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

Frets on Fire,
http://fretsonfire.sourceforge.net

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
www.blendernation.com/wp-content/uploads/2007/01/mousetrap_30.jpg

- # 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

Figure 10 **popular libraries**

PHYSICS

NVIDIA PHYSX	26.8%
HAVOK PHYSICS	22.7%
BULLET	10.3%
OPEN DYNAMICS ENGINE (ODE)	4.1%

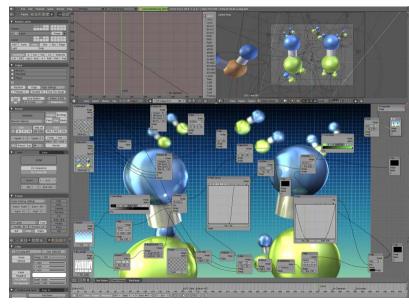# Content creation tools

- **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
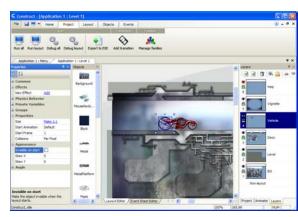

GIMP screenshot

Blender screenshot

Game Creation Tools

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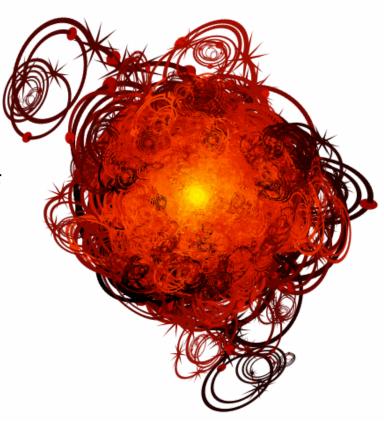- Novashell
  - ▶ www.rtsoft.com/novashell/

Image from a graphics demo using Sandbox
moukotiger.googlepages.com/sandbox

Screenshot of Construct Game Maker

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
  - ► www.nasa.gov/multimedia/3d_resources/3d-models-gallery-collection_archive_1.html
  - ► Public domain
- Turbosquid
  - ► Mixed commercial and gratis 3d models
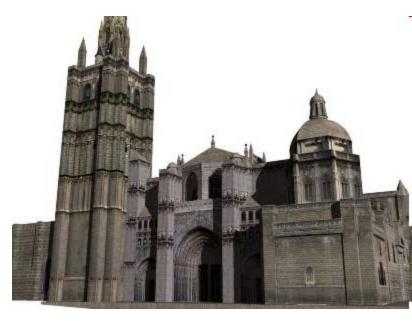 - ► Not truly free, no derivatives
  - ► www.turbosquid.com/

NASA Archives

Dim the lights
Dark Cloud 2
Maximilian (Uris), Monica Raybrandt and the Ridepod
www.newgrounds.com/art/view/jinndevil/dark-cloud-2

OpenGameArt pixel art

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 Castaña Pilonga

sketchup.google.com/3dwarehouse/details?mid=306a
f56acb7bb00396e492129c03c787&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