CS 241 - Foundations of Sequential Programs **Spring 2017**

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Lecturer: Kevin Lanctot *Notes By: Harsh Mistry*

7.1 The Assembler

7.1.1 The Steps

The assembler proceeds through the code in two passes, in order to produce the machine language version.

1. Analysis : First code is analysed and broken into tokens. If an error is found, the process is terminated.
2. Synthesis : After analysis, the machine code is produced

7.1.2 The Symbol Table

The symbol table is a collection of defined variables that are associated with existing values. The assembler uses the symbol table to keep track of labels. During the analysis pass-through the symbol table is constructed, and the label strong along with am address is stored within the table.

7.1.3 Bitwise Operations

- **Bitwise And** $A\&B$: Performs the and operation on individual bits and is often used to mask off or turn off bits.
- **Bitwise Or** $A \mid B$: performs the or operations on individual bits
- **Shift Left Operator** $A << 1$: shifts bits left, introducing 0's on the right hand side

7.1.4 Outputting Integer as Bytes

```
#include <cstdio>

void output_instr(int instr) {
  putchar(instr >> 24);
  putchar(instr >> 16);
  putchar(instr >> 8);
  putchar(instr);
}
```