Experimental Game Technologies

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Agenda

• HW1 Updates / Questions?

• Practicalities
  – Recording Videos
  – Creating Webpages

• Finishing our bridge game
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Recording Videos

• The hard highest quality way
  – Low level OpenGL calls
OpenGL – Saving Output

- `glReadPixels()` – will save the target OpenGL buffer to an array
- `glReadBuffer()` – choose which array to read

```c
bufSize = 3*width*height #size of data
glReadBuffer(GL_BACK);
glReadPixels(0, 0, width, height,
             GL_RGB, GL_UNSIGNED_BYTE, image)
```
Array to Image

• Write array to file, in known image format

• Ex: ppm
  – Magic number, \n, width height, \n, 255, \n  – List of all pixel values (0-254) in reading order

```python
f = open('dump/image%04d.ppm'%counter,'wb')
f.write("P6
{0} {1}
255
".format(width,height))

for j in reversed(range(height)):
    for i in range(width):
        f.write(chr(image[3*j*width+3*i+0]))
        f.write(chr(image[3*j*width+3*i+1]))
        f.write(chr(image[3*j*width+3*i+2]))

f.close()
```
Image to Video

• **ffmpeg** – command line tool for video encoding
  – ffmpeg -i input_video output_video

• Input can be image sequence
  ```
  ffmpeg -i image%04d.ppm video.mpg
  ```

• Framerate can be specified explicitly
  ```
  ffmpeg -i image%04d.ppm -r 20 video.mpg
  ```

• Bitrate can be controlled to reduce file size
  ```
  ffmpeg -i image%04d.ppm -vb 1M video.mpg
  ```
  ```
  ffmpeg -i image%04d.ppm -vb -sameq video.mpg
  ```
Low Level Frame Saving

• Good:
  – Generates the smoothest possible video
  – Full control

• Bad:
  – Hard to get up and running
  – Many steps (OpenGL ➔ PPM ➔ PNG ➔ Video)

• Ugly:
  – You must manually set the timestep!!
  – You need to provide fake user interactions
Recording Videos

• The hard highest quality way
  – Low level OpenGL calls

• The much easier way
  – 3rd party screen recording
Video Recording

• Fraps:
  – 30s limit on free version, must be installed

• VLC – OpenSource, Portable Versions
  – Has Screen Capture capabilities
  – Get the latest version (>= 2.1.0)
  – Set source to “screen://”

[Image of VLC interface with Source set to screen://]
Open Broadcast Software

• Free, open source full screen recording
CamStudio

- Free, Open source, Windows Only
3rd Party Screen Recorders

- **Good:**
  - Very easy to use
  - Lets you interact with your game in real time

- **Bad:**
  - Uses a lot of processing power
  - Slows down your game

- **Ugly:**
  - Many distort the colors, or record in poor quality
Recording Videos

• The hard highest quality way
  – Low level OpenGL calls

• The much easier way
  – 3rd party screen recording

• The quick & dirty way
  – Point your cell phone at the computer screen
Tutorial

• 1) Take phone
• 2) Point at screen
• 3) Press record
External Cameras

• Good:
  – Very easy to use
  – Lets you interact with your game in real time
  – No extra processing slowing down your game

• Bad:
  – Many phones give you little control over video quality

• Ugly:
  – Can look very unprofessional
  – Using a tripod & cropping the video can help
Sharing a Video

• Post a link to your webpage
  – Try to choose a common format/codec

• Post video to youtube
  – Easily integrates with any webpage & mobile
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Creating a Google Site - 1
Creating a Google Site - 2
Creating a Google Site - 3

Make this unique!

It can never be used again!
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Processing 101

• What is setup()? What is draw()?  
• What does P3D do?

```java
void setup() {
  size(400, 400, P3D);
  surface.setTitle("Bridge Creator");

  //restartGame();
  newBall();
}
```
Animation 101

• Why separate update() from draw()?  

• How to detect and handle collisions?  
  – Check if object is in colliding state  
  – Remove object from colliding state  
  – Adjust velocity

```cpp
if (cx[i] + r[i] > sizeW){  //Q: Why add radius?
    cx[i] = sizeW - r[i]; //Q: Why sub radius?
    vx[i] *= -1*random(.95,1.1);
}
```
Design so far

• How does setting the velocity for a new ball work? Why?

```c
vx[numB] = random(15,35);
if (random(1) < .5) vx[numB] *= -1;
vy[numB] = random(15,35);
if (random(1) < .5) vy[numB] *= -1;
```
Smooth Animation

• Q: Why is the ball’s motion non smooth and occasionally stuttery?

• How could we fix this?
Detecting Win State

• How can we detect if the game is won?
• Design an algorithm:
  – Does it work in all cases?
  – How efficient is it? (Big O?)
Adding a lose state

• The possibility of losing will make it feel much more like a game!

• Ideas:
  – Limit number of balls
  – Limit total time
  – Limit both
  – ???
Feedback to User

• Text is an quick mode of feedback
  – Easy to add in Processing/Unity
  – Rather a pain in direct OpenGL

PFont winFont;

void setup() {
  size(400, 400, P3D);
  surface.setTitle("Bridge Creator");

  // Arial, 16 point, anti-aliasing on
  winFont = createFont("Arial",32,false);
  restartGame()
}
Reporting Game State

- Tell users balls left and time left

```java
void draw(){
    [...]
    textFont(winFont,30);
    fill(40,20,0);
    time = curTime - (millis()-srtTime)/1000;
    text(str(int(time*10)/10.0),310,40);
    text("Balls: "+ballsLeft,30,40);
```
With a UI

Balls: 17  32.1
Other Elements

• In order of importance:
  – Add a “You Win” and “You Loose” screen
  – Add a restart button
  – Add a score
  – Add a high score board
UI Can be annoying

- End game screen:
  - Pause the countdown timer
  - Disable keyboard...
  - ...but allow restart
  - Make sure all text is visible
Open Ended

• What can we tune to make the game easier or harder?

• How could we improve our game?
Resources

• [http://www.catswhocode.com/blog/19-ffmpeg-commands-for-all-needs](http://www.catswhocode.com/blog/19-ffmpeg-commands-for-all-needs) - Some helpful FFmpeg examples