# Program Adjustment

Josh Branchaud and Eric Rizzi CSE 990 - 4/23/13



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#### How can we find the largest value? - C++ Forum

www.cplusplus.com > Forum > General C++ Programming

Sep 29, 2011 – Create an **array** of integral types(or std::vector if unsure of the size at compile-time) ... int i=0;i<5;i++) { if (**array**[i]>temp) temp=**array**[i]; } cout << "The **biggest number** is: " << temp << endl; return 0; } ... You're breaking the **code**!

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<u>C program to find maximum element in array | Programming Simplified www.programmingsimplified.com/...code/c-program-find-ma...</u>

Aug 14, 2011 – This **code find maximum** or **largest** element present in an **array**. ... main() { int **array**[100], **maximum**, size, c, location = 1; printf("Enter the **number** ...

#### FIND OUT LARGEST NUMBER IN AN ARRAY USING C PROGRAM

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11 answers - Jan 8, 2009

Right now, to **get the maximum**, I am looping through the **Array**, and resetting a variable to the **value** if it is greater than the existing **value**: ...

### Manual Code Search



var maxValue:Number = 0;

if (num > maxValue)

maxValue = num;

for each (var num: Number in myArray)

Questions

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### What is the best way to get the minimum or maximum value from an Ar

Let's say I have an Array of numbers: [2,3,3,4,2,2,5,6,7,2]

tagg

10

What is the best way to find the minimum or maximum value in that Array?

var myArray: Array /\* of Number \*/ = [2,3,3,4,2,2,5,6,7,2];

algo



Right now, to get the maximum, I am looping through the Array, and resetting a variable to the value if it is greater than the existing value:

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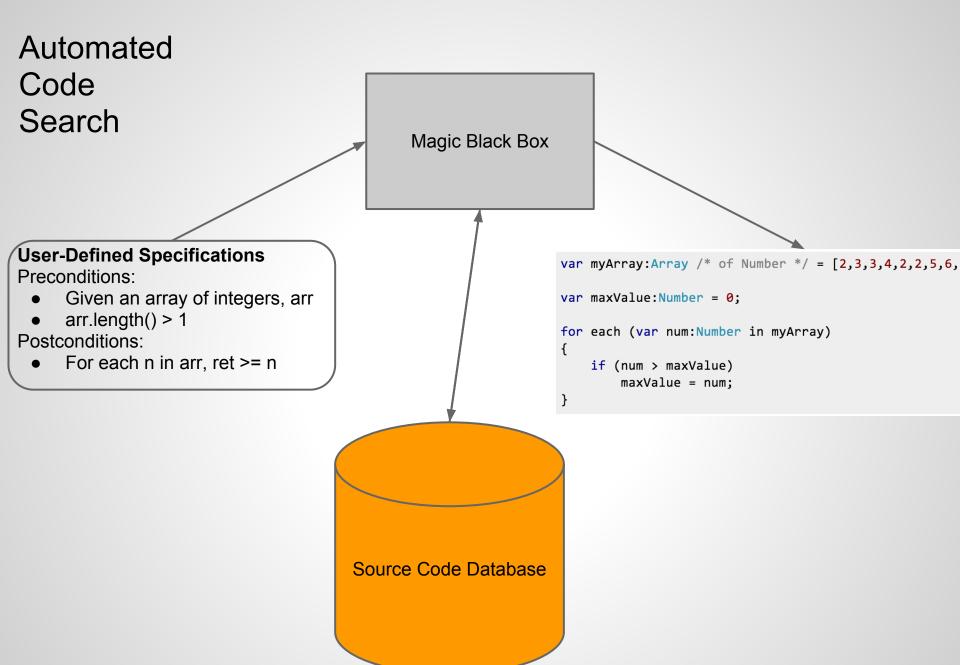
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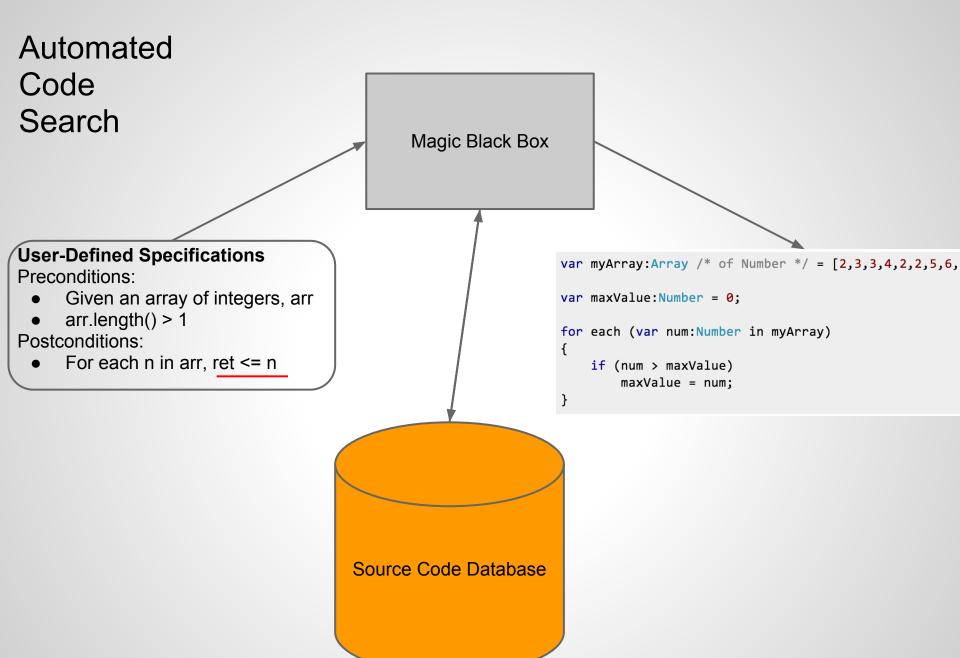
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### **Problem**

We have a program that almost does what we want it to (almost correct).

## Solution(s):

- Manually Fix/Adjust Program
- Automatically Fix/Adjust Program?

## **Project Overview**

- Trace Generation
- Trace Differentiation
- Fault Localization
- Pre/Post Condition Generation
- Synthesis

```
foo(x, y): precondition: (x != 0)
     int a = 1;
     if(x>0)
           if(y \le 0)
               a = -1;
     else
           if(y>=0)
               a = -1;
     if(a \le 0)
           if(y<0)
               y = y * -1;
          else
                if(x<0)
                    x = x * - 1;
     if(x<0)
          x = x * -1; y = y * -1;
     x = x + y;
      return x; postcondition: (return > 0)
```

## **Project Demo**

## **Evaluation and Expectations**

## Evaluation with control systems:

- Traffic Collision Avoidance System (TCAS)
- Wheel Brake System (WBS)
- Elevator control system

### Characteristics:

- Restricted to integers and booleans
- Lots of conditional control flow
- No looping
- 1 Step Mutations

### **Future Work**

- Glue all the pieces of the project together
- Consider generating subsets of traces rather than an exhaustive list
- Consider weighting traces before fault localization
- Generate more succinct constraints for the synthesis
- Add more complex grammars to the synthesis

## **Concluding Remarks**

Program Adjustment is possible by building off of existing approaches (Logozzo and SemFix) using:

- Statistical Fault Localization
- Localized Specification Construction
- Program Synthesis

### References

James A. Jones, Mary Jean Harrold, and John Stasko. 2002. **Visualization of test information to assist fault localization**. In Proceedings of the 24th International Conference on Software Engineering (ICSE '02). ACM, New York, NY, USA, 467-477.

Hoang D. T. Nguyen, Dawei Qi, Abhik Roychoudhury, and Satish Chandra. 2013. **SemFix: Program Repair via Semantic Analysis**. In Proceedings of the 35th International Conference on Software Engineering (ICSE '13). ACM, San Francisco, CA, USA.

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Liblit, Ben, et al. 2003. **Bug isolation via remote program sampling**. ACM SIGPLAN Notices. Vol. 38. No. 5. ACM..

## **Comments and Questions**