

ORTS – An Open Source RTS Game Engine

Michael Buro



GAMES Group
University of Alberta

(**G**ame-playing, **A**nalytical methods, **M**inimax search and **E**mpirical **S**tudies)

Joint work with Timothy Furtak and many others

April 28, 2006

- **Fast-paced** video games modeling small-scale warfare
- Players
 - ▶ build economy and military infrastructure
 - ▶ struggle over **resources** located on a 2d playing field
 - ▶ have to wipe out opponents to win
- **Limited vision** (“Fog of War”)
- usually ≈ 10 simulation steps per second

Million-sellers: **Warcraft**, **C&C**, **Age of Empires** ...

ortsg Screenshot



AI Challenges!

- Large number of simultaneous actions with local effects \Rightarrow need for **abstraction**
- Imperfect information \Rightarrow need to maintain beliefs
- Current AI systems for RTS games do not
reason, **plan**, nor **learn**
- Human players better than machines at macro level

Why not ...

- Choose a popular commercial RTS game,
- hook up remote AI software,
- and organise tournaments?

Problems!

Solution:



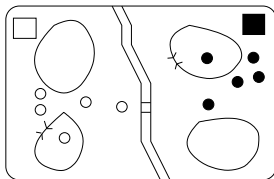
An Open Source RTS Game Engine

How ORTS relates to commercial RTS games

Feature	Commercial RTS Games	ORTS
Game Specification	fixed	user-definable
Network Architecture	peer-to-peer	server-client
Network Data Rate	low	low to medium
Prone to Map-Revealing Hacks	yes	no
Communication Protocol	veiled	open
Unit Control	high-level, sequential	low-level, parallel
Game Interface	fixed GUI	user-definable
License	closed software	open software (GPL)

ORTS Server-Client Operation

RTS Game Server



Terrain Features:
water, ground, plateaus, ramps

Object Types:
submerged, on water, on land, in air

High Resolution Object Motion

Fast Collision Test

View Obstruction by Plateaus

Simulation Rate: 25 updates/sec, 1000 objects, Athlon 1GHz

Differential View Computation + Compression/Action Decompression

TCP/IP

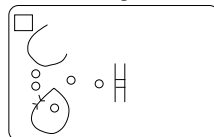
...

TCP/IP

...

RTS Game Client

View Decompr./Action Compression

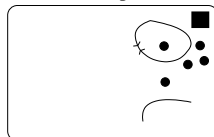


GUI

AI
plugins

RTS Game Client

View Decompr./Action Compression



GUI

AI
plugins

Long-Term Project Goals

- Create RTS game AI system that **defeats humans at macro level**, but does not cheat!
- Provide decision support for human players integrated in GUI

Short-Term Project Goals

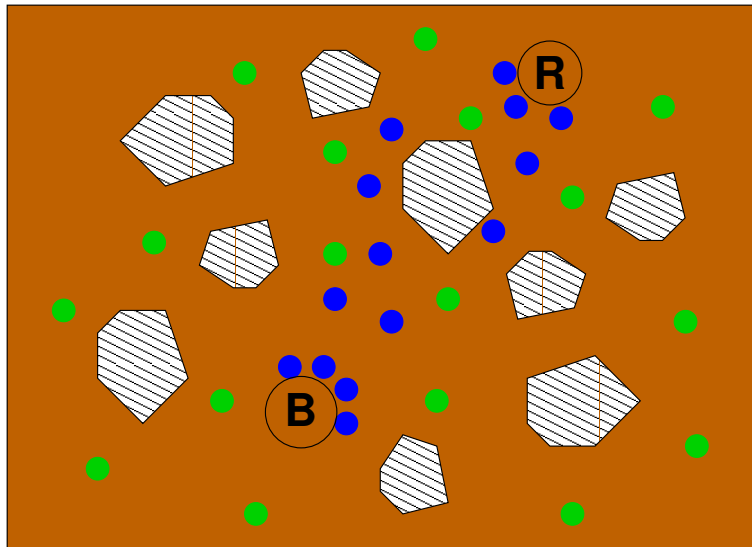
- Spark interest in RTS games among AI researchers
- Organize RTS game **AI competitions**
- Advance **real-time planning** state-of-the-art
- Create a standard ORTS game that people enjoy playing

- Graphics
 - ▶ animation, particle effects, LoD, ...
- Standard ORTS Game
 - ▶ Three Races
 - ▶ **Random Map** Generation
 - ▶ Internet ORTS Server **ORTS.NET**
- AI
 - ▶ Single-agent planning: **pathfinding**, **build orders**
 - ▶ Multi-agent planning: **small-scale combat**, **group coordination**
 - ▶ Terrain analysis

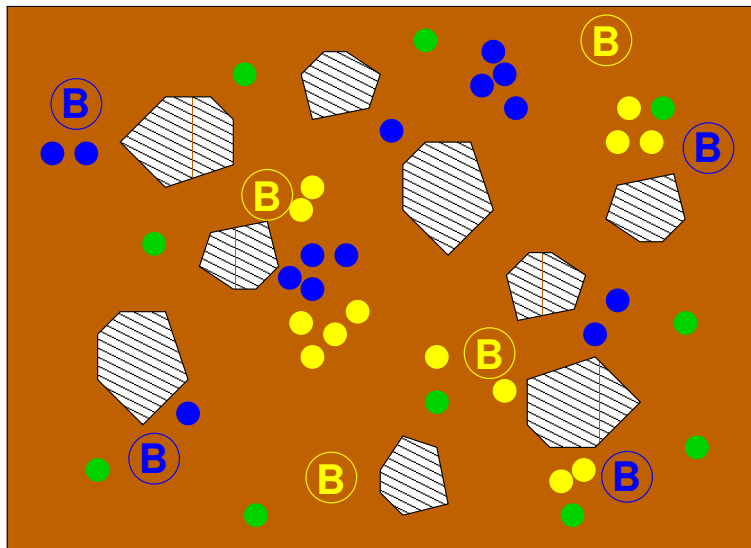
First RTS Game AI Competition

- Planned for AIIDE June 20-23, 2006
- Based on ORTS
- **Three Categories**
- Call for participation will be sent out shortly
- Download ORTS software and competition documentation at
`www.cs.ualberta.ca/~mburo/orts`

Game 1: Cooperative Pathfinding in Dynamic Environments



Game 2: Tank Combat



Game 3: Simplified RTS Game

