Hall Effect and Magnetism

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Hall Effect

Current passing through a conductor or semiconductor placed in a magnetic field

Result of Lorentz force

Requires - conductor or semiconductor, DC power, magnet, amplifier
Basic set up

Hall voltage – Voltage difference across medium

Extremely small voltages (μV)

Application

Proximity and displacement
Current and magnetic flux density

Variable Reluctance Sensors

Reluctance is the ratio of magnetomotive force (mmf) to magnetic flux.

Represents the opposition to magnetic flux.

Much like the resistance of an electrical circuit.
Variable Reluctance Sensors

Constructed by winding copper wire around a permanent magnet.
Do not require external power (passive)
Two wire leads, a signal and ground.

Variable Reluctance Sensors

Paired with ferrous gear-like ring with square teeth.
One cycle on output signal represents one tooth count.
Voltage magnitude is directly proportional to changing magnetic field
VR Sensor Applications

Automatic braking systems in modern vehicles

Work well in dirty environments

Engine speed sensors

Inductive Proximity Sensors

Induction is the production of an electromotive force across an electrical conductor in a changing magnetic field.
Inductive Proximity Sensors

Consists of coils of copper wire encased in metal with non-conductive tip

Impedance increases as ferrous target distance decreases

Require external power (active)

Inductive Proximity Sensors

Oscillation amplitude decreases

Detects oscillation amplitude and outputs an on or off signal
IP Sensor Applications

Used in some 3D printers to detect a metal print bed for auto bed leveling.

References

https://automation-insights.blog/2014/03/05/basic-operating-principle-of-an-inductive-proximity-sensor/
http://fullfunctioneng.com/info/Hall%20vs%20VR.pdf