CSE 403
Lecture 18

Debugging

Efficiency and code tuning
Final points

- Reductions in strength
  - if (sqrt(x) < sqrt(y))...

- Memory management
  - Even in Java / C#
  - Preallocating/reusing large objects
  - Buffer pool

Efficiency vs. Clarity

- Almost always favor clarity over efficiency
  - The human reader is more important
  - Compilers and processors have improved significantly in the last four decades

Debugging

- What are the key steps in debugging a program?

Kernigan and Pike's debugging wisdom

- Look for common patterns
  - Common bugs have distinct signatures
    - int n; scanf("%d", n);
  - Examine most recent change
  - Don't make the same mistake twice
  - Debug it now, not later
  - Numerology of failures
    - Example – editor that dropped every 1024th char
  - Get a stack trace
  - Read before typing

K & P, II

- Explain your code to someone else
- Make the bug reproducible
- Divide and conquer
  - Find simplest failing case
- Display output to localize your search
  - Debugging with printf()
- Write self checking code
- Keep records
My favorite bugs (and stupidities)

- BI280 Business Basic Interpreter written in C for CP/M
- Sporadic failure of parsing
- Only happened when Basic program was changed (after being loaded)
- Parsing done by interpreter, each time a line was executed
- Adding printf's to code also changed behaviour

The Bug

- Uninitialized variable
- Variable used by the parser to hold a character that would be either a binary operator or end of line
- Parsing algorithm looked at last character and tested if it was a binary operator to continue parsing

Don't do this

```java
try {
    doSomething();
} catch (Exception e) {
}
```

- Can cover up very bad things
- Violates K&P: Debug it now, not later

Apocryphal (but still a good story)

- A program which fails only in the month of September

```c
char monthName[9];
strcpy(monthName, "September");
```

ConferenceXP

- Video conferencing system would run (after initial install) for about an hour and then fail
- System would not work at all at this point
- In a week it would start working again (for an hour)
- Repeated recovery every week
Solution

- Install process (erroneously) set event log to “overwrite events older than 7 days
- Application was very verbose in logging
- Failure when log was full