Managing Competing Objectives in Soar
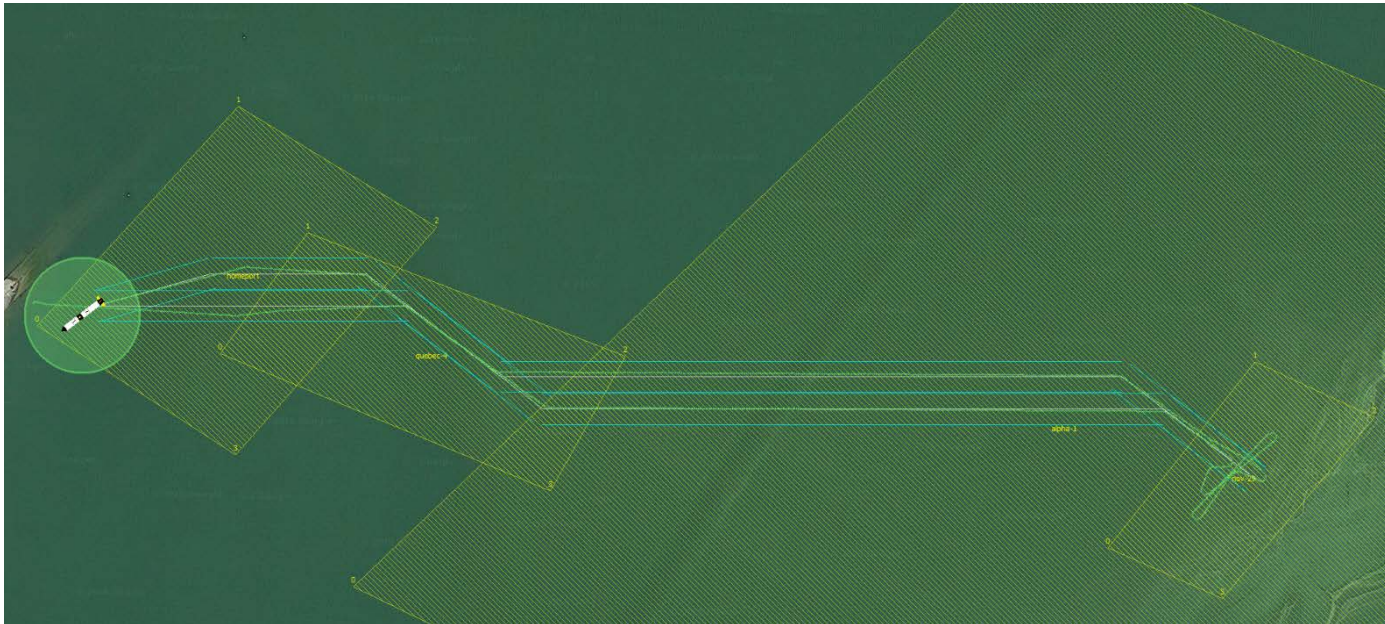
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Outline

- Navigation plan components and current execution

- Incorporation of in situ constraints
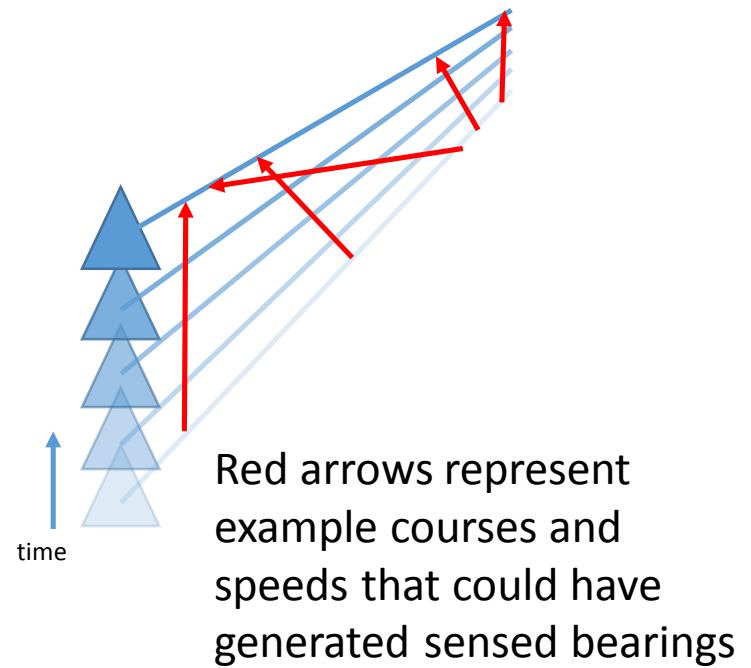
- Competing objectives
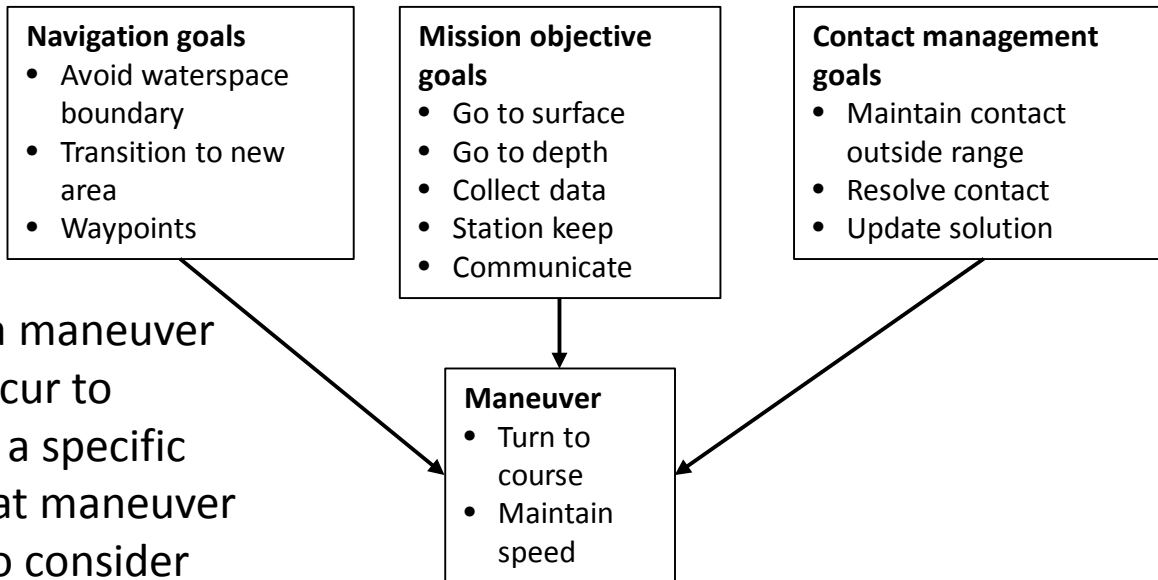
Navigation plan provides constraints

- Areas (space and time constraints) the vehicle must both stay within and keep out of
- Waypoints to guide navigation and provide opportunities to achieve mission objectives

Contacts are primary in situ constraint

- Navigation plan
  - Can consider expectations about contacts
  - Execution must be adapted based on in situ sensing

- Bearings only sensing
  - Build information over time
  - Target motion analysis
  - Requires a change in course or speed to learn information about contact

time

Red arrows represent example courses and speeds that could have generated sensed bearings

Simultaneous consideration of multiple goals

Navigation goals
- Avoid waterspace boundary
- Transition to new area
- Waypoints

Mission objective goals
- Go to surface
- Go to depth
- Collect data
- Station keep
- Communicate

Contact management goals
- Maintain contact outside range
- Resolve contact
- Update solution

Maneuver
- Turn to course
- Maintain speed

Even if a maneuver must occur to support a specific goal, that maneuver needs to consider constraints from multiple goals

Maneuver must consider simultaneous goals

- In isolation, decisions relatively simple
- Consider constraints from other relevant goals
- Resolve conflicting cases
  - Prioritize
  - Acceptance of more risk
- Possible use of alternative resolution techniques
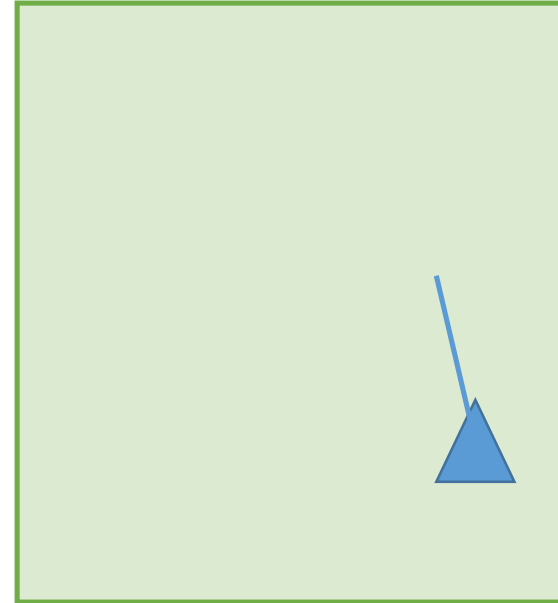
Representation of goals

- Current agent executes navigation plan using complex operators
  - Agent design performed before understanding of importance of contact management
  - Have created top-state goals maintained using ad hoc system
- Consider use of New Goal System

Summary

- Nuggets
  - Interesting problem space with decisions that can take advantage of Soar's strengths
  - Many decisions may be correct: explanations help a decision to be considered acceptable

- Coal
  - Initial agent design performed with incomplete understanding of problem