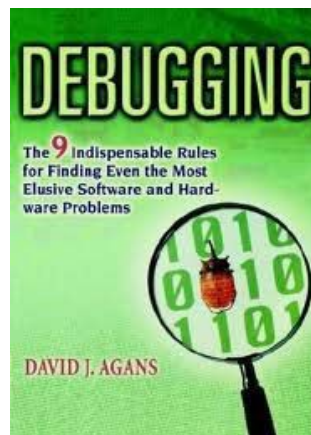

Debugging

9 Indispensable Rules for Finding
the Most Elusive Software and
Hardware Problems

David Agans' *Debugging*

- A short book on general principles of debugging
- Structured around a set of simple rules that really are a good idea



Rule #1: “Understand the System”



“READ THE MANUAL (Datasheet)”

- 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

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

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
 - Check

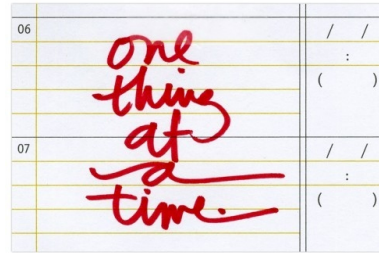


Rule #4: “Divide and Conquer”



- *This rule is the heart of debugging*
 - Heart of delta-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

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*

Rule #6: “Keep an Audit Trail”



*Dear
debugging
diary...*

- Don’t rely on your perfect memory to remember everything you tried
- Don’t assume only you will ever work on this problem

Rule #7: “Check the Plug”

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



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



Rule #9: “If You Didn’t Fix It, It Ain’t Fixed”

*Si fractum non sit,
noli id reficere.*

- 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

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2. Make It Fail
3. Quit Thinking and Look
4. Divide and Conquer
5. Change One Thing At A Time
6. Keep An Audit Trail
7. Check The Plug
8. Get A Fresh View
9. If You Didn’t Fix It, It Ain’t Fixed

