

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

```
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



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```
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

