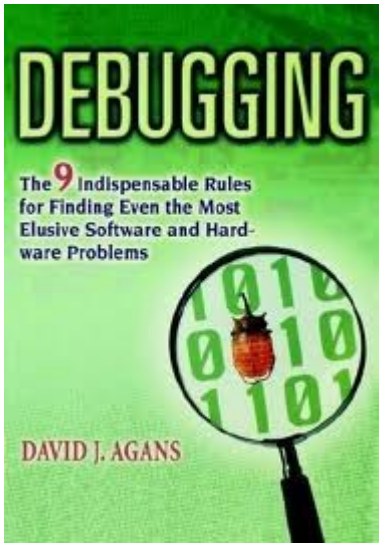
Topics for this Lecture

- David Agans' Debugging Rules
- Short book on general principles
- of debugging



David Agans' Debugging Rules

- Rule #1: "**Understand the System**"

- "READ THE MANUAL"
- Debugging something you don't understand is pointlessly hard
- Just as with testing, subject knowledge matters – here you need knowledge of the source code as well

David Agans' Debugging Rules

- Rule #2: "**Make It Fail**"
- You can't debug what you can't produce
- Find a way to reliably make a system fail
- Record everything, and look for correlation
  - Don't assume something "can't" be a cause

David Agans' Debugging Rules

- Rule #3: "**Quit Thinking and Look**"

- Don't hypothesize before examining the failure in detail – examine the evidence, then think
- Engineers like to think, don't like to look nearly as much (instrumentation and running a debugger both look like work)
- "If it is doing X, must be Y" – maybe you are right, but you need to check

David Agans' Debugging Rules

- Rule #4: "**Divide and Conquer**"

- This rule is the heart of debugging
  - Narrow down the source of the problem
  - "Does it still fail if this factor is removed?"
  - Use a debugger to check system state at checkpoints; if everything is ok, you're before the problem

David Agans' Debugging Rules

- Rule #5: "**Change One Thing at a Time**"

- A common very bad debugging strategy:
  - "It could be one of X, Y, Z. I'll change all three, and run it again."
- Isolate factors, because that's how you get experiments that tell you something
- If code worked before last checkin, maybe you should look at just those changes

David Agans' Debugging Rules

- Rule #6: "**Keep an Audit Trail**"

- Don't rely on your perfect memory to remember everything you tried
- Don't assume only you will ever work on this problem
- You have learned a lot of things about a bug write them down: I tried this, and that, the following change in the code it did not work,... etc.

David Agans' Debugging Rules

- Rule #7: "**Check the Plug**"

- Question assumptions
- Don't always trust the debugger
- Don't trust your tests

David Agans' Debugging Rules

- Rule #8: "**Get a Fresh View**"

- It's ok to ask for help
- Experts can be useful
- Explain what happens, not what you think is going on
  - Symptoms not Hypothesis

David Agans' Debugging Rules

- Rule #9: "**If You Didn't Fix It, It Ain't Fixed**"
  - Once you "find the cause of a bug" confirm that changing the cause actually removes the effect
  - A bug isn't done until the fix is in place and confirmed to actually fix the problem
  - You might have just understood a symptom, not the underlying problem
    - Test your fix is correct
    - Test your debugging
    - Test everything

References:

http://classes.engr.oregonstate.edu/eecs/summer2015/cs362-002/Lecture19.pdf
Debugging: The 9 Indispensable Rules for Finding Even the Most Elusive Software and Hardware Problems Paperback – November 5, 2006 by David J Agans (Author)