



Encoder

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📁 Class	IGVC

Mechanical Subsystem

Q1)

What is an encoder ?

A rotary encoder is a device that converts the angular position of a rotating object into an electrical signal.

In this project, a high-accuracy motor encoder is made using six disc magnets placed at 60-degree intervals around the motor wheel and a Hall effect sensor to detect rotational motion. The goal is to measure the angular displacement of the motor shaft with high precision while ensuring simplicity and ease of implementation.

Working Principle ??

The encoder works based on the **Hall effect principle**, which states that when a magnetic field passes through a Hall sensor, it induces a voltage proportional to the field strength.

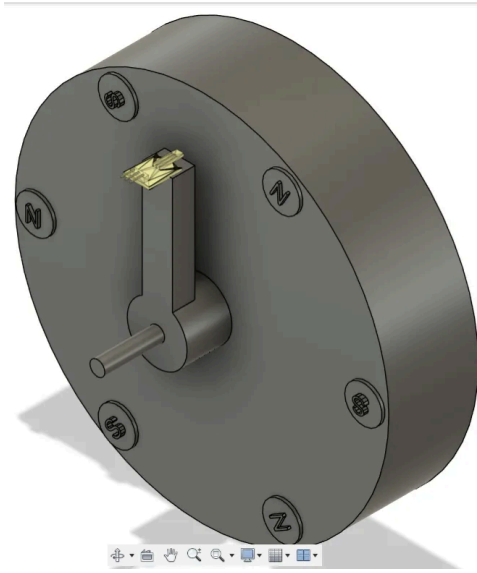
As the motor rotates, the magnets pass by the stationary Hall sensor, causing a change in the detected magnetic field. The ESP-32 microcontroller counts these changes, determining the shaft's angular position and velocity.

Each magnet passing by the sensor generates a pulse, and by counting these pulses, the angular displacement of the shaft can be determined.

Structure

MATERIALS USED

- TIRE {given}
 - Attached HUB
 - KY-035 HALL EFFECT sensor
 - extra bracket for holding the sensor
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- The **disc magnets** are attached to the **outer surface** of the rotating motor wheel at equal intervals (60 degrees)
 - The **Hall effect sensor** is mounted **radially**, positioned close to the path of the magnets but not touching them.
 - The sensor {KY-035} is connected to an **ESP-32 microcontroller**, which reads the pulses and calculates angular displacement and RPM.



FRONT VIEW



Least Count calculations

The least count (minimum measurable angular displacement) of the encoder is determined by the number of detected positions per full rotation.

- **Total number of magnets = 6**
- **Magnets are spaced at 60-degree intervals**
- **One full rotation (360 degrees) results in 6 pulses**

Thus, the least count (LC) is calculated as:

This means the system can measure angular displacement in steps of 60 degrees. To increase accuracy, we could use additional magnets .

Working Video

raw file in the below github link

IGVC_101/Working Video.mp4 at main · Adithya-Vishnu/IGVC_101
 Files to be added along with commenting on the tasks - Adithya-Vishnu/IGVC_101

Adithya-Vishnu/
IGVC_101

Files to be added along with commenting on the tasks

https://github.com/Adithya-Vishnu/IGVC_101/blob/main/Working%20Video.mp4

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