Sample Video Game & Sound

Game Theme

- Who is your audience?
- Why would they want to play your game?

A catching theme for a simple game can make the game better than a more complicated game with no theme.

Think: 'Where the hell is that Cat Shit?!?!'

Game Structure

- One player or two? Turn taking or simulataneous? Can the other player be the computer?
- Symmetric or asymmetric opponents?
- Action or Strategy?
Sprites

- What ImageSprites do you want?
- What StringSprites would be useful?
- Do you want to make custom Sprites?
- Which Sprites may need motion blur?

For choosing ImageSprites, be aware that they behave as squares with images painted on. This is particularly important for collision detection.

More exact boundaries are made when customizing Sprites, which can also be done with ImageSprite to get tighter boundaries.

Trackers

- How are the Sprites going to move?
- Are single Sprites going to use multiple Trackers in sequence? If so, consider using the Alarm, based either upon time or another event.
- What information do the Trackers need?
  - other Sprite locations?
  - boundary information?

Collisions

Collision of objects is the most frequent event in a game.

- What happens when objects collide?
  - Do they bounce?
  - Does one or both objects disappear?
  - Does the score change?
- How important is the resolution of the collision?
  - Are bounding boxes sufficient? If so, they are good because they are fast and simple.
  - Is normal information required at time of impact?

Score

- How can progress in the game be quantified?
- Does score trigger events? If so, use Alarms.
- People love scores. They can compare them to friends scores, play to beat the best score, or just use them to see that they are getting better.
Levels

- Levels are like integral scores.
- Many options for varying the level
  - change of theme/sounds
  - change of difficulty
  - change of structure
- Levels make the game more interesting, and more interesting levels drives players to play games repeatedly to reach those levels.

Splash Screens

- Provide smooth transitions between game levels, starting and ending the game.
- Can include more complex movement and sound because they are scripted and not interactive
- Can be reused with slight modifications

Design

- What classes are needed?
- What instance variables are needed in the classes?
- What are the methods of the classes?
- How do the classes fit together?
- Is this design flexible?
  - Can you get the basic structure completed quickly?
  - Can the basic structure be incrementally implemented?
  - Can the basic structure be enhanced?

Implementation

- If the design was done well, this should be the simple part.
- Should be done in small, separate, testable increments.
- Try to always keep a functional game ready for release – remember, programs are released, not finished!
- Will usually take longer than expected.
Testing/Debugging

- Your game almost never works the first time.
- Half or more of your time may be spent here, depending on your planning and design.
- Debugging/Testing can be unpredictable in how much you'll need to do and how long it will take.
- Again, this usually takes longer than expected.

Documentation

- Document minimally as you code so as not to forget what you've done.
- Wait until the code is near completion for full documentation as you may end up documenting code that is later changed or not used.
- Develop a user manual and programmer documentation using Javadoc and web pages.

Enhancements

- If you have extra time at the end, you can make a big difference.
- It's not unusual to complete 90% of the functionality in the last 10% of the coding.
- Slight modifications in the look and function of the interface can make the game much more appealing with little effort.
- While it's tempting to continue adding functionality, you should really stop early to polish your work.

Release

- Tell all your friends about your game.
- Visit gaming sites and link up your game to their indices.
- Be prepared to get emails about your work.
- Provide source code if possible to help others code.
Beat the Bugs!

1. Game Theme
2. Game Structure
3. Sprites
4. Trackers
5. Collisions
6. Score
7. Levels
8. Splash Screens
9. Design
10. Implementation
11. Testing/debugging
12. Documentation
13. Enhancements
14. Release

Game Theme

For my game, I wanted something students would enjoy playing. I also wanted something the pertained to what I was teaching. Students always write bugs in their programs and always get frustrated at some point. I decided to make a game they could play to relieve some frustration and have some fun.

Game Structure

Since I'm always short on time, I decided to choose something similar to what I already had coded, a shoot'em up.

It would be one player action game with the player at the bottom and enemies at the top. The player would be able to shoot the enemies and the enemies would be able to shoot at the player.

Sprites

- For the player, an ImageSprite of myself
  - I used a program to crop out the background and make a transparent gif
- For the player bullet, an ImageSprite of my head
  - I took the same photo and cropped out just my head into a transparent gif.
- For the enemies, a 'Java' StringSprite
- For the enemy bullets, a 'bug' StringSprite
Trackers

- I wanted the enemy Sprites to move in a pattern, but not in unison. I also didn't want their pattern to be monotonous.
- I chose a circling pattern for their basic movement.
- To avoid monotony, they would spin out and back periodically.
- The bullets would travel in a line and spin via the ProjectileTracker.

Collisions

- When the enemy bullets hit the player, reduce the life by one and the bullets disappear.
- When the player bullet hits the enemy, both the player and the bullet disappear.
- For simplicity, the each enemy and the player have only one bullet.

Score

- Enemies left
- Player life left
- Time

Levels

- Advance when enemies are eliminated
- Add more enemies
Splash Screens

- Intro - “Prepare to Program!”
- Levels - “Program X” where X is the level
- Game Over - “NullBrain Exception!”

Design Overview

GUI
- Title at top
- Score on right
- Control panel at bottom
  - Pause
  - Restart
  - Help
  - Quit
- Game in the middle

Design – Classes

Classes
- BeatTheBugs – the main GUI
- BeatTheBugsLoop – the animation loop
- ScorePanel – view of the Score
- Score – model of score
... more on next slide

Classes (cont'd)
- LevelAdvancer – controller between Score and BeatTheBugsLoop
- SplashScreens – Sprite generator for splash screens
- Help – displays user instructions
- TrackerBehavior – describes enemy motion
Design

BeatTheBugs extends JApplet implements ActionListener
- makeComponents
- layoutComponents
- actionPerformed
- init
- main
- constructor

ScorePanel extends JPanel implements Observer
- makeComponents
- layoutComponents
- update
- constructor

BeatTheBugsLoop extends GameLoop
- makeSprites
- addSprites
- advanceFrame
- advanceLevel
- handleCollision
- resetToBeginning
- constructor

TrackerBehavior
Score
ScorePanel
Help
BeatTheBugsLoop
LevelAdvancer
SplashScreens
State
- JFrame frame;
- JButton pause, quit, restart, helpPlay;
- BeatTheBugsLoop game;
- JLabel title;
- ScorePanel scorePanel;
- Help help;

State
- Ship[] enemies;
- Ship hero;
- LevelAdvancer levelAdvancer;
- Dimension enemyDimension;
- int enemiesLeft;
- Score score;

Score
- JLabel shipScore;
- JLabel enemyScore;
- JLabel time;
### Design – Class Methods & State

**Score** extends Observable
- set and get methods

**State**
- double shipScore;
- double enemyScore;
- double time;

### Design – Class Methods & State

**LevelAdvancer** implements Observer
- startGame
- update
- constructor

**State**
- BeatTheBugsLoop loop;
- SplashScreens screens;
- int level;

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### Design – Class Methods & State

**SplashScreens**
- start
- nextLevel
- gameOver
- constructor

**State**
- AudioClip startSound;
- AudioClip overSound;
- AudioClip nextSound;
- AnimationCanvas canvas;
- double spinDuration;
- double freezeTime;
- int rotations;
- Color color;

### Design – Class Methods & State

**TrackerBehavior** implements Alarm
- setSprite
- start
- stop
- alarm
- constructor

**State**
- Tracker spinOut;
- Tracker spinIn;
- Tracker original;
- double duration;
- int revolutions;
- double maxSize;
- double interval;
Design – Class Methods & State

Help
• makeComponents
• layoutComponents
• constructor

State
• JTextPane message;

Implementation
• See course webpage for link to jar file and applet under the sample games
• Will review in greater detail later

Testing/Debugging

Strategies
• Get a minimal working version to start – used a previous similar game
• Incremental updates – made only small changes and tested them as I went
• Periodic cleaning – remove and restructure code as design solidifies and game becomes more complex
• Testing on multiple platforms/computer speeds – two different Solaris and Windows machines
### Testing/Debugging

**Unresolved issues**
- Bullets still appearing in upper left corner for some reason
- Still slower than I would like
- Sounds don't always play
- Other components don't always refresh properly

### Enhancements

**Plans for future work**
- Add/animate a background of computer code
- Add a background sound track
- Make more interesting enemy movement and firing behavior
- Provide special levels
- Make the game more adaptive to skill level
- Improve splash screens

### Release

**To do:**
- Document code
  - add more comments
  - Javadoc
  - design description
  - document unresolved bugs and where they occur
- Distribution
  - develop webpage
  - submit to gaming sites
  - writeup for conference proceedings/talks
- Licensing
  - ensure authorship remains
  - enable free distribution of code as is
  - limit distribution of modified code

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### Practice

**Look over the code and post questions to the bulletin board about the parts you don't understand.**
- Add a level number to the Score and ScorePanel.
- Choose an enhancement and implement it.
- Find the bugs I haven't yet found, in particular the bullets in the upper left part of the screen.
- Use an image editor and use your own picture and/or change the theme of the game.