General Computer Science for Engineers CISC 106 Lecture 2^4

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Lecture Overview

- Practice problems
- Switch construct
- English -> Pseudocode -> Matlab
- Searching
- Linear Search
- Binary Search

Switch Construct

- like the IF construct, it is a way to branch or make a choice
- switch *switch_expr* %what we are testing the value of

  case *case_expr* % one possible value

  statement, ..., statement %if it's equal to the above value, execute this code

  case {*case_expr1*, *case_expr2*, *case_expr3*, ...} %many possible values

  statement, ..., statement %if it's equal to one of above values, execute this

  otherwise

  statement, ..., statement %otherwise (or else) execute this.

  end

- (Note: statements could be blank too, especially in the otherwise case.)

Switch Construct Example

```
x = 4;
If x == 1
    disp('x is one');
elseif x == 3
    disp('x is three');
elseif x == 4 | x == 5
    disp('x is four or five');
else
    disp('x is not 1, 3, 4, or 5');
end
```

```
x = 4;
switch x
    case 1
        disp('x is one');
    case 3
        disp('x is three');
    case {4 5} %note the braces
        disp('x is four or five');
    otherwise
        disp('x is not 1,3, 4, or 5');
end
```

- MATLAB documentation: http://www.mathworks.com/access/helpdesk/help/techdoc/index.html?/access/helpdesk/help/techdoc/ref/switch.html
- Nice quick video demonstrating it: http://blogs.mathworks.com/videos/2008/01/02/matlab-basics-switch-case-vs-if-elseif/
- (pp. 115-116 of Chapman)

Pseudocode

- Problem solving is about planning
- You should have an English description and/or pseudocode **before** coding
- In the text: Page 93 of Chapman
- Optional links:
- http://en.wikipedia.org/wiki/Pseudocode
- http://en.wikipedia.org/wiki/How_to_Solve_It
- http://users.csc.calpoly.edu/~jdalbey/SWE/pdl_std.html
- http://en.wikipedia.org/wiki/Problem_solving#Some_problem-solving_techniques
- Analogy: has a similar problem (possibly in a different field) been solved before?

Linear search

Searching, extremely important in computer science

If we have a list of unsorted numbers, how could we search them?

Binary search

Now, what if the list is sorted, can we search it faster?

Binary Search

Binary Search
Given: array *A* with attribute *Key*,
elements 1 to N ordered on the values of *Key*
so that *A(1).Key* ≤ *A(2).Key* ≤ … ≤ *A(N).Key*
Find index *p* such that *A(p).Key* = *x*.

Flowchart diagram of the algorithm

Note the two stopping conditions (Exits)

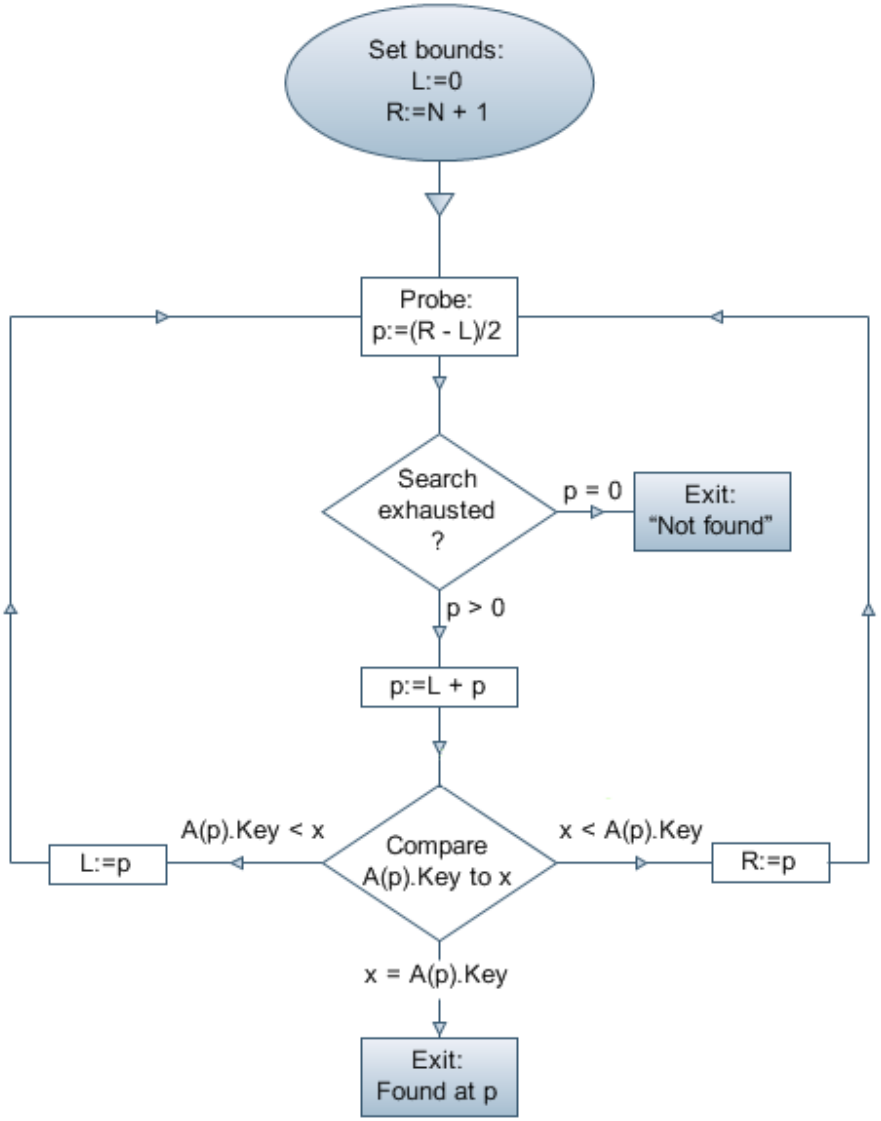
Note the one loop

(Note: flowchart is equivalent to pseudocode)

How much faster is this than linear search?

If linear search takes roughly n steps for n things,

Then binary search takes roughly log2(n) steps for n things. This is because we divide the n things by 2 each time.



Practice problems…

- Are…

A. Mandatory
B. Optional
C. A good idea
D. Waste of time
E. B and C

To make decisions or branch…

A. Use a for loop
B. Use an assignment statement
C. Use the matlab branch() function
D. Use an if or switch statement
E. None of the above

The case part of a switch statement can have multiple conditions?

A. True
B. False

Pseudocode …

A. Can be converted into any programming language
B. Will help me score more points on exams if I can't remember the exact Matlab code
C. Is an semi-formal way of describing an algorithm and is important for planning
D. Is intended for humans instead of computers
E. All of the above

Linear search can be coded using one for or while loop

A. True
B. False

Binary search can be coded using one for or while loop.

A. True
B. False