CSE306 Software Quality in Practice

Dr. Carl Alphonce
alphonce@buffalo.edu
343 Davis Hall
Classification of bugs

- Common bug (source code, predictable)
- Sporadic bug (intermittent)
- Heisenbugs (averse to observation)
  - race conditions
  - memory access violations
  - (programmer) optimizations
- Multiple bugs - several must be fixed before program behavior changes - consider violating rule #9 "one change at a time"
...the uncertainty principle, also known as Heisenberg's uncertainty principle, is any of a variety of mathematical inequalities[1] asserting a fundamental limit to the precision with which certain pairs of physical properties of a particle, known as complementary variables, such as position $x$ and momentum $p$, can be known.

observer effect

...the term observer effect refers to changes that the act of observation will make on a phenomenon being observed. This is often the result of instruments that, by necessity, alter the state of what they measure in some manner.

debugging tools

- instrument code during compilation
- instrumented code may behave differently than uninstrumented code
- in other words: the act of using a debugger may mask a bug, causing its symptoms to disappear, only to reappear when run without instrumentation
Essential tools

- compiler (e.g. gcc)
- debugger (e.g. gdb)
- memory checker (e.g. memcheck)
- runtime profiler (e.g. gprof)
- automated testing framework (e.g. cunit)
- build tool (e.g. make, gradle)
- code repository (e.g. git)
<table>
<thead>
<tr>
<th>Compiler</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>/usr/bin/gcc</td>
<td>4.4.7</td>
</tr>
<tr>
<td>/util/bin/gcc</td>
<td>6.4.0</td>
</tr>
<tr>
<td>/util/gcc-7.2.0/bin/gcc</td>
<td>7.2.0</td>
</tr>
<tr>
<td>/util/llvm/bin/clang</td>
<td>3.5.0</td>
</tr>
</tbody>
</table>
Compiler versions

timberlake.cse.buffalo.edu

- /usr/bin/gcc
  - Version: 4.4.7
- /util/bin/gcc
  - Version: 6.4.0
- /util/gcc-7.2.0/bin/gcc
  - Version: 7.2.0
- /util/llvm/bin/clang
  - Version: 3.5.0
Compiler versions

timberlake.cse.buffalo.edu

- /util/gcc-7.2.0/bin/gcc    7.2.0
- /util/llvm/bin/clang      3.5.0

Make sure you ssh to timberlake from the lab machines:

ssh timberlake.cse.buffalo.edu
Compiler versions

timberlake.cse.buffalo.edu

- `/util/gcc-7.2.0/bin/gcc 7.2.0`
- `/util/llvm/bin/clang 3.5.0`

Make sure your path is updated so that you can use these versions. Update in your `~/.cshrc` file.
Compiler documentation

https://gcc.gnu.org/onlinedocs/7.2.0/

https://gcc.gnu.org/onlinedocs/gcc-7.2.0/gcc/Standards.html#C-Language

http://releases.llvm.org/3.5.0/tools/clang/docs/UsersManual.html

http://releases.llvm.org/3.5.0/tools/clang/docs/UsersManual.html#c
Common options

-std set language standard
-o set output file name
-g debugging
-c compile/assemble do not link
-Wall report "all" warnings
-L library path
-I include path
We also did some live coding showing the compilation process.