

1) Embedded system

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Diff b/w General computing System & Embedded system.	
General computing system	Embedded system
* It is made general purpose hardware and general purpose o.s	* It is made up special purpose hardware and special purpose o.s
* The application are altered by the user	* The application are not altered by the user
* This always contain os	* I may or may not contain o.s
* Power saving mode present	* Power saving mode not present
* It is general purpose in design	* It is mainly based on application purpose
* It is mainly for performance	* It is mainly for application

* Embedded system

Electrical / Electrochemical devices which assigned with specific task and contains hardware and software are called Embedded system.

* Classification of Embedded System

- i) Based on generation
- ii) complexity & performance
- iii) Deterministic behaviour
- iv) Triggering

- i) Based on generation
 - ^{1st} Generation & application
 - Digital telephone Keypads
 - Stepper motors.
 - 8 bit micro processor & 4 bit micro controller
 - ^{2nd} Generation & application.
 - 16 bit micro processor and 8 bit micro controller
 - Data acquisition.
- SCADA → Supervisory control And Data acquisition

* ^{IIIrd} Generation & application.

- 32 bit microprocessor & 16 bit micro controller
- It is mainly used in Robotics then networking industrial process control, media.
- (DSP & ASIC's) → Application System done by
 - DSP → Digital signal processing
 - ASIC's → Application Specific Integrated Circuit

* ^{IVth} Generation & Application (more than 32)

- It is designed by SOC
- SOC → System on ~~chip~~ chip
- MID's → MOBILE internet devices
- Mainly used in Smartphone

ii) complexity & performance

i) SSES /SSI

- SSES → small scale embedded system
- SSI → small scale integrated

ii) MSES /MSI

- MSES → median scale Embedded system
- MSI → median scale integrated.

iii) LSES /LSI

- LSES → Large Scale Embedded system
- LSI → Large scale integrated.

i) SSES /SSI

- 8 & 4 bit of mp & mc
- complexity & performance is small
- e.g: Electronic toys. (application)

ii) MSES /MSI

- 16 & 8 bit of mp & mc
- application DSP
- complexity & performance is medium

iii) LSES /LSI

- 64 & 32 bit of mp & mc
- complexity & performance is large
- e.g: encoding & decoding of media (application)
cryptography function implementing

* Major Application Area of Embedded System

i) consumer Electronics Eg: camcorders, cameras etc

ii) Household Application eg: TV, DVD players, washing machine, AC etc

iii) Home automation
Eg: microwave oven, sprinklers, fire alarms etc

iv) Automotive Industry
Eg: ABS, Engine control, ignition system etc

v) Telecom
Eg: cellular telephones, telephone switches etc

vi) Computer peripherals
Eg: pointers, scanners, fax machine etc

vii) computer Networking Systems
Eg: routers, switches, hubs etc

viii) Health care
Eg: EEG, ECG, different types of scanners etc

ix) Measurements & Instrumentation
Eg: Digital multimeters, CRO's etc

x) Banking & Retail
Eg: ATM, currency counters etc

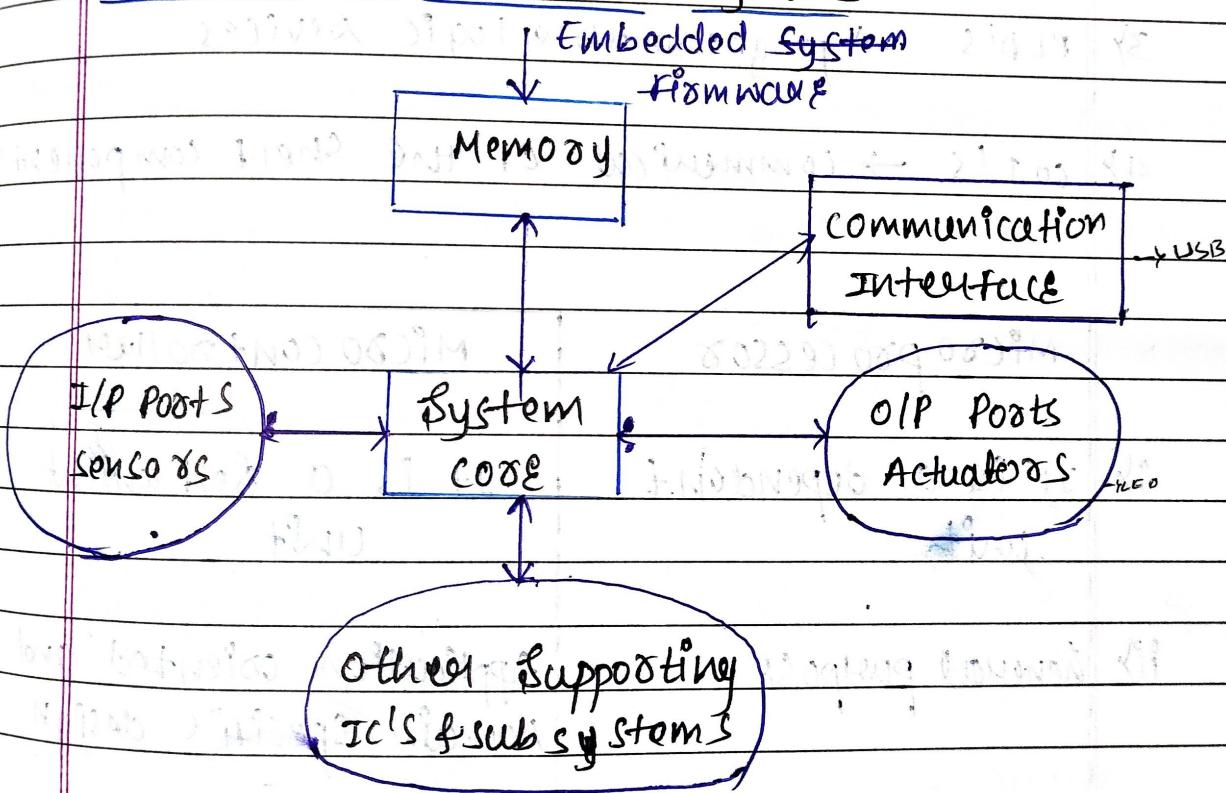
XI) Wearable Devices

Eg: Health & fitness trackers, smartphone screen
extension for notification

XII) Card Readers

Eg: Barcode, Smartcard, handheld devices etc.

* Elements of Embedded Systems



System code - Algorithm purpose (Programs)

Memory - Storage

CORE of the Embedded System

1) General purpose & Domain specific processor

→ microprocessors

→ microcontrollers

→ DSP (Digital Signal Processing)

2) ASIC's → Application Specific Integrated Circuits

3) PLD's → Programmable Logic Devices

4) COTS → commercial off the shelf components

MICROPROCESSORS

i) It is a dependent unit

ii) General purpose

iii) It does not contain built-in I/O port

iv) Limited power saving modes.

Targeted for high-end market

MICROCONTROLLERS

i) It is a self-contained unit

ii) Application oriented and domain specific design

iii) It contains built-in I/O port

iv) It includes lots of power saving mode

Targeted for embedded market

RI SC	CISC
* (reduce instruction sent for computing)	(complex instruction sent for computing)
* by Lesser number of instructions	Created no. of instructions
* instruction pipe lining present & speed of execution increases	No. pipelining
* orthogonal instruction set	Non-orthogonal instruction set
* operations are performed by registers only..	operations are performed register on memory
The memory operations are located and stored.	A lot
A large no. of registers are available	Limited number of Reg. are available
Less silicon usage and PIN count	more silicon usage
fixed length of instructions	variable length of instructions

Sensor and Interfacing

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* Instrumentation System

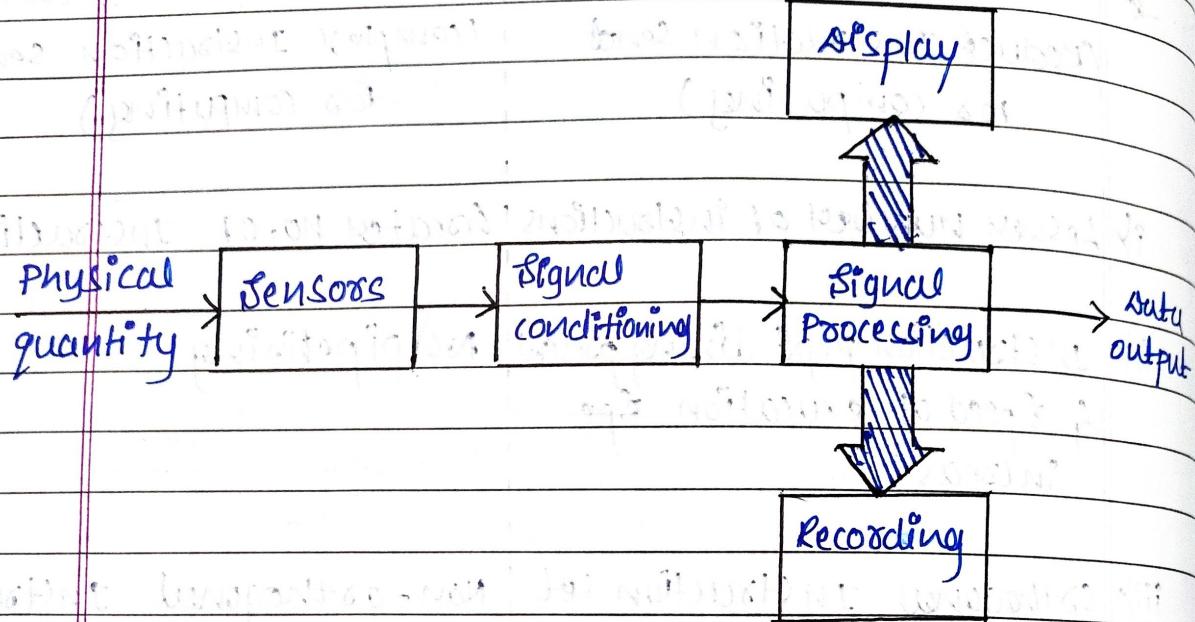


Fig: Instrumentation System

* Control System

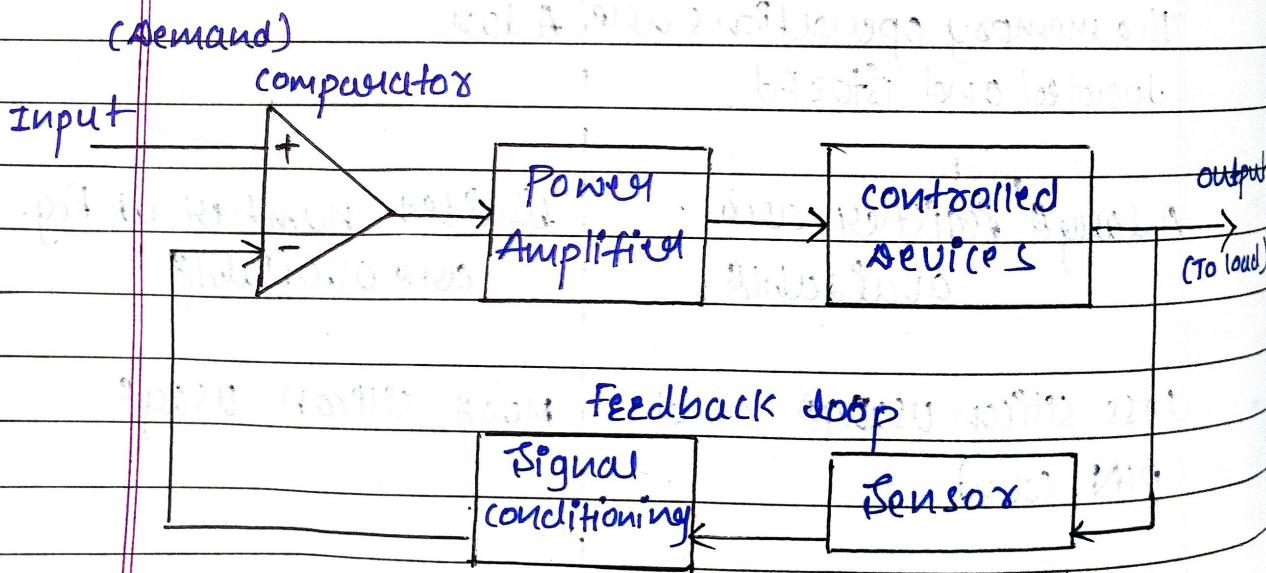


Fig: Control System

* Transducers

1) Input transducers

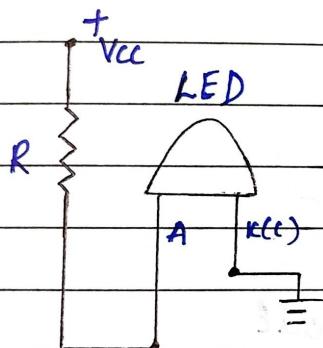
e.g. microphone, thermocouple (temperature measuring).

2. output transducers

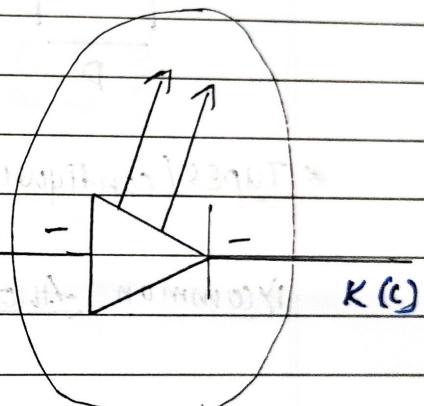
e.g. Loudspeaker, heating Element.

* Actuators

LED :-



LED Interfacing circuit



Symbol of LED

* Advantages of LED:

→ * Lower Energy consumption.

* Longer life-time

* Smaller in size

* Faster switching

* Improved physical robustness

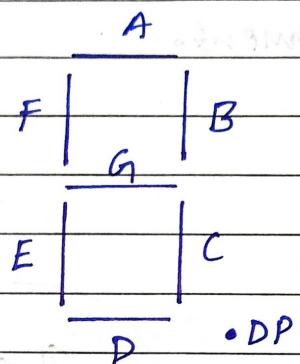
* Application of LED.

* Automotive head lamps

* Traffic Signal

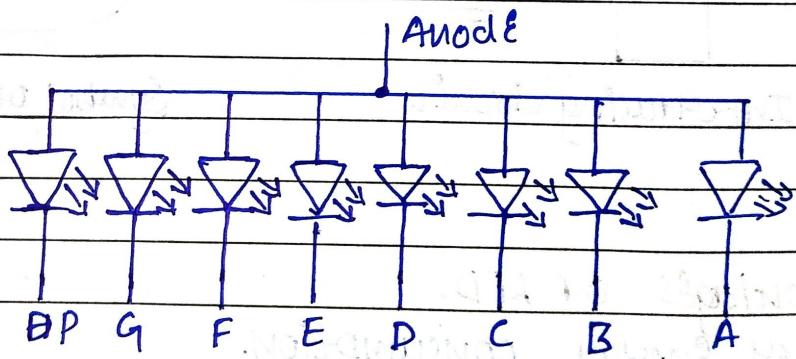
- * camera flashes
- * LED TV's
- * General lighting bulbs
- (*) * Medical devices etc.

* 7-Segmented LED Display



* TYPES / configurations

1) common Anode display :-



2) common cathode display

