Course Overview

http://www.ee.nmt.edu/~erives/

Texts: Freescale Databooks on the MC9S12 (You can pick up the Freescale data sheets at the end of class today)

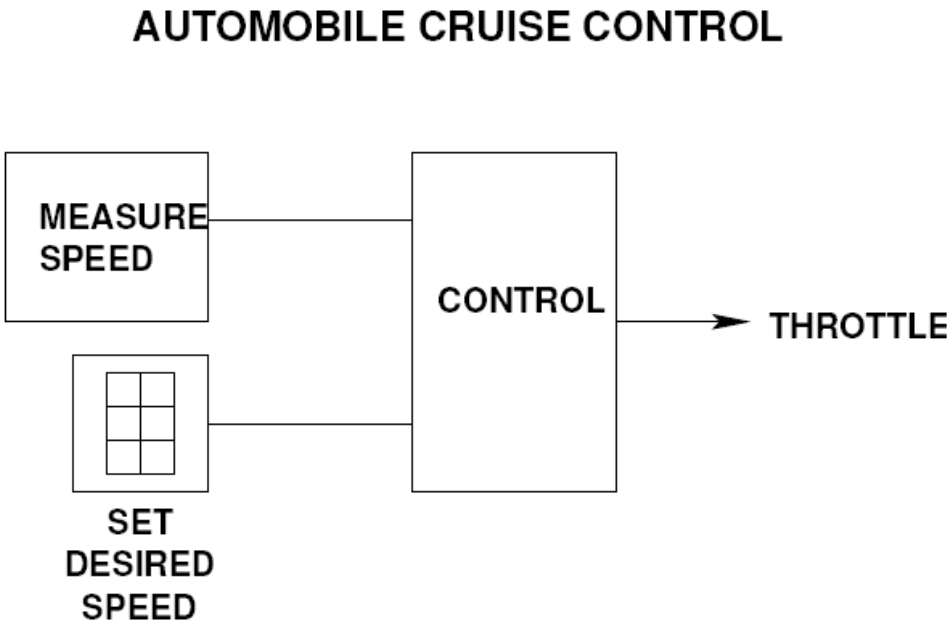
The HCS12/9S12: An Introduction to Software and Interfacing (Recommended)

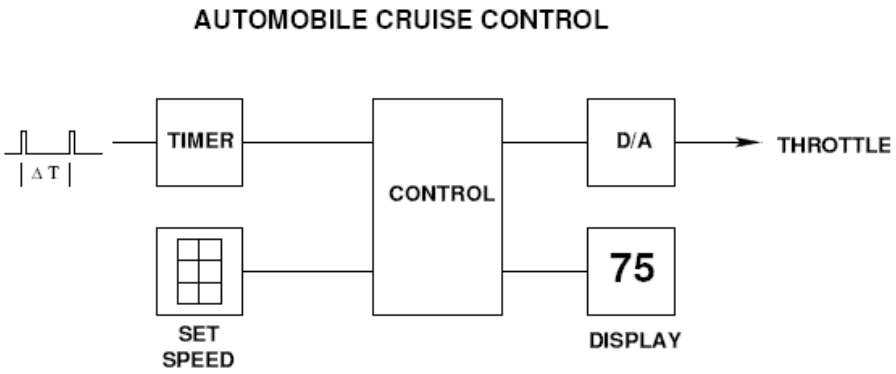
• Introduction to the MC9S12 Microcontroller
• Binary and Hexadecimal Numbers
• Assembly Language Programming
• C Language Programming
• Introduction to MC9S12 Internal Peripherals
– The MC9S12 Timer Subsystem
– Interrupts using the Timer Subsystem
– The MC9S12 Pulse Width Modulator Subsystem
• The MC9S12 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 instructors are Dr. Scott Teare and Dr. Anders Jorgensen. The lab meets Monday and Wednesday afternoons. No labs this week.
• Lab handouts will be posted on Dr. Teare's EE 308 website:
• 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.

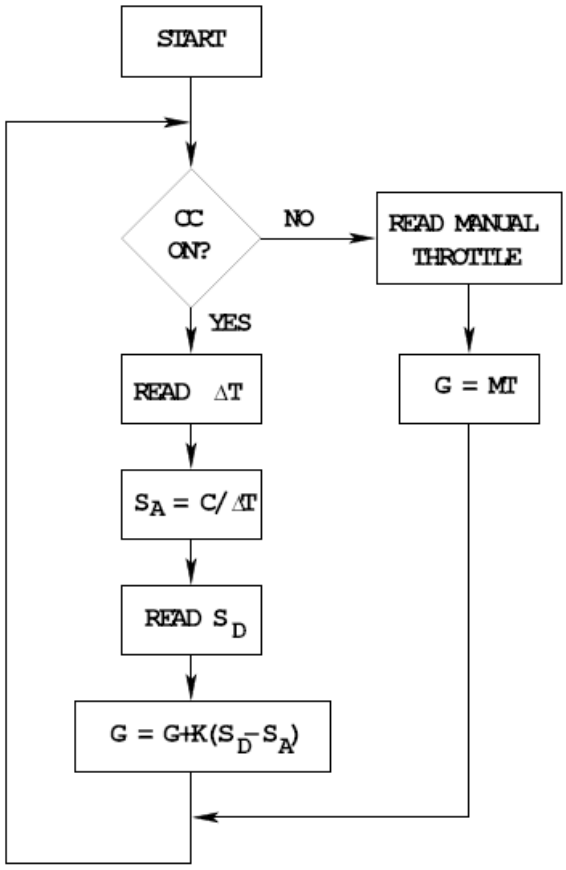
- **Introduction to Microprocessors and Microcontrollers.**
- Huang, Sections 1.2, 1.3
  - Course Overview
  - Cruise Control Block Diagrams and Flowchart
  - Block Diagrams of Simple Microprocessor and Microcontroller
  - Harvard architecture and Princeton (Von Neuman) architecure microprocessor block diagrams
  - Memory map for a Princeton architecture microprocessor



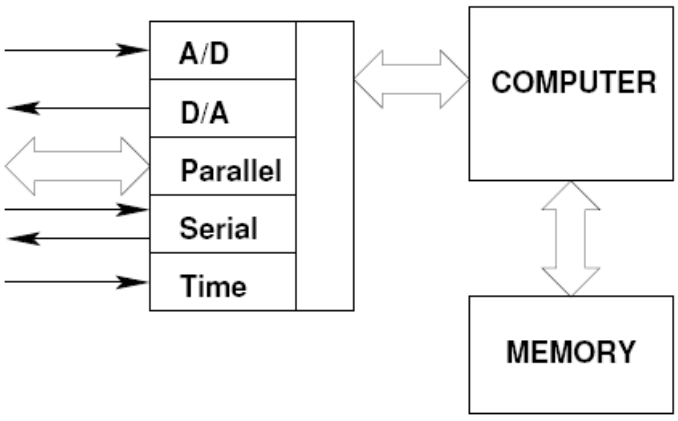


ΔT = time for one revolution of wheel.

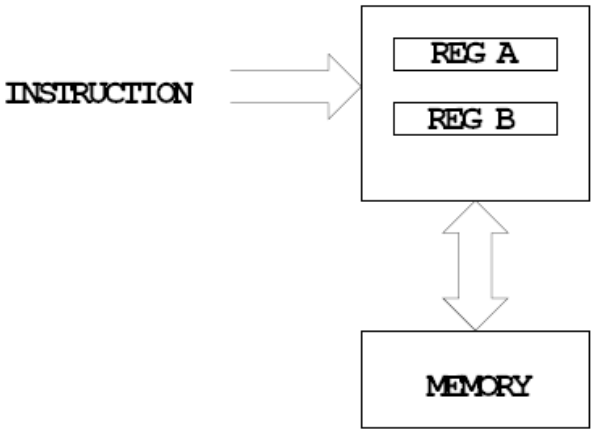
Speed = C/ΔT, where C is the circumference of the wheel



MICROCONTROLLER

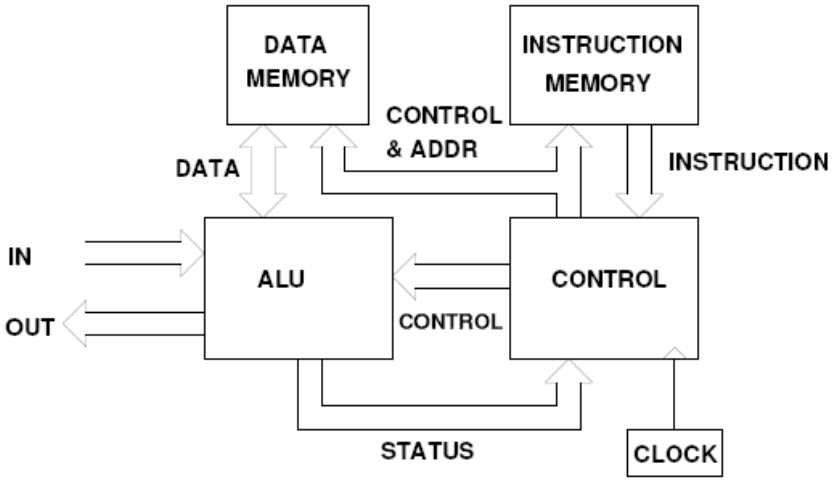


SIMPLE MICROPROCESSOR



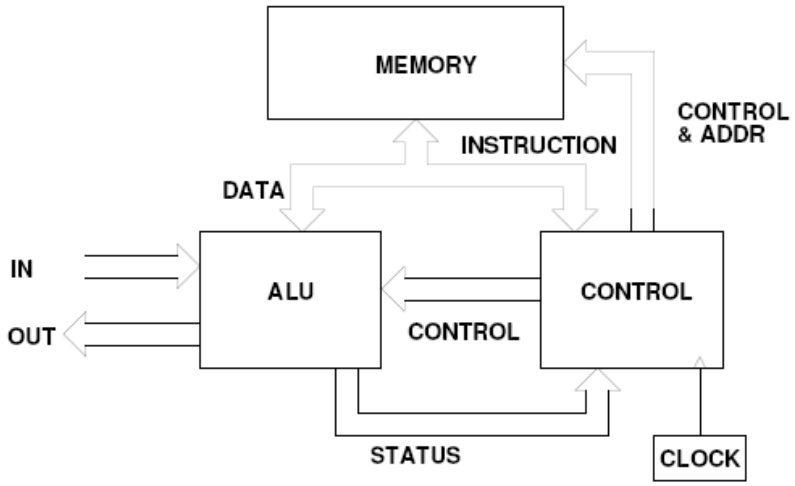
INSTRUCTION	ACTION
18 06	(A) + (B) => A
87	0 => A
5A 05	(A) => Address 5

HARVARD ARCHITECTURE MICROPROCESSOR



PRINCETON (VON NEUMAN) ARCHITECTURE

MICROPROCESSOR



MEMORY MAP

(Princeton Architecture)

Function of memory
determined by programmer

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}