ORTS

A Hack-Free RTS Game Toolkit

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RTDS-Meeting Oct/25/2002

Outline

- RTS Games
- Issues and Benefits of Server-Side Simulation
- Experiments
- ORTS
- Plans for ORTS-2
- Demo

Real-Time Strategy (RTS) Games

- Players build and command armies
- Real-time object motion on 2D/2.5D battlefield
- Imperfect information ("Fog of War")
- Realistic terrain features
- Resources
- Technology trees

+ Fancy graphics = Million sellers

WarCraft, StarCraft, C&C, Age of Empires ...

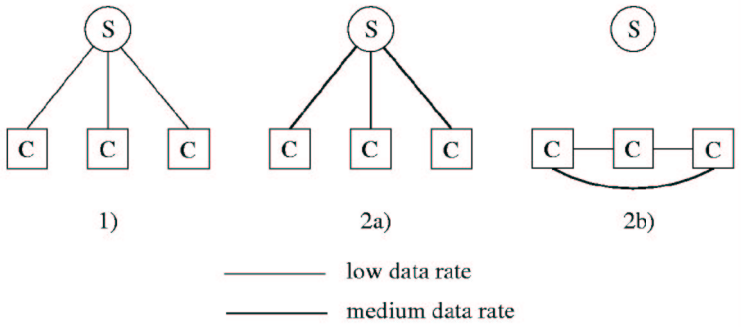
A Typical RTS Game

StarCraft (tm)

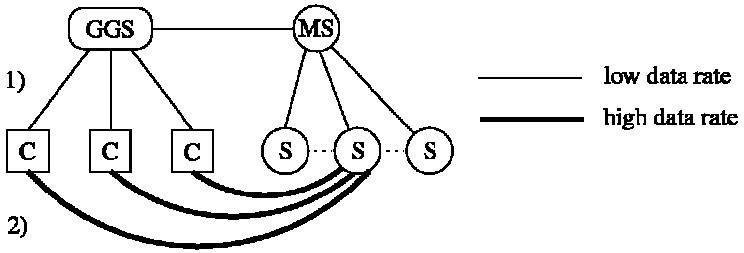
RTS Game Wish List

- Multiple-view GUIs
- Public AI interfaces
- RTS programming toolbox
- Sophisticated distributed game AI
- Competition on server
- Hack-free client software

Client-Side Game Simulation



Server-Side Game Simulation



Server-Side Simulation Benefits

- **Client hacks useless. Fair competition!**
- All unit commands are generated in clients
- Users can roll their own client software
  - GUIs with multiple views, resolutions etc.
  - Low-level unit behavior (a la Quake's AimBots)
  - RTS AI competition

Server-Side Simulation Issues

- Large amount of downstream data
  ~ Θ(#visible objects)
- Can the server be trusted?

Compression

Many object attributes vary slowly ->
Send compressed incremental updates

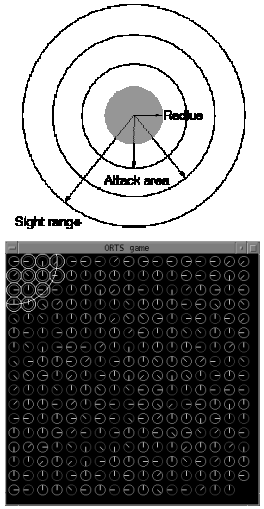
v = (hitpoints, posx, posy)

V(t) = (35,10,10; 20,8,8) **2 Objects**
V(t-1)= (30, 8, 10; 20,8,5)

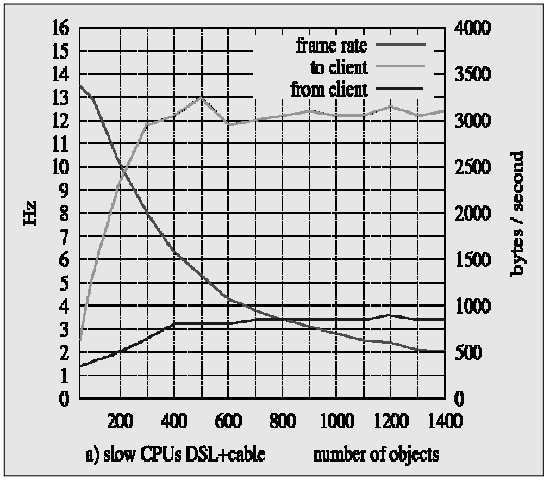
D(t)= V(t)-V(t-1) = **(5,2,0; 0,0,3)**

Experimental Setup

- Square playing field (800x800)
- Up to 1400 moving circles:
  - Radius 8, Speed 4
  - Sight range 60
  - Random motion, no attacks
- Initially located on a grid
- Random colors
- 80ms ping time, DSL+Cable



Simulation Results



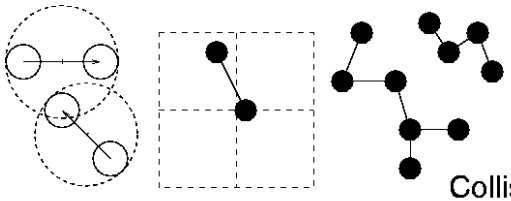
Observations

- **Modest data rate after compression:**
  - 1.2 bytes/frame/#visible-objects downstream
  - 0.6 bytes/frame/#own-objects upstream
- With more than **400 objects** transfer rates stay flat @ **3KB/sec down** and **1KB/sec up**
- Latency caused by (de-)compression and data transmission
- **475 visible moving objects @ 5 Hz** over DSL/Cable

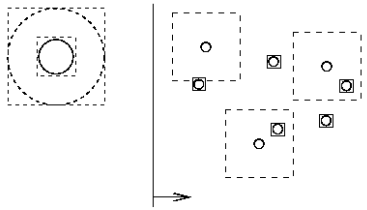
Open RTS Game Toolkit

- 2D battle simulation
- **Server-side** simulation **– no client hacks**
- C++ classes for
  - fast 2D **object collision** and **view computation**
  - **efficient** server-client data **transmission**
  - **GGS** connection
- Free software (GPL)
- Download at www.cs.ualberta.ca/~mburo

Algorithms



Collision Test

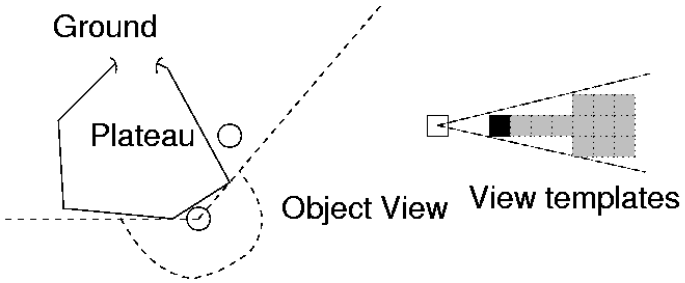


Visibility (no obstruction)

Plans for ORTS-2

- Terrain layers
  - **in air**
  - **on plateau**
  - **on ground**
  - **on water**
  - **under water**
- View obstruction
  - only by elevation
  - partly implemented (sectors, view templates)
- Implement platform independent GUI with AI interface (SDL, Kylix, Qt?)

View Obstruction



Player Views