

CS2011: Introduction to Machine Organization and Assembly Language

Class 1: Introduction

- Logistics of the course
 - Who's who
 - Syllabus
 - Grading
 - etc.
- What we'll be learning!

Teaching Staff

- Instructor: Janet Burge
 - office hours in FL144,
M 10-11, Tu 9-10, Th 9-10, 2-3
 - email: jburge@cs.wpi.edu
- TAs and SAs:
 - Katica Dimitrova, Kavita Vijay,
Senthil Palanisamay, Mukund
Seshadri
 - Brian Roberts, Chris Barratt
 - Office hours will be in the CS
Annex
 - cs2011_ta@cs.wpi.edu

Class Mailing Lists

- For the instructor and TAs:
 - cs2011_ta@cs.wpi.edu
 - This is what you should use for
questions on the classwork!
- For the whole class (also
includes instructor and TAs):
 - cs2011@cs.wpi.edu
- You should be added to these
automatically when you register
for the course.

Class Web Page

- <http://www.cs.wpi.edu/~jburge/courses/c02/cs2011>
- This will be updated throughout the course.
- This is also the best place to check to see when office hours are.

Textbook

- Required:
 - K.R. Irvine, *Assembly Language for Intel-Based Computers*
 - R. Hyde, *The Art of Assembly Language Programming* – http://webster.cs.ucr.edu/Page_asm/ArtOfAsm.html
- Optional:
 - A.S. Tannenbaum, *Structured Computer Organization*
 - Five copies of the previous edition are on reserve at the library.

Syllabus

- See the web page!
- Subject to change...

Lectures

- Partial lecture slides will be available on the web in advance of the lecture (PDF format).
- Most lectures will also include in-class exercises on the material covered in the lecture.
 - these are NOT quizzes
 - they are done in groups
 - you will be expected to have your book with you in class
 - you should take notes on them!

Labs

- You *must* attend your scheduled lab section
- Bring:
 - your text (Irvine)
 - a floppy disk
 - a pen or pencil – you will be turning in your lab results

Homework

- Due at the START of class on the day it is due. Homework is always due each Friday. Homework due-dates will not be extended until Monday unless Friday's class was cancelled.
- No late homework will be accepted under *any* circumstances (but lowest grade will be dropped)
- Homework will be returned during lab the following week.
- If you do not pick it up in lab, you can pick it up from the TA assigned to record grades for your lab section *during their office hours* (this will be posted on the web)

Exams

- Closed book
- You can bring one 8 ½ by 11 sheet of paper (with notes, hand-written, both sides)
- NO CALCULATORS
- No make-up exams except in cases of serious health-related emergencies with appropriate documentation signed by a medical doctor.
- Sample exam questions will be posted one week prior to the actual exam. Sample exam answers will *not* be posted. Some problems will be worked out in-class, for others you will need to check your answers with a TA.

Grading Policy

- Two Exams – 25% each: 50%
- Six Homework Assignments, 7% each, lowest dropped: 35%
- Six Laboratory Assignments, 2% each, lowest dropped: 10%
- In-Class Exercises – 5% total, lowest dropped

Academic Honesty Policy

- All assignments must be performed *individually*.
 - Students may ask general questions of each other but should not see each other's homework assignments under any circumstances.
 - Working together on a homework assignment is considered an academic honesty violation.
 - Comparing homework answers is also an academic honesty violation.
- It is expected that students follow the policies of this class. There will be opportunities for collaborative work during class but homework assignments are not collaborative.

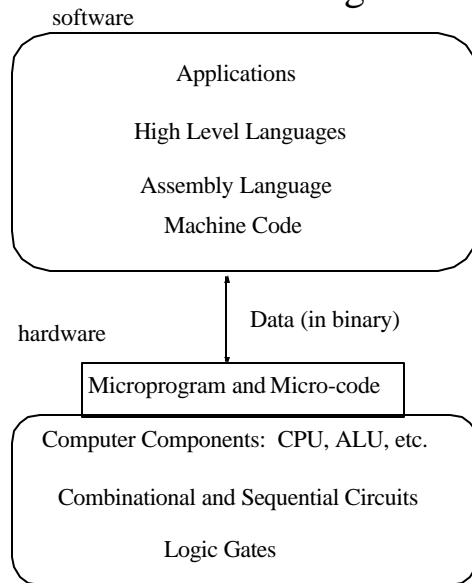
Academic Honesty Policy (continued)

- If cheating is suspected the following procedure will be followed:
 - The students will receive a photocopy of their homework assignment rather than the original.
 - The instructor will examine the homework to determine if an academic honesty violation has occurred.
 - The instructor will meet with the students prior to computing final grades for the course to discuss the situation and give an appropriate penalty.

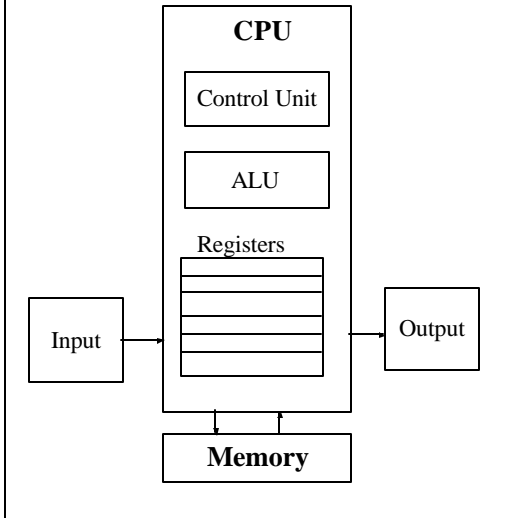
CS2011: What We'll be Learning

- Major parts to the course:
 - Data representation (homework 1)
 - Machine code (homework 2)
 - Assembly language (homeworks 3-5)
 - Machine architecture (logic, circuits, microprogramming, etc.) (homework 6)

How it All Fits Together



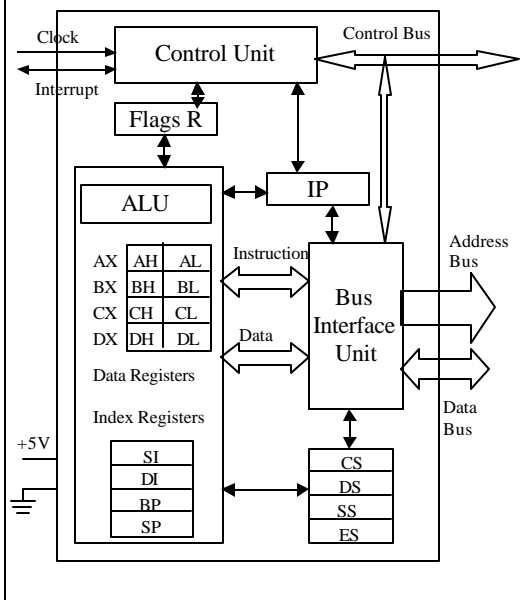
Computer Organization



CPU Components

- Constructed from:
 - combinational and sequential circuits (made from logic gates)
- Include:
 - Control Unit
 - Arithmetic logical unit (ALU)
 - Buses
 - Registers

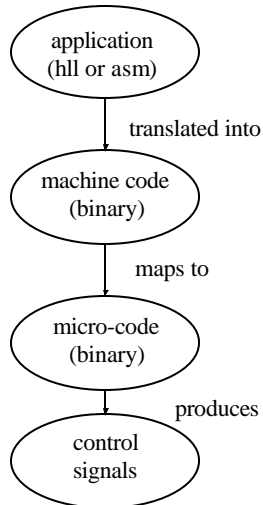
8086 Block Diagram



Registers

- 8, 16, or 32 bit high-speed storage locations inside the CPU
- They can be accessed at a much higher speed than conventional memory.
- When optimizing for speed, use registers.
- Four types: general purpose, segment, index, status, and control

Telling It What to Do



What is Assembly Language?

What is Machine Language?

Example

- Assembly language instruction:
`mov al, 5 ;move 5 to the al register`
- Machine language instruction:
`101100000000101`

Context

- table 1 from Irvine

Why Learn Assembly Language?

Comparison of Assembly Language and High Level Languages

- table 2 from Irvine

Differences in Assembly Languages

- Our move example:
 - Intel: `MOV AL, 5`
 - MC6800: `MOVQ #5, D0`
- Defining memory:
 - Intel: `COUNT DW 5`
 - MC68000: `COUNT DS.W 1`
reserves space only!

Assembly Language Instructions

- A symbolic representation of a single machine instruction.
- Consists of a mnemonic and zero or more operands

- Operand types:

Sample Program

- Figure 5 from text