Software structure

marks an object

Simulation Environment

State

sea
wind
Water currents
waves

obstacles

ship1 (internal)

ship1 (external)

ShipAgents

agent1

world model
decision making strategy

agent2

world model
decision making strategy

agent3

world model
decision making strategy
Software Structure – cont. (Zooming in)

A ship doesn’t know its “external state” and therefore it is not part of the ship object.

Internal state of the ship, like rudder angle, engine speed...

External state of the ship, with respect to the outside world.
Computation Flow

1. Get percepts from ship
2. Agent processes the percepts and updates its belief state about the world
3. Agent decides on action to take based on its current world model and its decision strategy
4. Action is executed and ship's internal state is changed, e.g., rudder angle increased
5. Compute spontaneous change in the environment and the new external ship state

Start

Happens in parallel for all ships
Software Extensibility

Any subset of: \{Radar, sonar, optical, gps, ...\} → Ship perception capabilities

Any subset of: \{Kalman filter, particle filter, ...\} → Agent process-percepts algorithm

Deterministic, Probabilistic, ... → Agent world modeling

Learning agent, multi-agent coordination, ... → Agent decision-making algorithm

Any subset of: \{Rudder, engine, ...\} → Ship actuators

Mass, drag, response to wind, currents, waves, ... → Ship physical properties

Can easily plug-out and replace each component of the flow