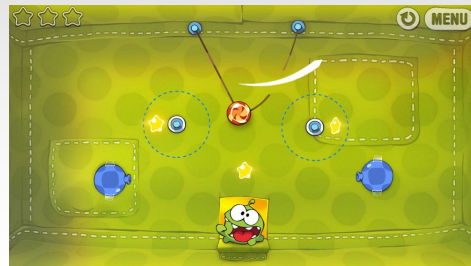


CPSC 427

Video Game Programming



Debugging



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Debugging



- *There will be bugs...*
- *Strategies for Fixing?*

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Debugging

- ***There will be bugs...***
- ***Strategies for Fixing?***
 - Anticipate
 - Reproduce
 - Localize
 - Use proper debugging tools

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Debugging: Strategies for Fixing?

- Anticipate I
 - *Unit tests*
 - *Logging*
 - *Explicit tests for “what can go wrong” (assert)*
 - Anything that can go wrong will go wrong... at the worst possible time
 - *State/play saving and loading*
 - *Visual testing (early)*
 - *Avoid randomness (seed)*
- Reproduce
- Localize
- Use proper debugging tools

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Debugging: Strategies for Fixing?

- Anticipate II: *your compiler (-Wall) is your friend*
- Reproduce
- Localize
- Use proper debugging tools

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Debugging

- **Strategies for Fixing?**
 - Anticipate
 - Reproduce
 - *When does it happen?*
 - *Logging + unit tests*
 - *Record/load gameplay*
 - Localize
 - Use proper debugging tools

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Debugging

- **Strategies for Fixing?**
 - Anticipate
 - Reproduce
 - Localize
 - *In time: version control*
 - *In place: logging*
 - Divide and Conquer
 - *Minimal trigger input*
 - *Don't guess; measure*
 - Use proper debugging tools

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Debugging

- **Strategies for Fixing?**
 - Anticipate
 - Reproduce
 - Localize
 - Use proper debugging tools
 - *Run with debug settings on*
 - *Run within a debugger*
 - Set breakpoints
 - Examine internal state
 - *Learn debugger options*

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Debugging (From Waterloo ECE 155, Zarnett & Lam)



- **Strategies for Fixing?**
 - Scientific method.
 - Observe a failure.
 - Invent a hypothesis.
 - 3 Make predictions.
 - 4 Test the predictions using experiments and observations.
 - Correct? Refine the hypothesis.
 - Wrong? Try again with a new hypothesis.
 - Repeat

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Debugging (From Waterloo ECE 155)



More (Human Factor) Strategies

- Take a Break/Sleep on it
- Code Review
 - Look through code
 - Walk someone through the code

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Debugging

More (Human Factor) Strategies

- Question assumptions
- Minimize randomness
 - Use same seed
- Check boundary conditions
- Disrupt parallel computations

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Debugging (From Waterloo ECE 155)

More Strategies

- Know your enemy: Types of bugs
 - Standard bug (reproducible)
 - Sporadic (need to chase – right input combo)
 - Heisenbug
 - Memory (not initialized or stepped on)
 - Parallel execution
 - Optimization

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Hard Bugs (cheat sheet)

- *Bug occurs in Release but not Debug*
 - Uninitialized data or optimization issue
- *Bug disappears when changing something innocuous*
 - Timing or memory overwrite problem
- *Intermittent problems*
 - Record as much info when it does happen
- *Unexplainable behavior*
 - Retry, Rebuild, Reboot, Reinstall
- *Internal compiler errors (not likely)*
 - Full rebuild, divide and conquer, try other machines
- *Suspect it's not your code (not likely)*
 - Check for patches, updates, or reported bugs

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