The landscape of open source game software

Jim Whitehead
ejw@cs.ucsc.edu
Creating a computer game

- **Game software**
  - User interface, animations, artificial intelligence, networking, collision detection, physics simulation, playback of audio and video, game controller input, game rules, etc.

- **Game content**
  - Artwork for all avatars, in-world items, music, audio effects, user interface elements, level designs, etc.

- Each represents about half of the effort of a typical game

Scenes from Yo Frankie! A Blender-based platformer.
http://www.yofrankie.org/
Challenges for open source games

• Computer games have a short lifespan
  ► Period of maximum interest within a year or two of initial release
  ► Rapid decline in interest thereafter for most games
  ► Graphics become dated quickly

• Challenges
  ► Takes a long time to make a game
  ► Art assets that seemed good at the start seem dated by the end
  ► May need to redo artwork

Scenes from 0 A.D., a real-time strategy game under development since 2001. http://os.wildfiregames.com/
Challenges for open source games (2)

• Single-player games tend to be play-and-forget experiences.
  ► Play for 5-20 hours
  ► Once done, move on to another game

• Challenges
  ► Hard to develop long-term development community around such a game
  ► Little incentive for users to work to perfect the game experience

Open source software and games

- Middleware
  - Graphics libraries, audio libraries, game engines, physics engines
- Content creation tools
  - 2d artwork, 3d artwork
- Game creation tools
  - Game creators, interactive fiction authoring
- Popular game genres
  - First person shooter
  - Real-time strategy
  - Turn-based strategy
- Will talk about each of these on following slides

Images from Glest, an real-time strategy game glest.org
Open source middleware: Libraries

• Simple Directmedia Layer
  ► Cross-platform graphics library
  ► Sits on top of openGL, DirectX
  ► www.libsdl.org

• OpenAL
  ► Cross-platform audio library
  ► connect.creativelabs.com/openal/

• Mesa 3D
  ► Open source openGL implementation
  ► www.mesa3d.org
Open source middleware: engines

- A *game engine* provides:
  - 3D scene rendering
  - 3D collision detection
  - 3D model rendering and animation
    - A challenge due to existence of multiple 3D object formats
  - Lighting
  - Scripting of game events
  - Particle effects
Open source middleware: engines (2)

- Major open source game engines
  - Ogre
    - www.ogre3d.org
  - Irrlicht
    - irrlicht.sourceforge.net
  - Many others
    - Key points of comparison are scene rendering efficiency, types of collision detection, documentation, and number of model formats handled.

*Video showing major Ogre features*
http://www.youtube.com/watch?v=woHZRUIOQqo
Open source middleware: physics engines

- **A physics engine provides:**
  - Multi-body physics simulation
    - Mass, acceleration, velocity, friction, wind resistance, rotational dynamics
    - Sometimes fluid simulations
  - Collision detection
  - Can be 2D or 3D

Mousetrap game using bullet physics engine
Open source middleware: physics engines (2)

- Major open source physics engines
  - Bullet physics
    - bulletphysics.org/wordpress/
    - Used in many commercial games
    - 3rd most commonly used physics engine in games industry
    - Integrated in Blender
  - Tokamak physics
    - www.tokamakphysics.com/
    - Video showing Bullet Physics used within Blender

http://www.youtube.com/watch?v=WGF8UhBaeLc&feature=fvw
Content creation tools

• 2D content creation
  ▶ GIMP
    • Bitmap image editor, photo editing
    • www.gimp.org/

• 3D content creation
  ▶ Blender
    • 3d modeling, raytracing, animation, shaders, particle systems, lighting, water simulations, 3d game engine
    • www.blender.org
    • Used to make Elephant’s Dream, first open source animated movie
    • Video demo of game engine features at:
      • www.blender.org/features-gallery/feature-videos/?video=game_engine_one
Game Creation Tools

- Allow creation of games without substantial programming knowledge
  - Typically property-sheet based
- Platinum Arts Sandbox
  - sandboxgamemake.com/
- Construct Game Maker
  - www.scirra.com/info.php
- Game Editor
  - game-editor.com
  - Video feature demo at above link
- Novashell
  - www.rtsoft.com/novashell/
Other creation tools

- Interactive fiction authoring
  - Create games like Zork, Infocom series
  - Inform7
    - inform7.com/
    - Partially open source
    - Very rich authoring environment for IF
  - Games run in a Zmachine
    - Frotz (frotz.sourceforge.net/)

- Context Free Art
  - Generate artwork via a grammar
  - Simple grammars generate beautiful artwork
  - www.contextfreeart.org/

Oozescape by momo
www.contextfreeart.org/gallery/view.php?id=122
Open source graphics content

- **OpenGameArt**
  - 2D, 3D, audio
  - Artwork tagged with license terms
  - www.opengameart.org

- **NewGrounds**
  - Artwork, music
  - Ability to associate creative commons license
  - Huge site, tons of content
  - www.newgrounds.com

- **NASA Archives**
  - Public domain

- **Turbosquid**
  - Mixed commercial and gratis 3d models
  - Not truly free, no derivatives
  - www.turbosquid.com/

---

OpenGameArt pixel art

NASA Archives

Dim the lights
Dark Cloud 2
Maximilian (Uris), Monica Raybrandt and the Ridepod
Open source content challenges

• Many sites offer free content
• Very few offer ability to tag contents with Creative Commons license
• Some sites have no license terms
• Others have one-off licenses
  ► These typically do not permit derivative works
  ► Example: Google 3D Warehouse
• Consistent artwork
  ► Even when art is available with good license, may not have enough artwork for all aspects of your game

Catedral de Toledo
by Salva Castaño Pilonga
sketchup.google.com/3dwarehouse/details?mid=306af56acb7bb00396e492129c03c787&prevstart=0
Popular open source game styles

- Real-time strategy (RTS), Turn-based strategy and First-Person Shooter (FPS) deathmatch games
  - Games offer multi-year appeal
  - Tend to be multi-player, so human opponents provide continual source of challenge
  - Graphics can be a few years behind the curve, and game still provides strong entertainment
  - Provides incentive for creation of multi-year development communities
  - Online player communities provide positive social feedback to developers

FreeCiv
freeciv.wikia.com/wiki/Main_Page

Battle for Wesnoth
www.wesnoth.org
Summary

- Rich set of open source content creation and middleware tools
- Best middleware is professional grade
- Content creation tools 1-3 years behind pros
  - Still quite excellent
- Huge numbers of open source games
  - Most are libre and gratis
  - Very few examples of libre and for sale
  - Games tend to be reimplementations of existing game concepts, innovation at edges
  - In general, many labors of love, few for-profit
- Libre content lags libre software for games
  - Few examples of professional grade libre artwork