Mechatronic Systems Design
HW3

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PROBLEM1

- Q: Investigate and explain the coding for the disk of an absolute encoder.

- A: Inside an absolute encoder, there're serval concentric tracks on the code disk. Each track represents a bit, combining these bits yields a digital word. Each digital word corresponds to a unique rotational position of the shaft. Thus, the absolute position of the shaft can be identified easily.
  The most common types of numerical encoding used are gray and natural binary codes. Natural binary code is straight forward but may suffer from mutiple changes of bits in one transition. Usually, the gray code is preferred as only one bit changes state for each count transition.

PROBLEM2

- Q: Investigate and explain how does the hall sensors in the ABS work to measure the wheel velocity in a reasonable accuracy? Note that the sensor is essentially a low-resolution position sensor.

- A: A typical configuration is shown as Fig(0.1). Each time a gear teeth is opposed to the magnet, a peak voltage is generated. Thus the velocity can be measured from the gap between two pulse. Despite the low-resolution property of hall sensor, the velocity accuracy is refined by increasing the number of teeth when the radius of gear is fixed.
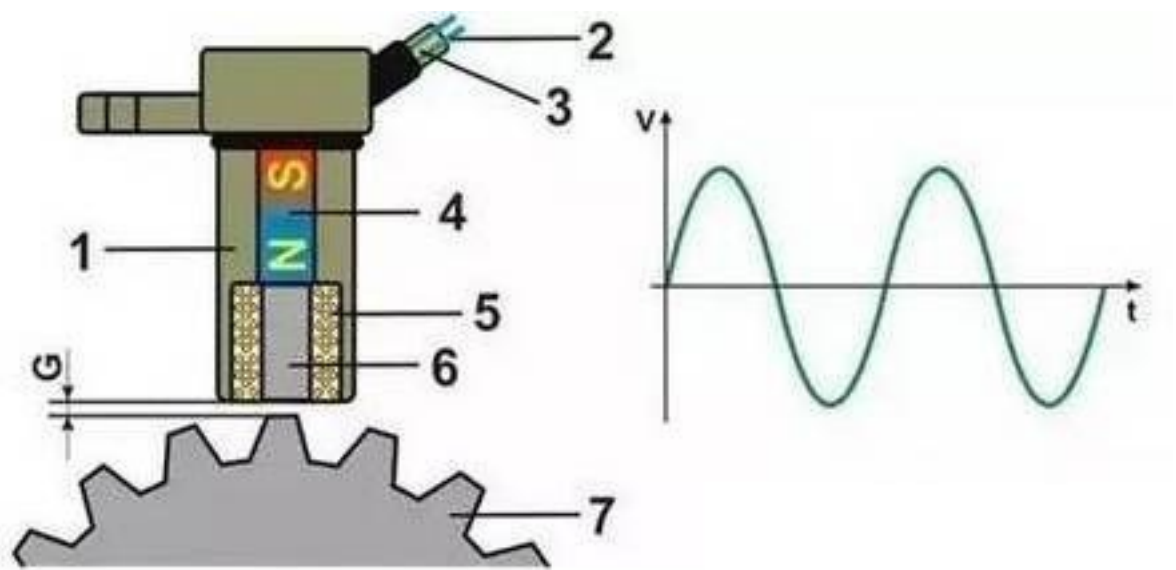
Figure 0.1: Hall sensor in ABS