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## DD2458, Problem Solving and Programming Under Pressure

### Lecture 3: The Hitchhiker's Guide to Debugging and Testing

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Debugging is the art of finding bugs in code and to be able to get rid of them. Nowadays, this art has become a serious profession for many programmers, who spend their working days hunting bugs. The first step in learning about debugging is to know about one of the most well-known bugs in history. In 1946, at Harvard University, a moth caused a system failure by being trapped inside a relay in one of the electromechanical computers used at the time. Even though it is not common nowadays that program bugs are caused by actual insects, their source is still often evasive and hard to detect. This is a short guide for anyone interested in learning more about debugging and testing.

## 1 Testing

Testing the code you have written is of great importance. It is the way you confirm that your program runs the way you expect it to. Having a well tested program means that you can be sure the program will not behave unexpectedly. There are a number of testing techniques available and the most important ones are listed below.

### 1.1 Documenting tests using a test matrix

Test #	Prerequisites	The test	Expected result	Test results
1	Compiled with g++ -O2 -g on an Intel x86-64 architecture, debian stable.	Provoke the program to divide by zero.	An error mentioning divide by zero.	The system crashed and burned.

## 1.2 State-based testing

### 1.2.1 Boundary values

### 1.2.2 Well defined behaviour

## 1.3 Behavioural testing

## 1.4 Testing manually

## 1.5 Automated testing

### 1.5.1 Unit testing

# 2 When an error occurs

## 2.1 Errors

### 2.1.1 Run time errors

### 2.1.2 Logical errors

### 2.1.3 Compile errors

### 2.1.4 Warnings

## 2.2 Debugging

### 2.2.1 Trace output

### 2.2.2 Logging

## 2.3 Tools

# 3 Models

## 3.1 Test-driven

## 3.2 Contract programming

# 4 If you get stuck