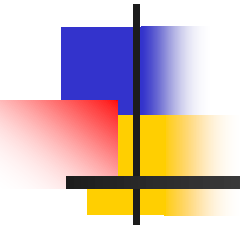
COMS W3101 Programming Language: C++ (Fall 2016)



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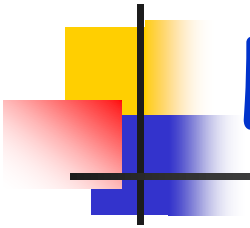
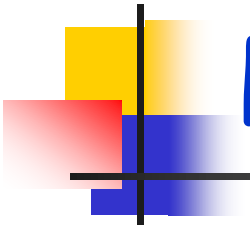


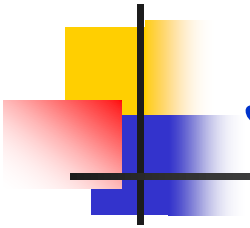
Lecture-1

- Course overview
  - See http://www.cs.columbia.edu/~ramana



Prerequisites

- A good background in at least one programming language is recommended.
- Or, ability to learn programming "quickly" – in about a week.

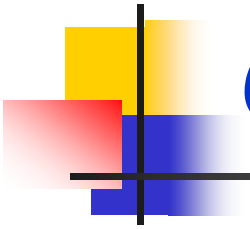


Syllabus Overview

- Overview of C
  - We will NOT cover details of C programming
- Object Oriented Programming principles wrt C++
  - Concepts of class/object, methods, inheritance, polymorphism, abstraction, data encapsulation

Overview of C programming language

- Basic data types
  - char, short, int, long, long long, unsigned, float, double, long double, …
- Operators:
  - Arithmetic: +, -, *, /, %, ++, --
  - Logical: ==, !=, >, <, >=, <=, &&, ||, !
  - Bitwise: &, |, ^, <<, >>, ~



Overview of C, contd.

- Input, output
- Control statements
  - Conditionals
    - if else
  - Loops
    - for
    - while
    - do .. while
  - switch, case

Control statements … if

```
if (<expr_1>)
{
   <body of if_expr_1>
}
else if(<expr_2>)
{
   < body of if_exp_2>
}

else /* default */
{

}
```

- Example-1

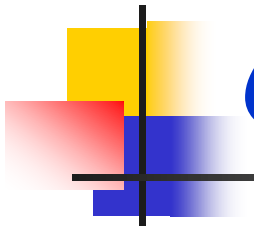
```
if (i > j)
   printf ("i is larger\n");
```

- Example-2

```
if (i > j)
   printf ("i is larger\n");
else
   printf ("j is larger or equal to i\n");
```

- Example-3

```
if (i > j)
   { }
else if (i > k)
  { }
else { }
```



Control statements - for

- for (<start_expr>;
  <termination_cond>;
  <loop_increment>)

{

  <body_of_for>

}

- Example-1 /* print 0 to 9 */

```
for (i = 0; i < 10; i++)
{
   cout << i << endl;
}
```

- Example-2

```
for ( ;  ;)  /* infinite loop */
{
   /* do something */
}
```

Control statements - while

- Similar to for statement
- while (<while_cond>)

```
{
        <while_body>
}
```

```
do
{
        <body_of_do>
} while (condition);
```

- Example-1 /* print 0 to 9 */

```
i = 0;
while (i < 10)
{
        cout << i << endl;
        i++;
}
```

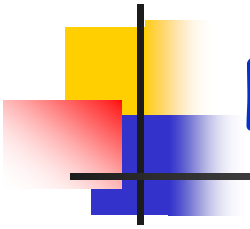
- Example-2

```
while (1) /* infinite loop */
{
        /* do something */
}
```

Control Statements – switch, case

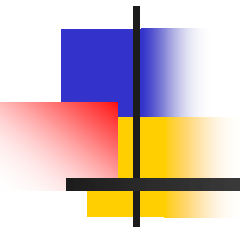
```
switch (x)
{
    case val1:
        <val1_body>;
        break;
    case val2:
        <val2_body>;
        break;
    …
    default:
        <default_body>
}
```

```
int x = 2;
switch (x)
{
    case 1:
        procedure1();
        break;
    case 2:
        procedure2(); /* executed*/
        break;
    …
    default:
        default_procedure( );
}
```



Data types, IO, control statments

- C data types, IO and control statements work in C++
- C++ defines additional IO.
- Popular among that
  - cout
  - cin
- Advantage of cout and cin over printf, scanf
  - No need for %d, %s, %c, etc



Arrays

Arrays

- Arrays – an ordered sequence of elements of the same type.
- One dimensional array

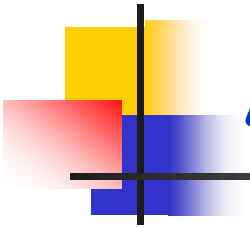
2	4	6	8	10

  - arr1[0] = 2; arr[1] = 4 …
- Two dimensional array

5	10	15
20	25	30

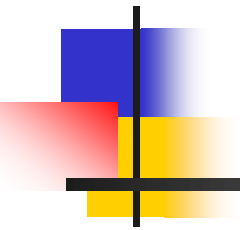
  - E.g.-2: arr2
- arr2[0][0] = 5; arr2[0][1] = 10; arr2[0][2] = 15;

  arr2[1][0] = 20; arr2[1][1] = 25; arr2[1][2] = 30;



Arrays … contd.

- Array of ints
  - int intArray1[ ] = {2, 4, 6, 8, 10};
- Array of floats
  - float floatArray1[ ] = {1.1, 2.2, 3.3};
- character array
  - char str[] = "abcdef";



C - character arrays

C uses character arrays for strings

- C uses character arrays for strings.

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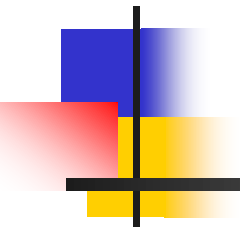
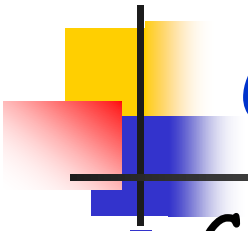
- Useful string functions
  - strlen – find the length of a string.
  - strcmp – compares two strings
    - Returns 0 if they match.
  - strstr – check if a string is sub-string of another string.
  - strcat – concatenate two strings.
  - Many others



C++ string class



C++ strings

- C uses char arrays to represent strings
- char arrays are messy
  - Need to predefine the size of array
  - Size can't be increased easily for longer strings.
  - Copying strings need to use strcpy.
- C++ strings – don't have these issues.
  - E.g. string str1 = "abc";

    string str2 = str1;

    string str3 = str1 + "pqr";

    Much more convenient than C character arrays