AlsHockey—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
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

server to clients: multicast
client to server: unicast
AlsHockey 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

$\text{operation area}$

$m = 75 \text{ kg}$

0.50 m 0.35 m
Player’s Methods 1(3)

\[
\begin{align*}
\text{shoot}(p) & \quad 0.0 \leq p \leq 1.0 \\
\text{keepPuck}() &
\end{align*}
\]
Player’s Methods 2(3)

dash(p)
0.0 \leq p \leq 1.0

brake(p)
0.0 \leq p \leq 1.0
Player’s Methods 3(3)

head(a)

\[ a = \text{angle in radians} \]

say(m)

\[ m = 64\text{-bit long word} \]
Player’s Perception

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