Course Overview

URL: http://www.ee.nmt.edu/~erives/classes.php

Texts: Freescale Databooks on the MC9S12
Recommended: **The HCS12/9S12: An Introduction to Software and Interfacing, 2nd Edition** by Han-Way Huang

Grading:

- 10%: Homework.
- 10%: Quizzes
- 60%: Three midterms exams
- 20%: Final exam

• Introduction to the MC9S12 Microcontroller

• Binary and Hexadecimal Numbers

• Assembly Language Programming

• C Language Programming

• Introduction to MC9S12 Internal Peripherals
  – The MC9S12 Timer Subsystem
  – Interrupts using the Timer Subsystem
  – The MC9S12 Pulse Width Modulator Subsystem

• The MC9S12 Expanded Mode
  – Address and Data Buses and Timing
  – Adding Memory and External Peripherals
  – Interfacing to the MC9S12

• More MC9S12 Internal Peripherals
  – The A/D Converter Subsystem
  – The Serial Peripheral Interface
  – The Serial Communications Interface
• Using the MC9S12 in a Control Application

Lab Overview

• The lab meets Monday and Wednesday afternoons. **No labs this week**.

• Lab handouts will be posted starting the following week.

• The 9S12 evaluation kits will be passed out in lab next week.

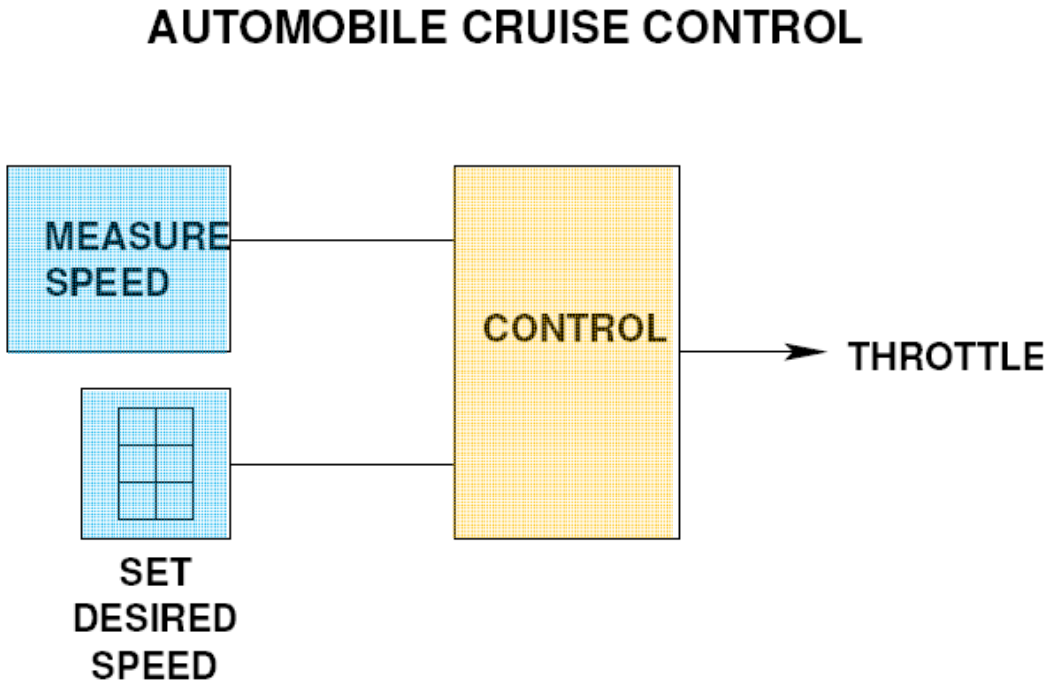
• You need to bring a bound lab notebook to the first lab.

• There will be a prelab for each lab. This must be done and turned in at the start of your lab section. The lab TA will verify that you have completed the prelab.

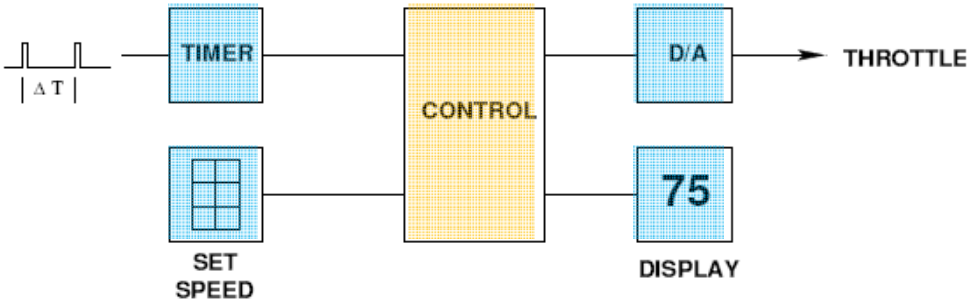
• Be prepared to answer questions about the pre-lab when you come to lab.

• If you do not complete the prelab before coming to lab, you will lose 70% (TBD) of the points for that lab.

- **Introduction to Microprocessors and Microcontrollers.**
  - Course Overview
  - Cruise Control Block Diagrams and Flowchart
  - Block Diagrams of Simple Microprocessor and Microcontroller
  - Harvard architecture and Princeton architecture microprocessor block diagrams
  - Memory map for a Princeton architecture microprocessor

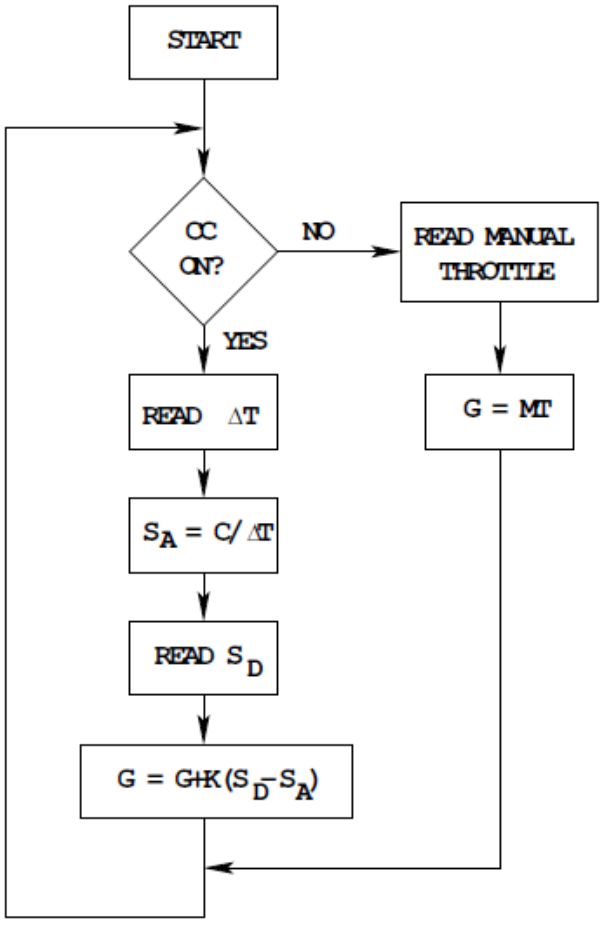


AUTOMOBILE CRUISE CONTROL

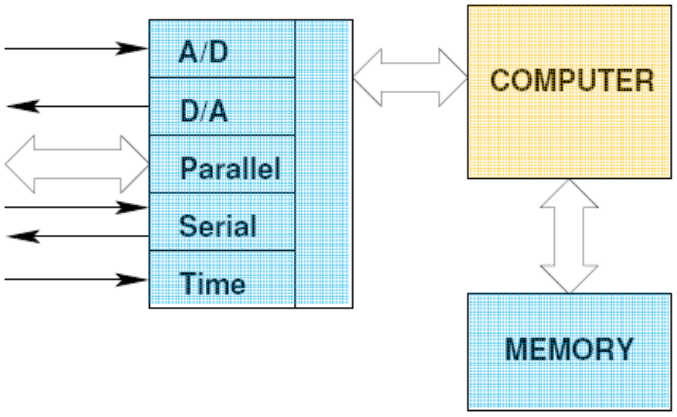


ΔT = time for one revolution of wheel.

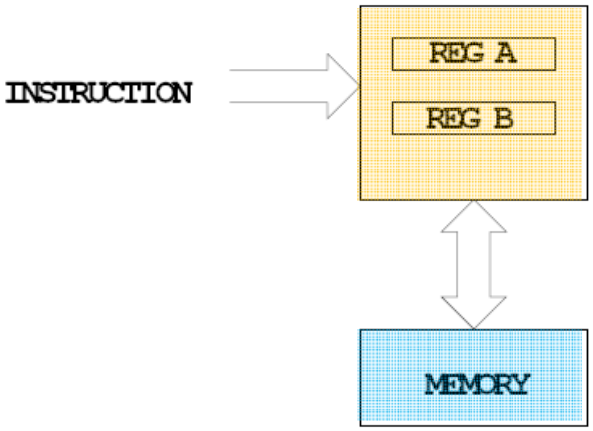
Speed = **C/ΔT**, where C is the circumference of the wheel



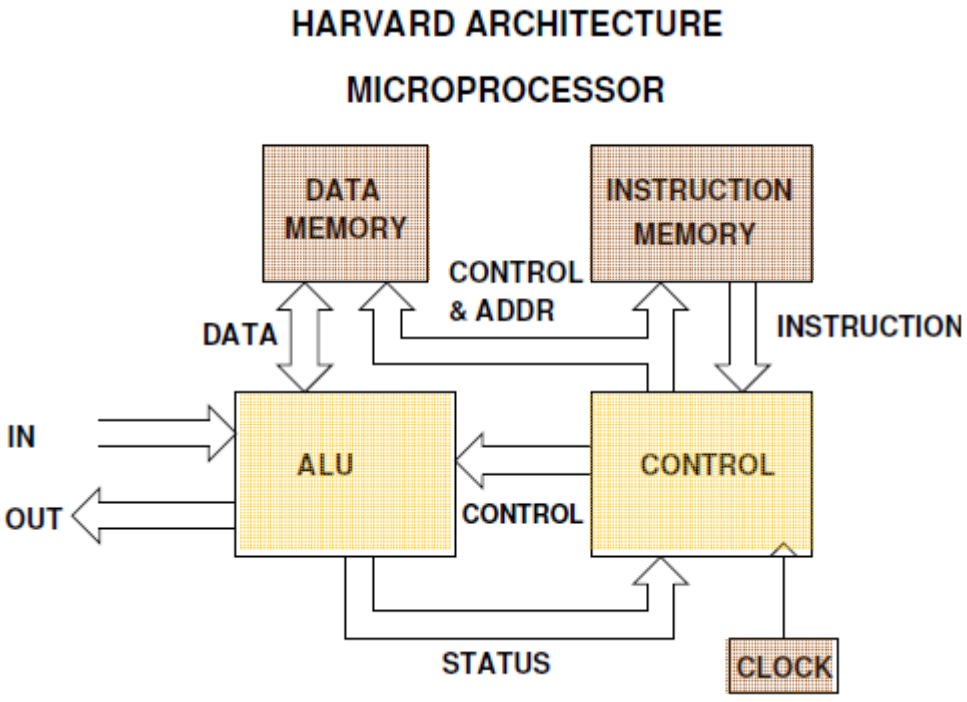
MICROCONTROLLER



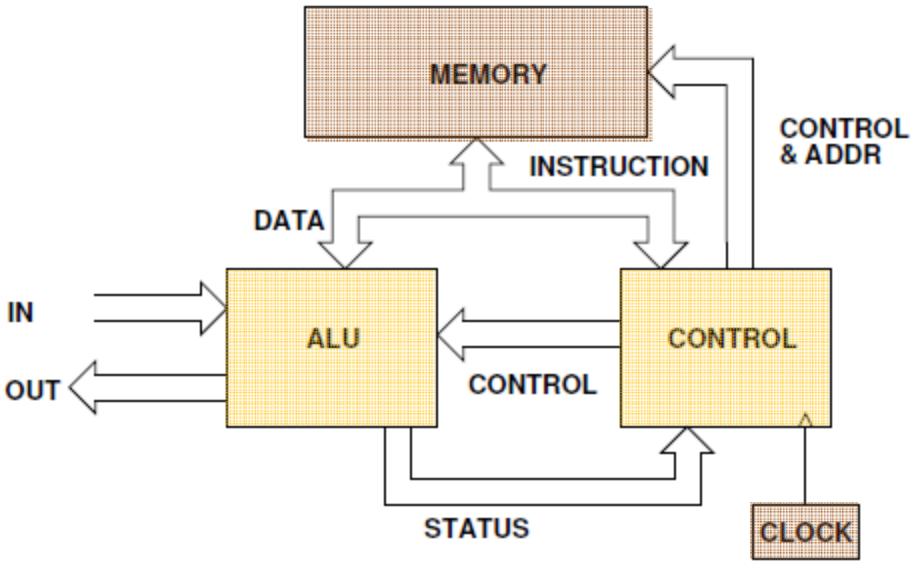
SIMPLE MICROPROCESSOR

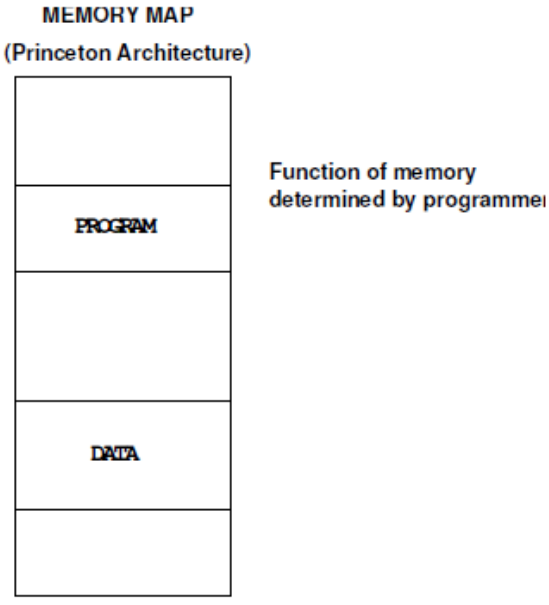


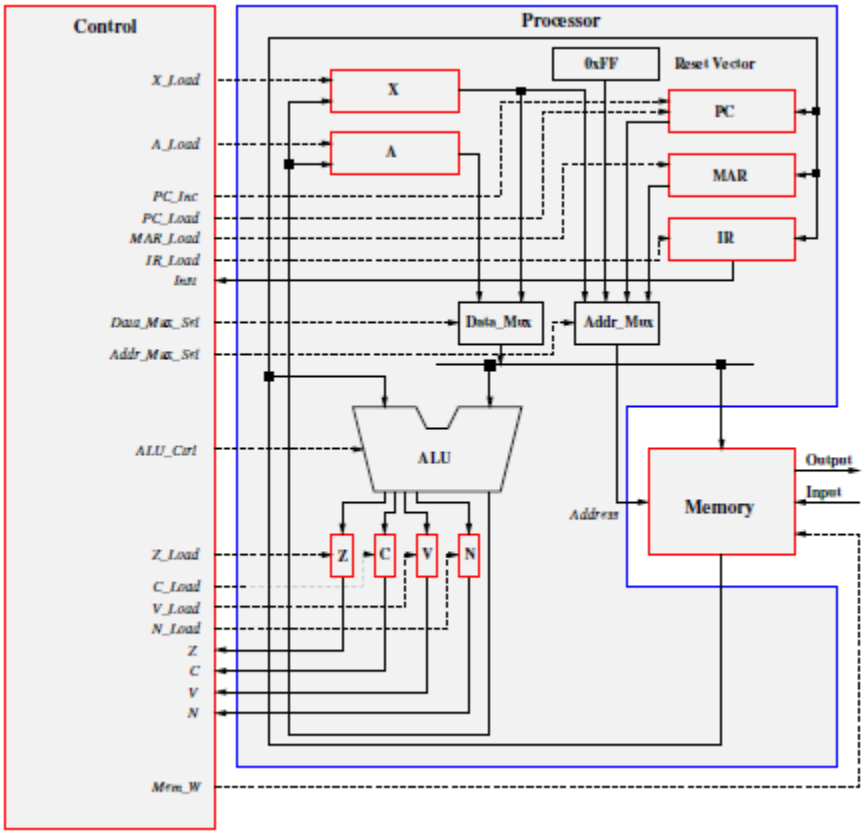
INSTRUCTION	ACTION
18 06	(A) + (B) ⇒ A
87	0 ⇒ A
5A 05	(A) ⇒ Address 5



PRINCETON (VON NEUMAN) ARCHITECTURE







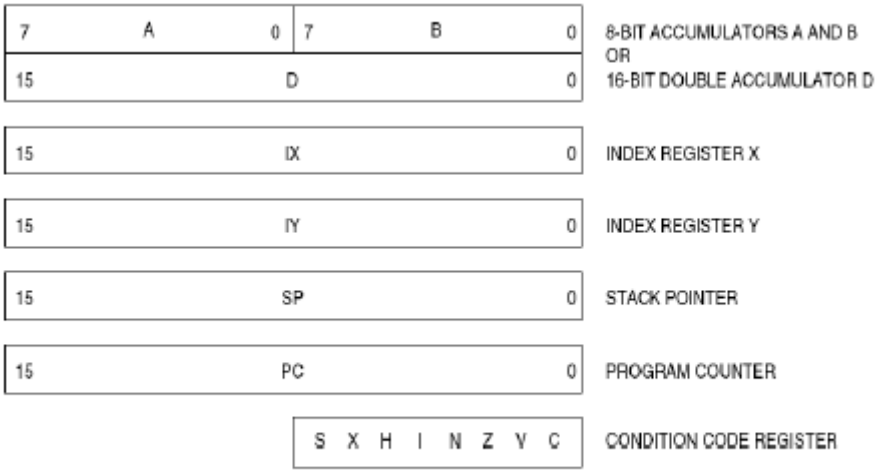


Figure 2-1. Programming Model

Binary	Hex	Decimal
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	A	10
1011	B	11
1100	C	12
1101	D	13
1110	E	14
1111	F	15

Convert Binary to Decimal

1111011_{2}

$1 \times 2^{6} + 1 \times 2^{5} + 1 \times 2^{4} + 1 \times 2^{3} + 0 \times 2^{2} + 1 \times 2^{1} + 1 \times 2^{0}$

$1 \times 64 + 1 \times 32 + 1 \times 16 + 1 \times 8 + 0 \times 4 + 1 \times 2 + 1 \times 1$

123_{10}

Convert Hex to Decimal

$82D6_{16}$

$8 \times 16^{3} + 2 \times 16^{2} + 13 \times 16^{1} + 6 \times 16^{0}$

$8 \times 4096 + 2 \times 256 + 13 \times 16 + 6 \times 1$

33494_{10}