use of unmanned vehicles.

▼ Unclassified challenge based on open-source software so that it could be widely used.

▼ Perhaps it could become a RoboCup domain, or it could merely be a parallel challenge that is publicized.

Examples of Issues

▼ Extreme Heterogeneity
  - Players
  - Portions of the playing field

▼ Asymmetry
  - Goals
  - Teams (number of teams, number on a team, and composition)
  - Rules

▼ ROE (or the oxymoron, legal fouls)

▼ Dynamic Playing Field with Features (think *battle room*)

Heterogeneity of players and portions of the Game Field

From FIFA, Laws of the Game
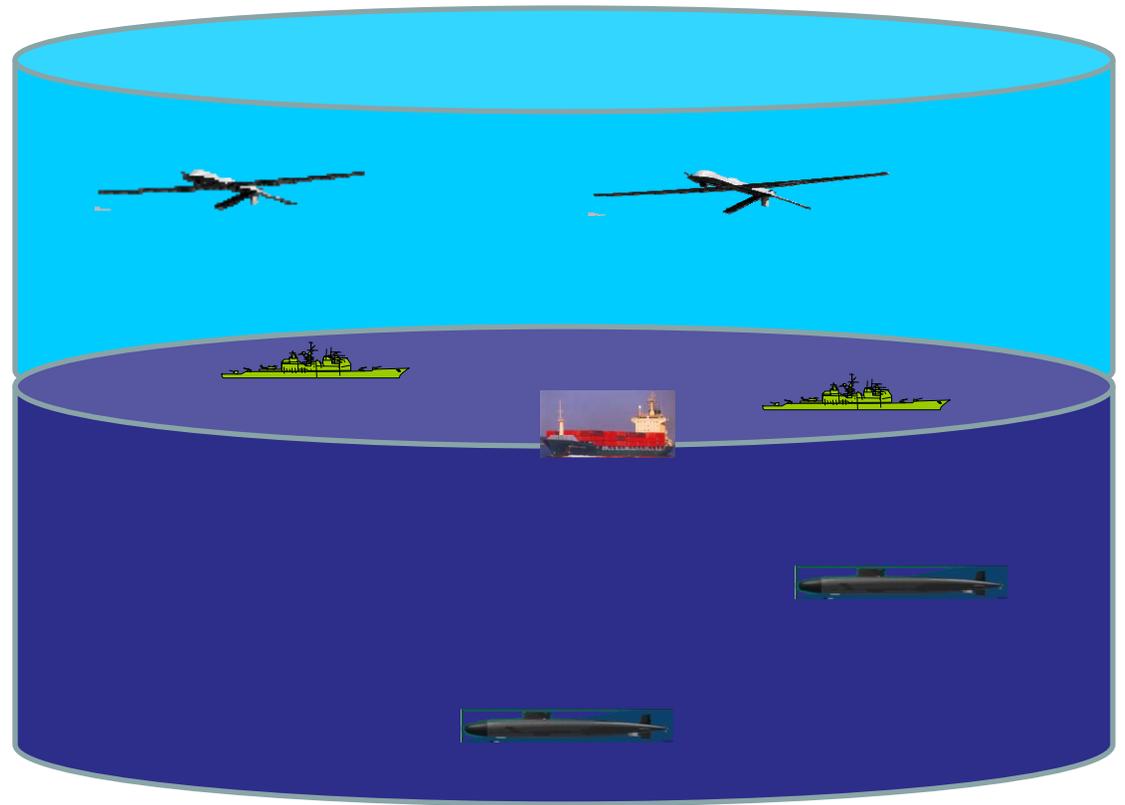
ROE

▼ In our game, sometimes what would be called a foul in some games, should be legal.

- Score points for attacking a player with "hostile intent".
- Lose points for attacking a player without it.

▼ But there needs to be a substantial penalty for mistakes that break the ROE.

Evolving the Game – A Force Protection Scenario

▼ Begin with keep ball game, but play defense.

▼ Multiple balls

▼ More than two teams. One team may be neutral. Players don't all wear uniforms.

▼ Defend a goal.

▼ Allow certain fouls.

▼ 3-D field with omni-directional goal. Field bisected by a plane. The plane itself is a playing area as are the areas above and below.

- Restrictions on movement
- Restrictions on communication

▼ The goal moves and the field moves relative to the goal.

▼ Addition of obstacles and other features.

Summary

Idea is to create an open source game that researchers can use to experiment with technology that is relevant to DOD problems, but where there are few if any restrictions.

- Autonomy
- Data Fusion

Started with RoboCup Simulator and have tried evolving the game.

Having success in the evolution, but it is better if we keep the game a bit more like a game/activity that is outside the military realm.

- Perhaps just have modified RoboCup simulators with individual changes.
- Perhaps find another game to model activity after.

Hope to publish the game into open source and perform outreach to get researchers using it.