Lecture 6

For Loop
and
Arrays

Jan 21  Friday 11:05-12:30  PCS D2
Jan 25  Tuesday 2:00-3:30  FCK D4

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Revision: Iteration

- Iteration is repetition of something again and again
- Iteration has a body
- It has a terminating condition
- In every iteration, both are executed exactly once
  - Either body before the terminating condition
  - Or the terminating condition before the body
- Iteration terminates when terminating condition evaluates to value `true`

- do `{...;...;...;}` while `(c)`;
- while `(c) {...;...;...;}`;
- Which one to choose?
  - Avoid redundant code
  - Avoid exit from within the body. We want exit from the terminating condition
  - Watch out trivial looping
  - Avoid extra assignments and extra checks
Control Flow Diagram for do while statement

- **Termination Condition**
  - true
  - false
- **Body of iteration**
Control Flow Diagram for while do statement

Termination condition

false

true

Body of the iteration
Loop/Iteration index

- An integer variable that keeps track of the number of times the iteration is executed
- It is initialized at the start of the iteration
- It is incremented in every iteration
- Such a variable is called loop index
- Or also called iteration index
  - demo
Counter

- An integer variable that counts something is called a counter.
- It is initialized and incremented whenever the counting situation arises.
- A loop index is a counter since it counts the number of iterations.
- A variable that counts the no. of odd integers within range 0..9 is also a counter.

- demo
A variable that indicates the boolean status of some situation occurring in the program.

It is initialized to appropriate value (true or false).

A flag is set as soon as the situation is detected.
  - Thus an occurrence of the situation is remembered.

Then it is used later in the program.

We used a flag during last lecture in one of our attempts at refining the while loop.
  - Back to old demo.
Collections of values

- Int a, b, c;
- Char ch;
- Float r1, r2;
- Double d;
  - All these are single values

- What if you wanted to store a collection of many values of one type?
- e.g. 10 integers corresponding to marks of 10 students?
- Using 10 variables is cumbersome
  - Not only many variables
  - Size of the control flow increases
  - You have observed this in lab 2
Arrays

- **int A[5]**
  - An array of 5 integers
  - How to get to the individual integers?
    - They are:
      - A[0]
      - A[1]
      - A[3]
    - Each one of numbers 0 to 4 has been used as an array index
Array Index

- We can also use a variable in place of a number

```c
int A[10];
i=0;
A[i]=0;
i=1;
A[i]=1;
i=2;
A[i]=2;
// and so on
```
Operations on Collections by Using Arrays inside iterations

- Use iteration index as array index
- An indexed value from an array can be used on left hand side or on the right hand side as lvalue or as rvalue respectively.

```c
int i;
i=0;
while (i<n) {
    A[i] = i;  // lvalue
    cout << A[i];  // rvalue
    i = i + 1;
}
...
For loop

A simple way to right loops

Loop index **initialization**, loop **termination** in terms of loop index and the loop index **step** all at once place

```c
for (i=0; i<n; i++) {
}
```