Debugging

Debugging Process

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Bug Hunting Using Print Statement

- Weak form of debugging, but still common
- print variables other than just those you think suspect
- print valuable statements (not just “hi” or “aaaaaaa”)
- move print through a program to track down a bug
- use exit() to concentrate on a part of a program

Writing Program for Debugging

- print messages, variables/test results in useful places throughout program
- use a ‘debug’ or ‘debug_level’ global flag to turn debugging messages on or off, or change “levels”
- possibly use a source file preprocessor (#ifdef) to insert/remove debug statements.

Compiler Warning Messages

- Set your compiler's warning level to the highest, pickiest level possible, and fix the errors it reports
- Treat warnings as errors
- Initiate project-wide standards for compile-time settings

A Recipe for Effective Debugging

- A bug happens when there is a mismatch between what you (someone) think is happening and what is actually happening
- Confirm things you believe are true
- Narrow down the causes one by one
- Make sure you understand your program state
- Keep a log of events and assumptions

A Recipe for Effective Debugging

- Try explaining what should be happping

  - Verbalization/writing often clarifies muddled thoughts

- Do not randomly change things, your actions should have a purpose
  - If you are not willing to check it into the Version Control code repository (for example, Git and SVN) with a log that your boss may read, then you are not ready to make that change to the code
  - Think it through first, both locally and globally

Tips for Debugging

- Reproduce the error in several different ways
- Narrow the suspicious region of the code
- Be suspicious of classes and routines that have had defects before
- Check code that has changed recently
- Integrate incrementally
- Check for common defects
- Talk to someone else about the problem
- Take a break from the problem

Psychological Considerations in Debugging

- Be careful about variable names:
  - Short form of a word may mean multiple things
  - Be careful in not using different spelling for the same variable
- Check for indentation problems

```
if ( x < y )
     swap = x;
     x = y;
     y = swap;
```

- Be careful about multiline comments

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