

Debugging Tips For Hardware/Software

Andy Gray

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Objectives

- ▶ Debugging history
- ▶ What is debugging
- ▶ Hardware/Software debugging fundamentals
- ▶ Preventive measures for hardware/software

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Debugging History

Photo # NH 96566-KN First Computer "Bug", 1945

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0800 Anticon started
 1000 stopped - anticon ✓
 1300 (030) HP-MC 1.58140000 9.037 846 845 correct
 033 PRO 2 2.13047695 4.615925059(-2)
 correct 2.13047695
 Relays 6-2 in 033 failed speed test
 in relay 11,000 test.

1100 Relays changed
 Started Cosine Tape (Sine check)
 1525 Started Multi-Adder Test.

1545 Relay #70 Panel F
 (moth) in relay.

First actual case of bug being found.
 1630 anticon started.
 1700 closed down.

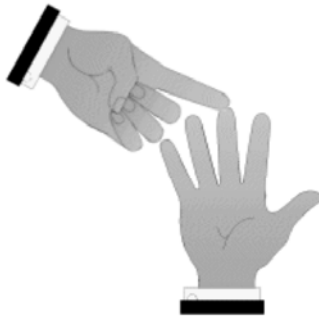
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5 Steps of debugging according to Andy

- ▶ Recognize
- ▶ Isolate
- ▶ Identify
- ▶ Fix
- ▶ Test



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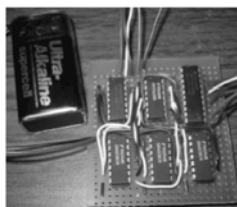
What do you mean hardware/Software?

Hardware

- ▶ Processor
- ▶ Wiring
- ▶ Motors
- ▶ Gears
- ▶ Servos
- ▶ Batteries
- ▶ LEDs
- ▶ Speakers
- ▶ Sensors

Software

- ▶ Lower Level
- ▶ Upper level
- ▶ Component level



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Recognize/Isolate

- ▶ What is it doing/not doing?
- ▶ How is the response not what you expected?
- ▶ What did you just change?
- ▶ What happened that has never happened before?

- ▶ Remove unnecessary components
- ▶ Break the suspected part down to the minimum required parts



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Identify



- ▶ Gradually add components
- ▶ Add feedback to your robot (UART, LEDs)
- ▶ Use tools (step through, multi-meter, o-scopes)
- ▶ Smell
- ▶ Visually inspect
- ▶ Search for the error online
- ▶ Follow documentation line by line
- ▶ Change your environment



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Fix/Test



- ▶ Physically Repair
- ▶ Replace
- ▶ Create a workaround
- ▶ Restore the robot to the previous configuration
- ▶ Repeat the situation that caused the problem
- ▶ Exceed the expected environmental variables



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Preventative Measures

- ▶ Take the time to read the documentation
- ▶ Research parts/projects online prior to starting
- ▶ Pay attention to what you are doing
- ▶ Mathematically ensure that your hardware will physically work
- ▶ Easy access to electrical components
- ▶ Label components
- ▶ Document code
- ▶ Understand software before utilizing
- ▶ Ensure the tutorials you follow are up to date
- ▶ Use the correct tools

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5 Steps again...

- ▶ Recognize
- ▶ Isolate
- ▶ Identify
- ▶ Fix
- ▶ Test



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Questions

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