A Hybrid Architecture for Robotic Soccer

Iain Wallace

What is it?

- My masters project.
- A control architecture for collaborative agents (robots).
- Based on reactive behaviours, and classical planning.
- Combines simple, efficient behaviours with complex team-level plans.

Why Robotic Soccer?

- A (relatively) simple application
  - All robots can do is move or kick
  - A simple world to move in - rectangular pitch, 2 goals
  - Limited number of agents (5 per team)
- Quantity of existing work (Robocup has run since 1997)
- Existing simulator

Reactive Behaviours

- Simple method to create “intelligent” behaviour.
- Agents react to the environment
- Behaviour defined by percept/action pairs
- Combinations of simple rules give rise to more complex emergent behaviours

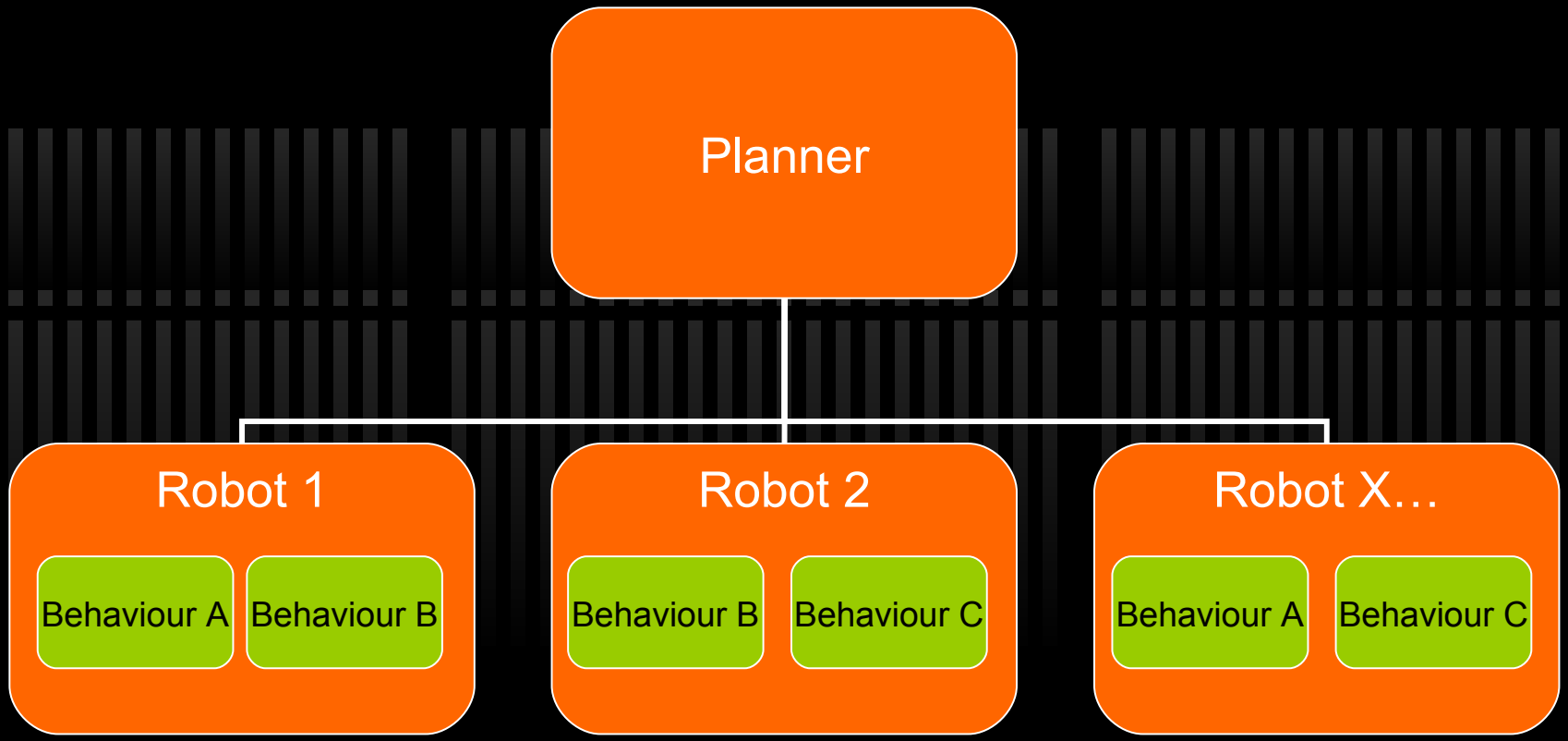
Planning

- A planner has several representations
  - **Actions** – have pre-conditions and post-conditions
  - **States** – A description of the world. Actions applied to states lead to successor states
  - **Goals** – A test to apply to a state.
  - **Plans** – a sequence of actions.

Problems….

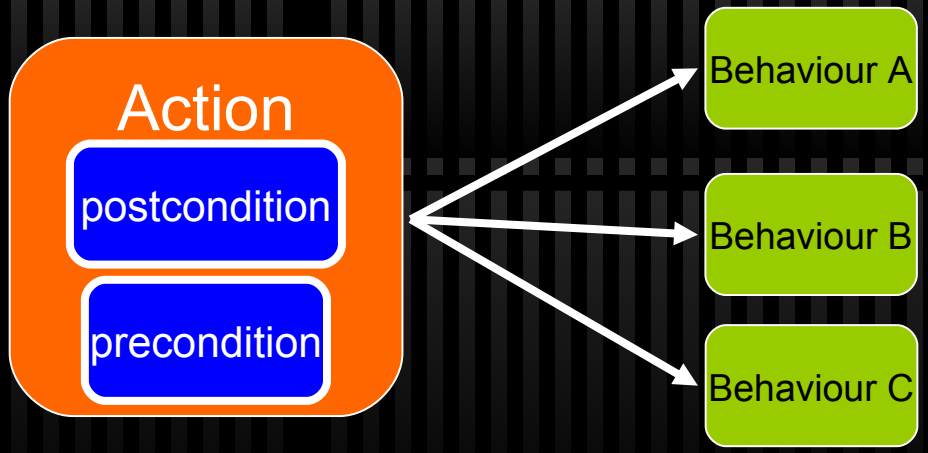
- Reactive behaviours quickly get complicated and expensive.
- Plans take time to create, can’t deal with the unexpected

A Solution? - Overall View

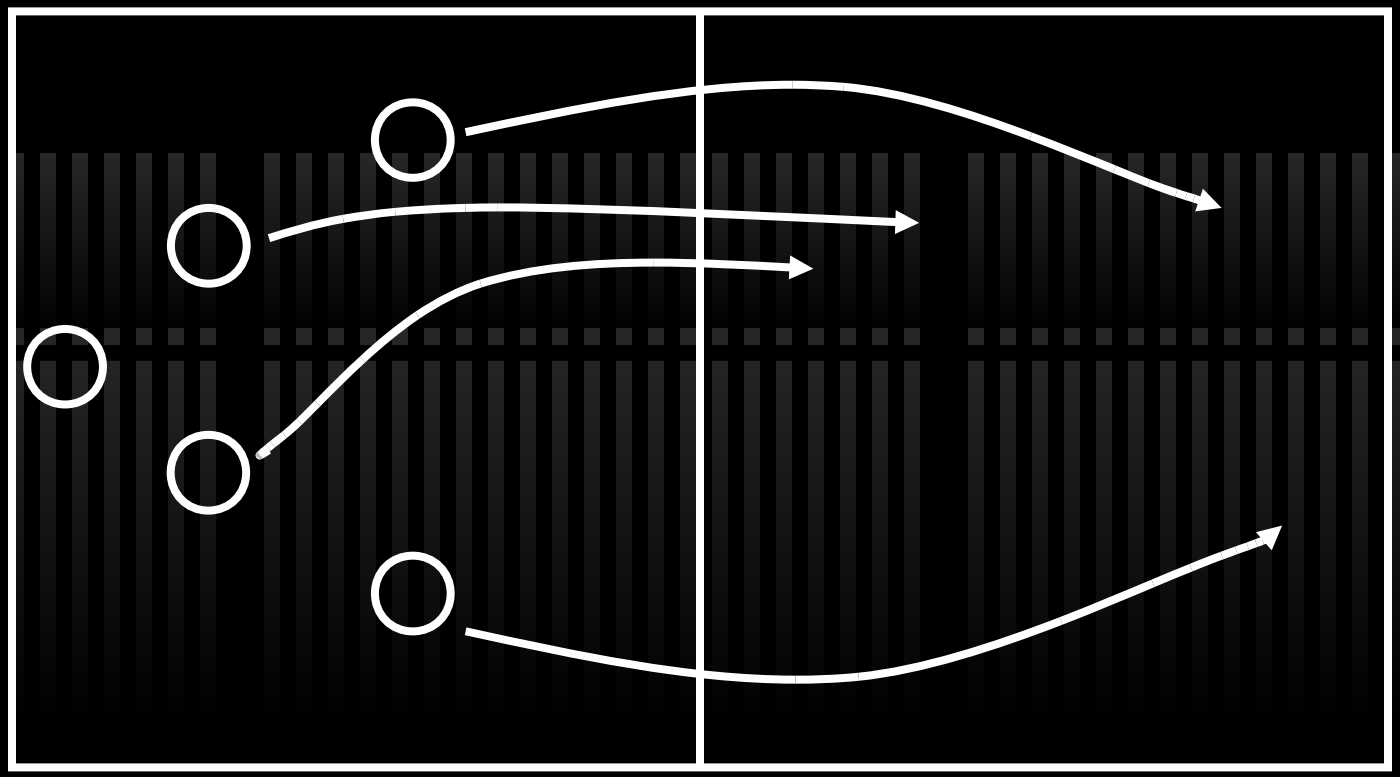


Overall View Continued…

- Plan actions map to simple sets of behaviours
- A plan is a sequence of behaviour changes for each robot.
- Consider a football coach planning a match…



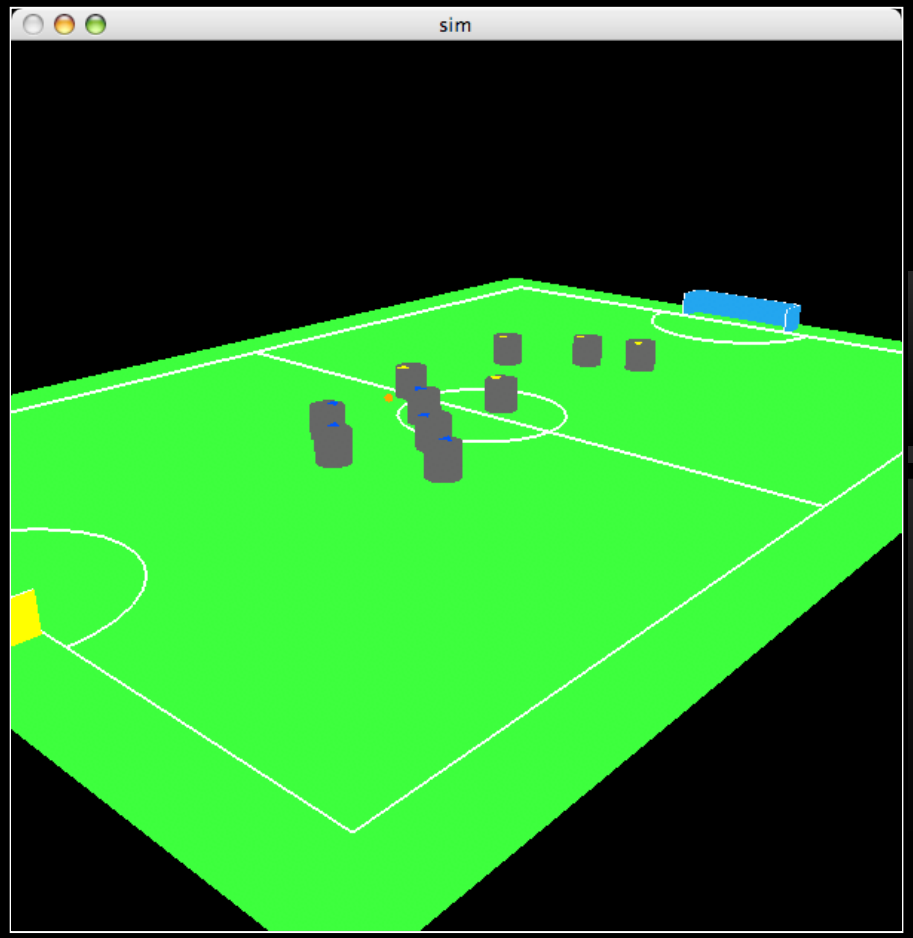
The Plan



Overall plan, but players carry it out autonomously, reacting to the opposition.

Implementation

- ✓ C++/OpenGL/ODE simulator
- ✓ OpenSteer library for behaviours
- ✓ GraphPlan, STRIPS based planner.



Any Questions?