18ECO134T – Sensors and Transducers

Unit IV : Session 4 : SLO 2

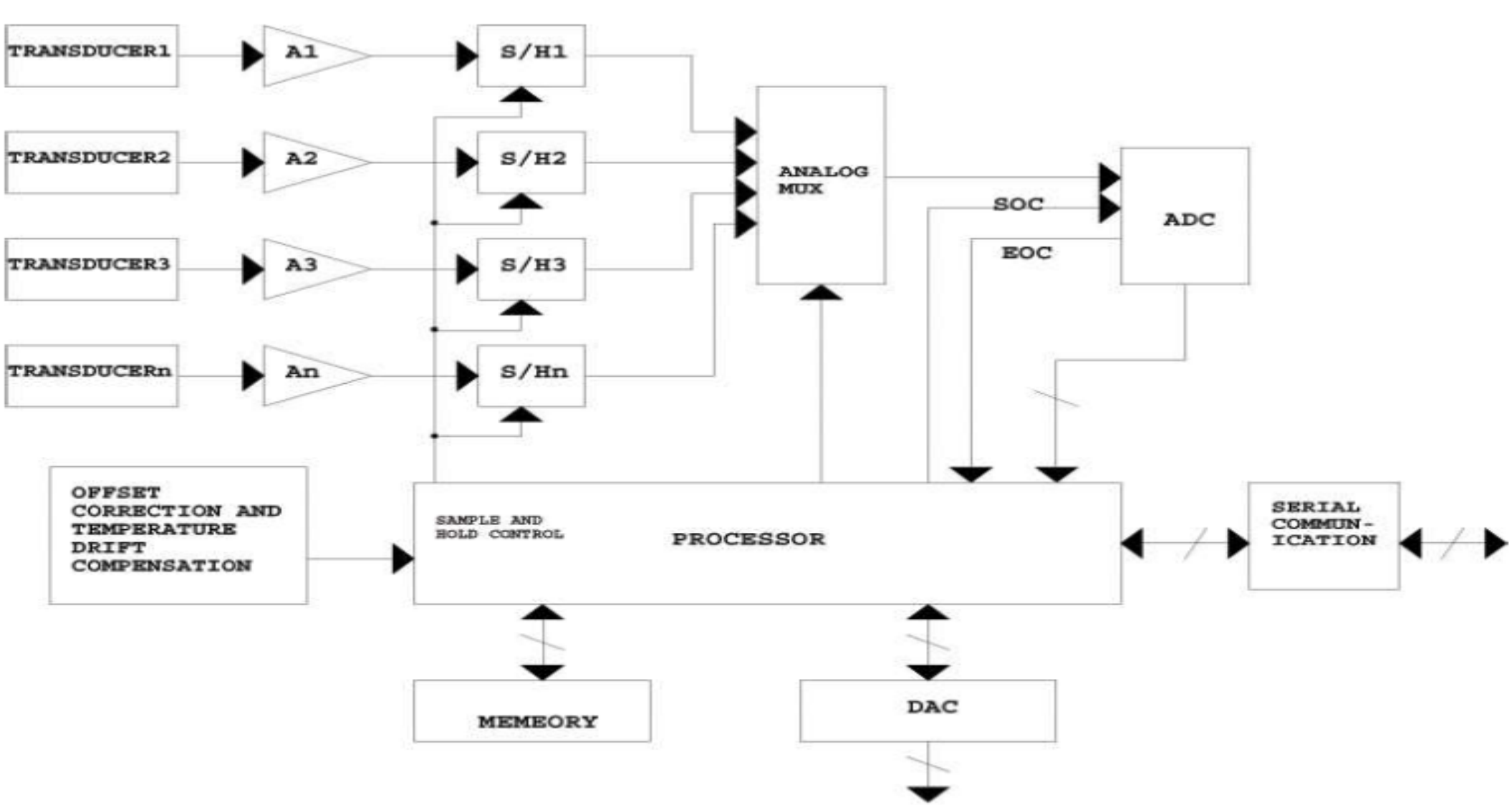
SMART SENSOR

A smart sensor is an analog/digital transducer combined with a processing unit and a communication interface. It consists of transduction element, signal conditioning electronic and controller/processor that support some intelligence in a single package.

This integrated sensors which has electronics and the transduction element together on one silicon chip, this system can be called as system-on-chip (SoC).The main aim of integrating the electronics and the sensor is to make an intelligent sensor, which can be called as smart sensor. Smart sensors then have the ability to make some decision.

The basic architectural components of smart sensor are listed as follows:

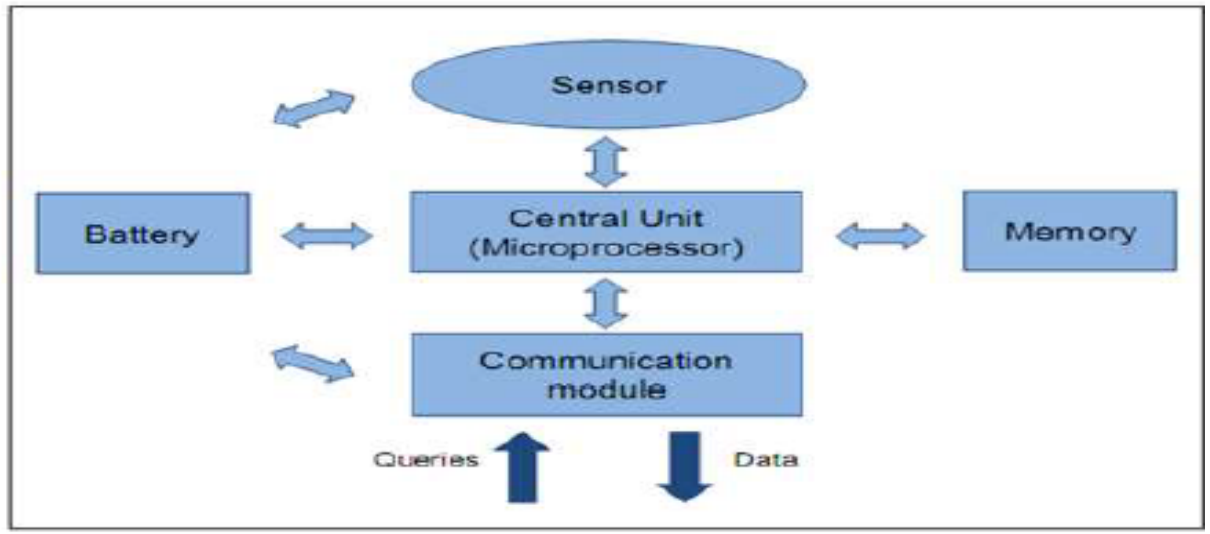
- Sensing element/transduction element,
- Amplifier,
- Sample and hold,
- Analog multiplexer,
- Analog to digital converter (ADC),
- Offset and temperature compensation,
- Digital to analog converter (DAC),
- Memory,
- Serial communication
- Processor



GENERAL ARCHITECTURE OF SMART SENSOR

Five main parts of sensor node are:

- The central unit: It is in the form of microprocessor which manages the tasks.
- Battery: Is the source of energy
- A Transceiver: Interacts with the environment and collects data.
- Memory: Used as storage media for storing data or processing data.
- Communication module: It includes transceivers and forwards queries and data to and from central module. [2]



Smart Sensors - Exmples

- Temperature Sensors
- Proximity Sensor
- Pressure Sensor
- Gas & Smoke Sensor
- Accelerometer Sensors
- Level Sensors
- Image Sensors
- Motion Detection Sensors
- Optical Sensors
- Gyroscope Sensors

Advantage -

- The smart sensor takes over the conditioning and control of the sensor signal, reducing the load on the central control system, allowing faster system operation.
- Direct digital control provides high accuracy, not achievable with analog control systems and central processing.
- The cost of smart sensor systems is presently higher than that of conventional systems, but when the cost of maintenance, ease of programming, ease of adding new sensors is taken into account, the long- term cost of smart sensor systems is less.
- Individual controllers can monitor and control more than one process variable.

Disadvantages -

- If upgrading to smart sensors, care has to be taken when mixing old devices with new sensors, since they may not be compatible.
- If a bus wire fails, the total system is down, which is not the case with discrete wiring. However, with discrete wiring, if one sensor connection fails, it may be necessary to shut the system down. The problem of bus wire failure can be alleviated by the use of a redundant backup bus.