AIsHockey—A Platform for Studying Synthetic Players

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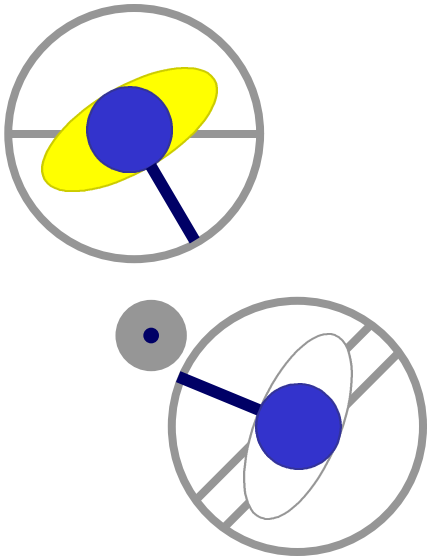
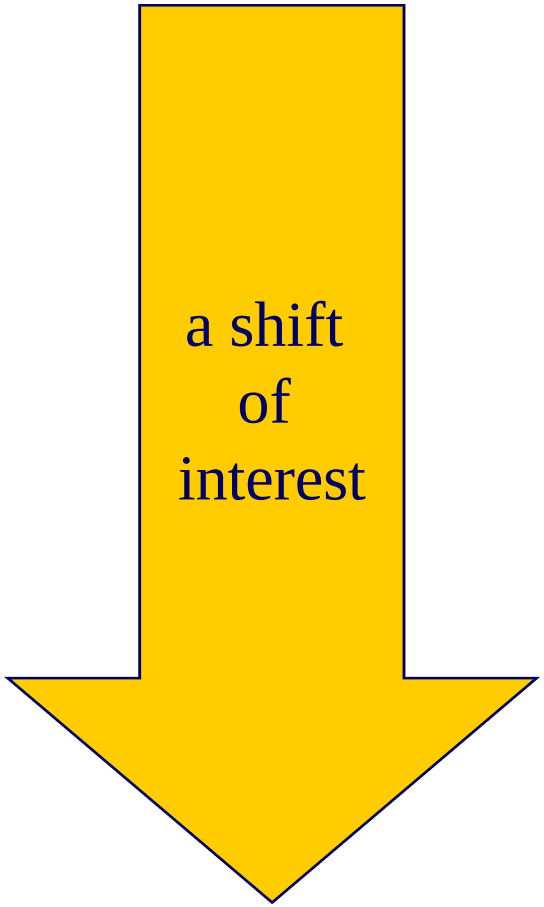
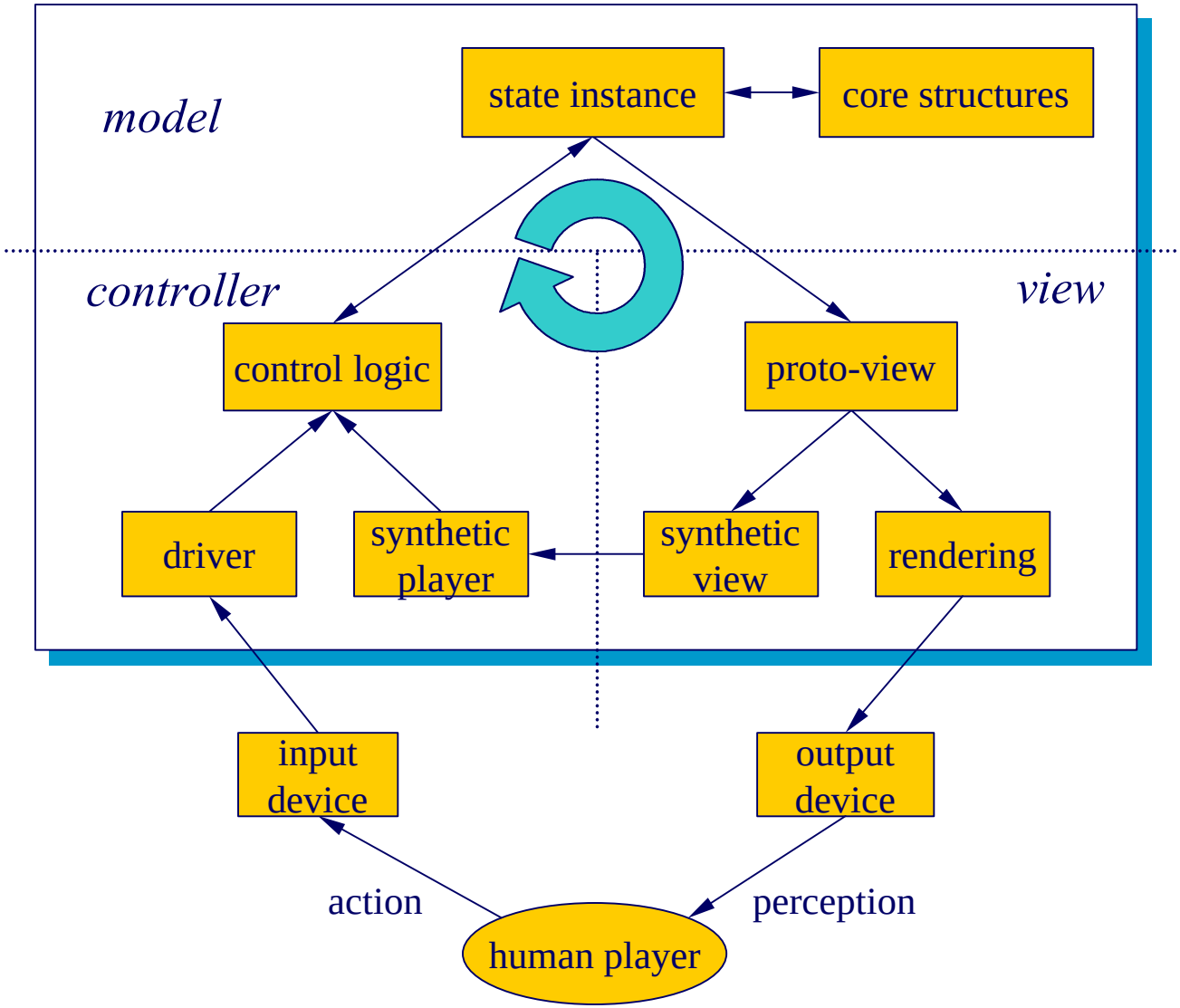


Algorithmic Problems in Computer Games

- graphics and audio
  - 3D rendering
  - camera movements
  - adaptive audio
- simulation and modeling
  - game engines
- multiplayer networking
  - protocols and security
  - resource distribution
- artificial intelligence (AI)
  - computer-controlled actors



Model-View-Controller

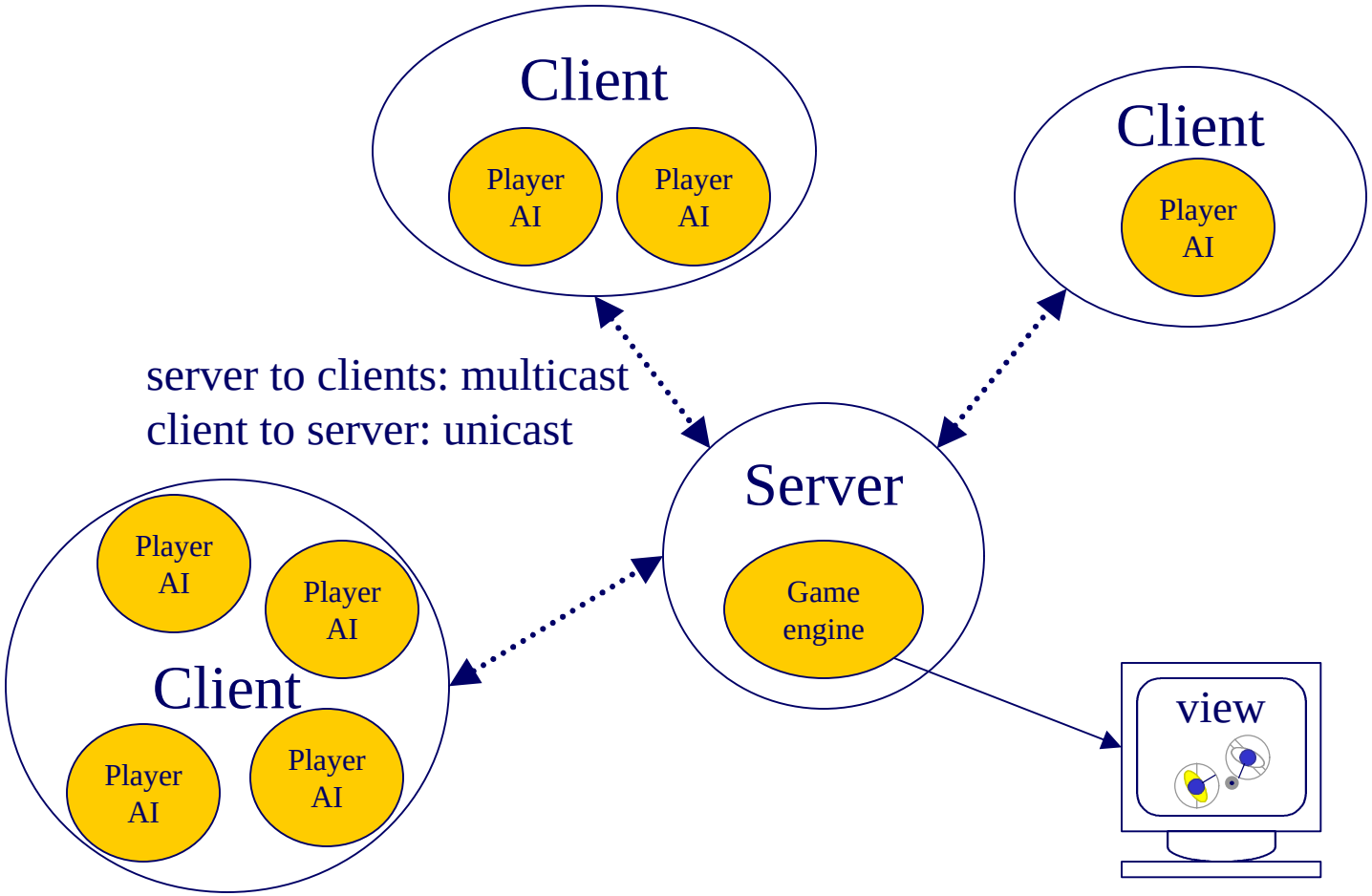


What Is AIsHockey?

- simplified ice hockey:
  - official IIHF rules
  - real-world measurements
  - Newtonian physics engine
- distributed system
  - client/server architecture

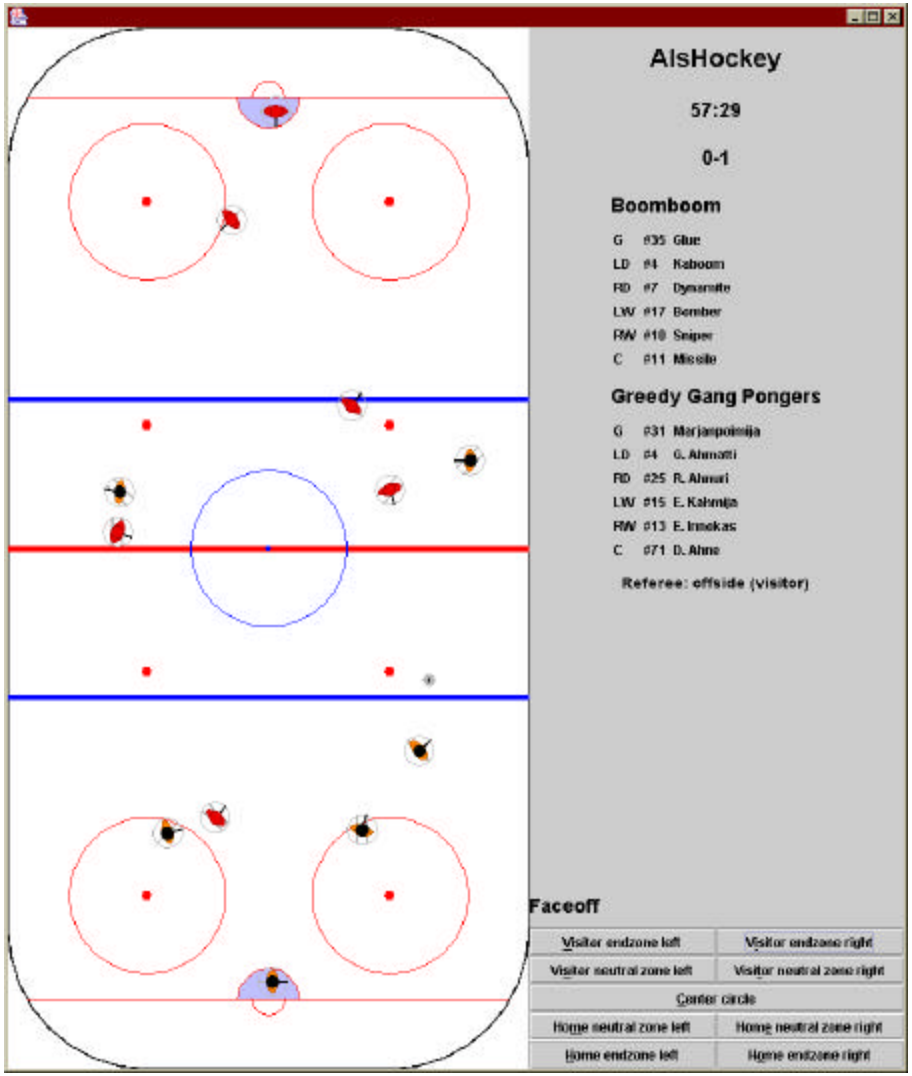
- the challenge: implement a collaborating team of autonomous, real-time synthetic players

Client/Server Architecture

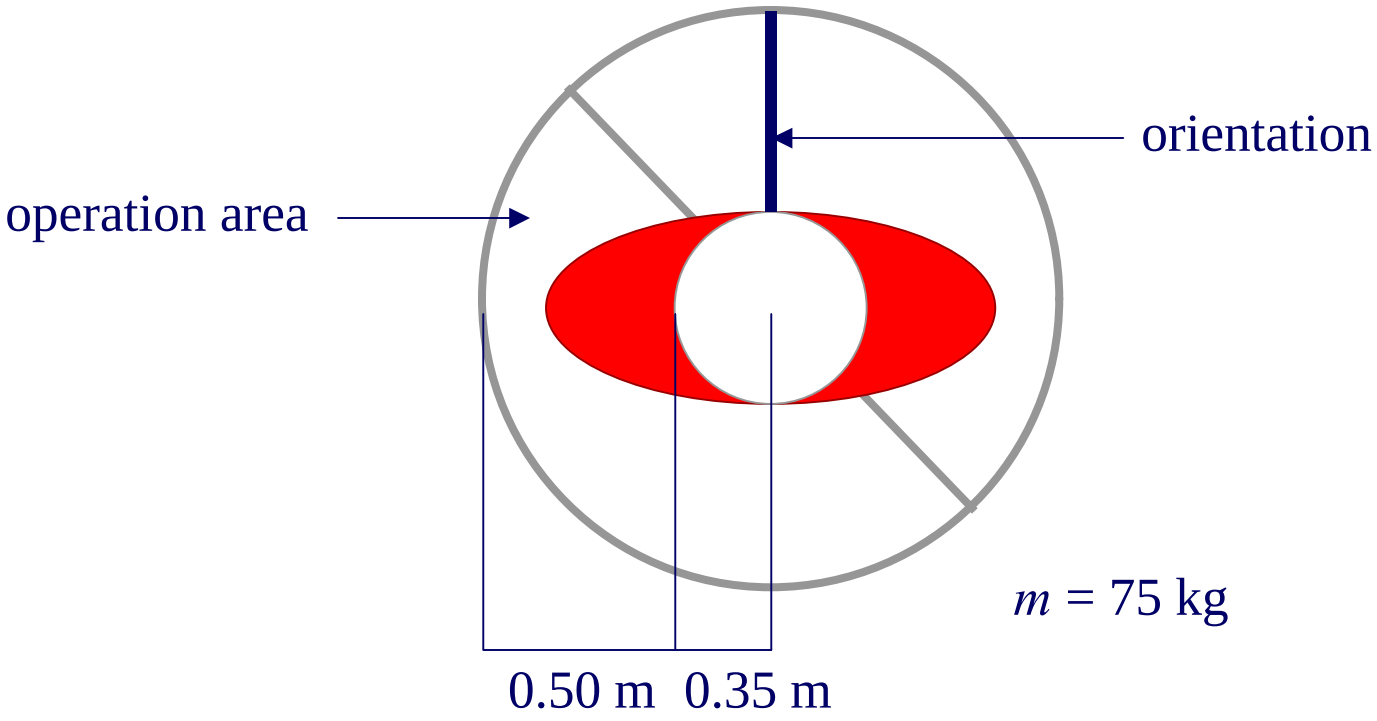


AIsHockey Platform

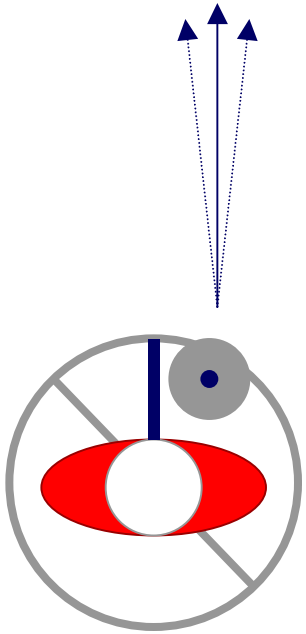
- implemented with Java
- synthetic player is an instance of a class
  - inherits methods for receiving and sending data
  - runs on own thread
- team is a collection of synthetic players
  - defined in an initialization file
  - teams can be distributed



Player's Attributes



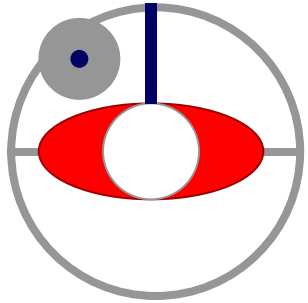
Player's Methods 1(3)



shoot(p)

0.0 <= p <= 1.0

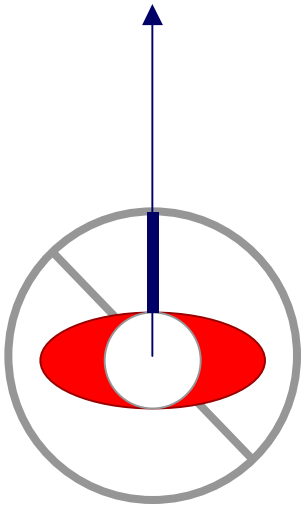
keepPuck()



Player's Methods 2(3)

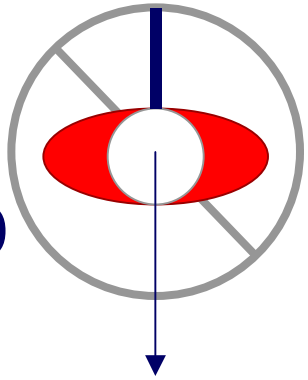
dash(p)

0.0 <= p <= 1.0



brake(p)

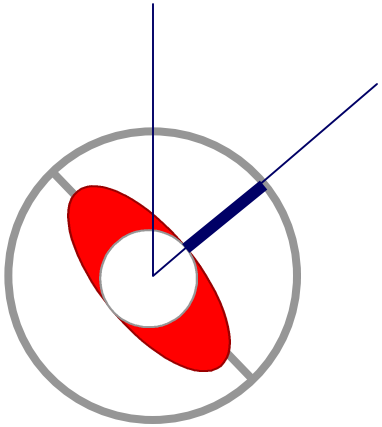
0.0 <= p <= 1.0



Player's Methods 3(3)

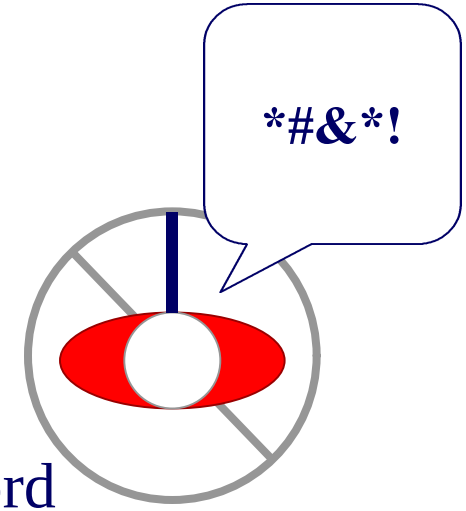
`head(a)`

`a` = angle in radians



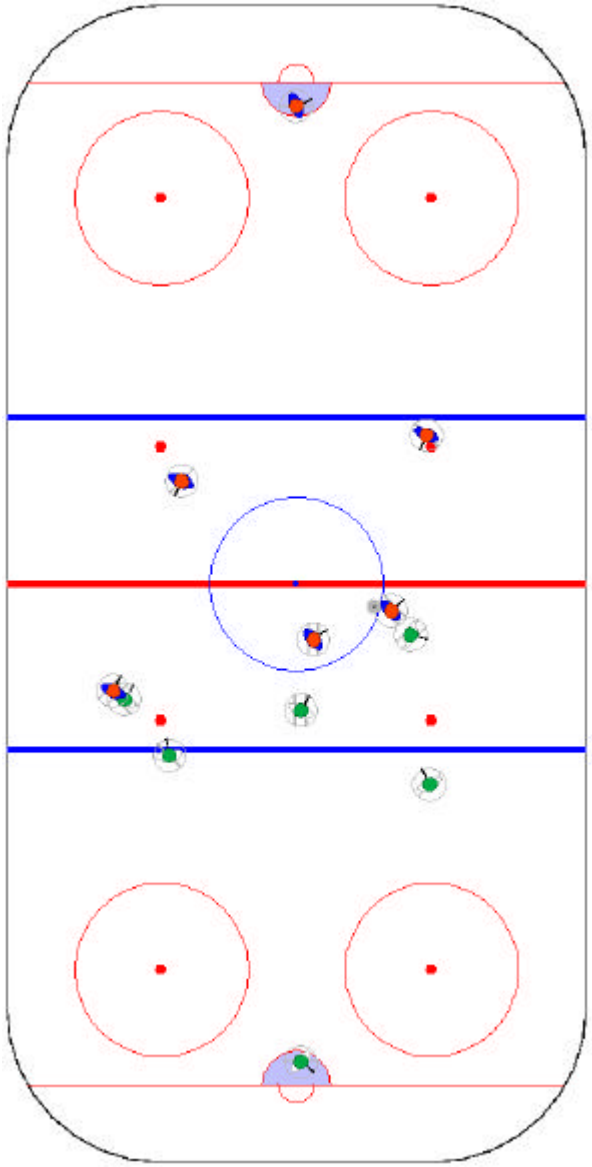
`say(m)`

`m` = 64-bit long word



Player's Perception

- players
  - position
  - orientation
  - message
- puck
  - position
- auxiliary methods
- constants
  - measurements of the rink



Example: MyAI.java

```
import fi.utu.cs.hockey.ai.*;

public class MyAI
                    extends AI implements Constants {
    public void react() {
        if (isPuckWithinReach())  {
            head(headingTo(0.0, THEIR_GOAL_LINE));
            brake(0.5);
            shoot(1.0);
            say(1050L);
        } else {
            head(headingTo(puck()));
            dash(1.0);
}   }   }
```

Key Questions

- how to achieve real-time response?
- how to distribute the synthetic players in a network?
- how autonomous the synthetic players should be?
- how to communicate with other synthetic players?

Observations

- educational tool
  - strategic, tactical and operational level decision making
  - software design
  - algorithm implementations
- AI programming as a game
  - game within a game
  - human player coaching synthetic players
  - engaging and entertaining

Try It Out!

- platform and teams are publicly available:
  `http://staff.cs.utu.fi/staff/jouni.smed/aishockey`