ENGR 3421: ROBOTICS I

Encoder

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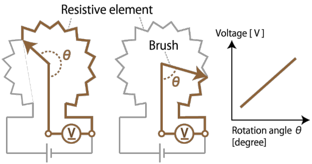
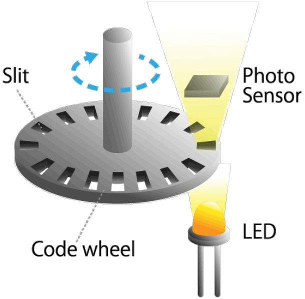
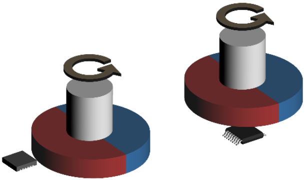
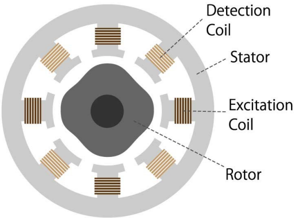
Types of Encoder

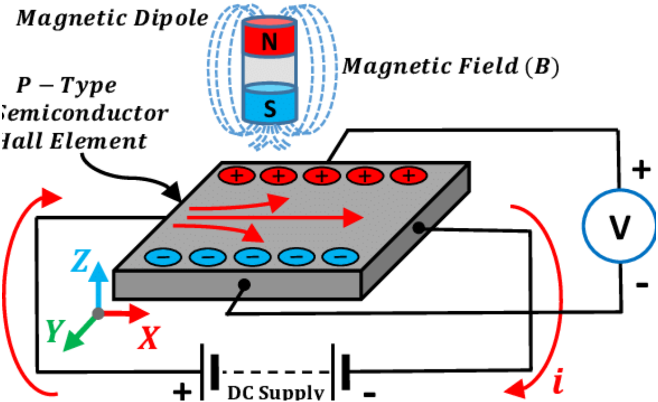






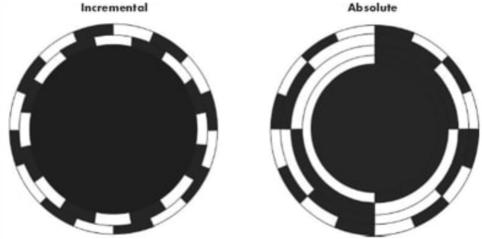


Hall Effect



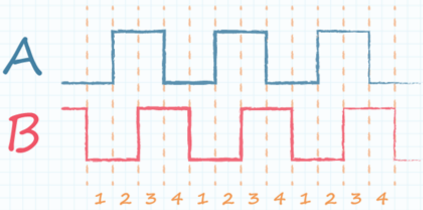
Magnetic Dipole
N
S
Magnetic Field (B)
P – Type
Semiconductor
Hall Element
Z
Y
X
V
+
-
DC Supply
+
-
i

Absolute Encoder vs. Incremental Encoder



Absolute	Incremental
More complicated	Simpler
Output position and velocity	Output velocity and displacement (optionally direction)
Fixed origin	Floating origin
Lower cost	More expensive

Quadrature Encoder



A	0	0	1	1
B	0	1	1	0
#	1	4	3	2

Clockwise

A	0	1	1	0
B	0	0	1	1
#	1	2	3	4

Counter Clockwise

Encoder Usage

Details for item #4805

Exact gear ratio: $\frac{22 \times 22 \times 22 \times 22 \times 24}{12 \times 10 \times 10 \times 10 \times 10} \approx \mathbf{46.85:1}$

Using the encoder

A two-channel Hall effect encoder is used to sense the rotation of a magnetic disk on a rear protrusion of the motor shaft. The quadrature encoder provides a resolution of 48 counts per revolution of the motor shaft when counting both edges of both channels. To compute the counts per revolution of the gearbox output, multiply the gear ratio by 48. The motor/encoder has six color-coded, 8″ (20 cm) leads terminated by a 1×6 female header with a 0.1″ pitch, as shown in the main product picture. This header works with standard 0.1″ male headers and our male jumper and precrimped wires. If this header is not convenient for your application, you can pull the crimped wires out of the header or cut the header off. The following table describes the wire functions:

$$\omega = \frac{c}{CPR \cdot t} \cdot 2\pi$$

ω: shaft angular speed, c: counts, CPR: counts per revolution, t: time

$$\dot{\theta} = \omega / i$$

$\dot{\theta}$: wheel angular speed, i: gear ratio

$$v = R \cdot \dot{\theta}$$

v: vehicle speed, R: wheel radius