Module 4 : Sensors and Controllers in Robots

Lecture 10 : Incremental encoders and position, velocity sensors, external state sensors

Objectives

In this course you will learn the following

- Internal State Sensing

- Position

- Incremental Encoders

- Position Decoding

- Velocity Measurements

- Velocity from encoder
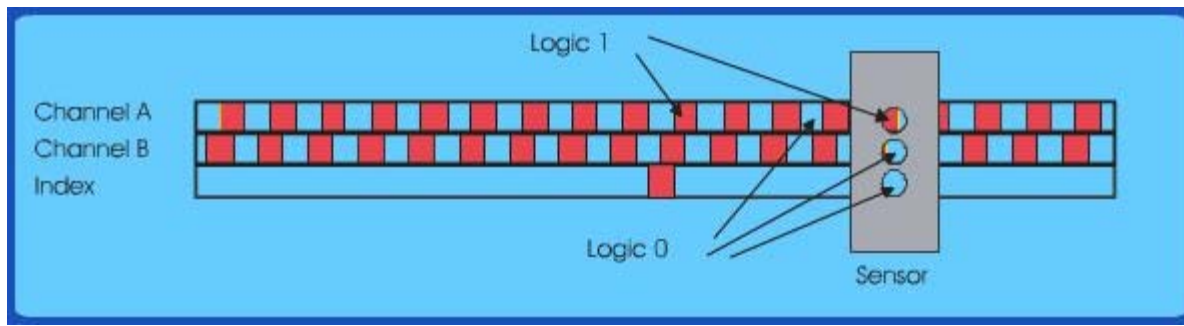
- Acceleration Sensing

- External State Sensing

Internal State Sensing

Position

- Potentiometer

- Absolute encoders

-
  - Binary Vs. Gray Code

- Incremental Encoders

Incremental Encoders

- Initial Position Uncertain

- More Processing

- Less Expensive

- **Velocity from encoder**

  Output pulse frequency œ Speed. Use frequency to Voltage converter.

  - AD451 FVC DC to 10 KHz

- Software estimate

  - Based on current & previous positions, higher order estimation of derivative.

  - Higher delay

  - Sampling time
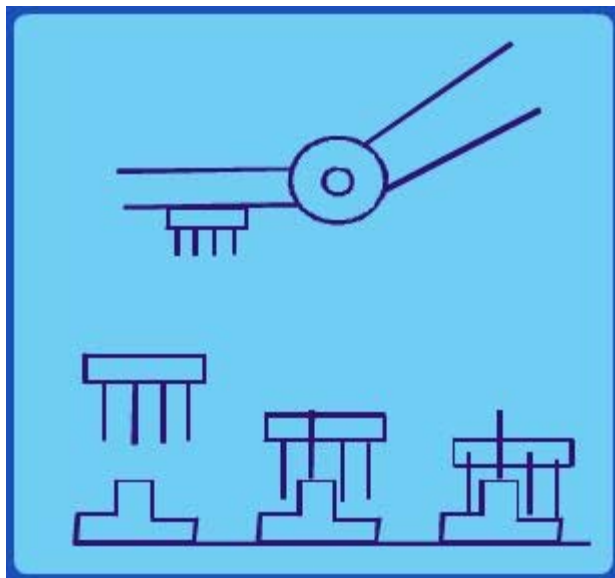
Acceleration Sensing

- Generally acceleration is not specified.

- Measured using 'accelerometers' – device having a known mass supported on springs. The deflection measured using arrangement similar to LVDT.

- Angular Acceleration not measured directly.

- Useful if play in transmission or flexible links.

External State Sensing

- Vision, Touch

- Taste, smell, feel, slip, forces

- Advantages of Tactile sensing over Vision feedback

- More direct

- Fewer data

- Cleaner image

- Ruggedness

- Dynamic range

- Repeatability (Hysteresis)

Proximity Rod Tactile Sensor

Low resolution Binary or Gray Image

Sense Part orientation

Figure 10.1.6

Recap

In this course you have learnt about

- nternal State Sensing

- Position

- Incremental Encoders

- Position Decoding

- Velocity Measurements

- Velocity from encoder

- Acceleration Sensing

- External State Sensing

  Congratulations, you have finished Lecture 10. To view the next lecture select it from the left hand side menu of the page

  Velocity Measurements

- Permanent Magnet DC Motor working as a generator.

- Each armature coil giving rectified DC

- Increase No. of coils (19-23) ripple < 1%

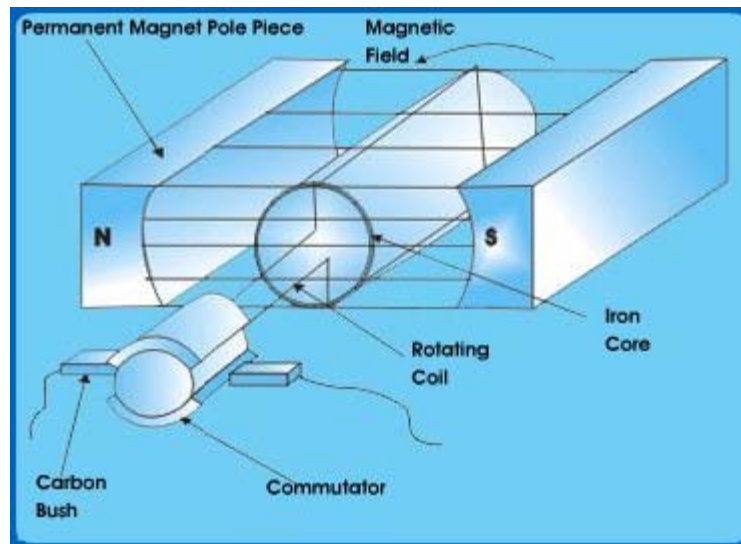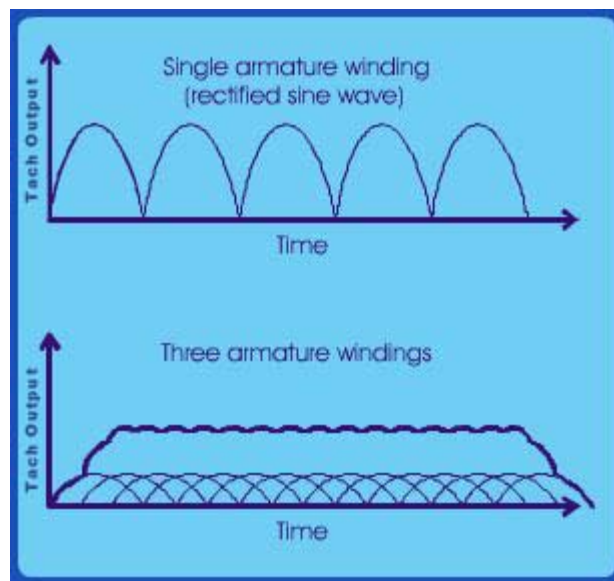- Reduce Iron in armature => Inductance reduces, No. of coils increases

Figure 10.1.4

Figure 10.1.5