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**SENSOR FAULT**

We are going to discuss four different type of sensor fault.

1. Sensitivity Error
2. Offset Error
3. Hysteresis Error
4. Quantization Error

**SENSITIVITY ERROR:**

Sensitivity error occurs when the sensor’s output does not change proportionally to the change in the input. For example, if a temperature sensor is supposed to increase by 1 degree increase in actual temperature, but instead it increases by 0.9 degrees, there is a sensitivity error.

**OFFSET ERROR:**

Offset error occurs when there is a constant deviation between the sensor’s output and the actual value. This means the sensor always reads too high or too low by a constant amount. For example a temperature sensor consistently reading 5 degrees higher than the actual temperature. This sort of errors can be detected by comparing sensor readings with a known reference and can be corrected by adjusting the sensor’s output by the offset amount

**HYSTERESIS ERROR:**

Hysteresis error occurs when the sensor's output depends on the previous input values, leading to different outputs for the same input depending on the history of the input. A temperature sensor that shows different readings when the temperature is increasing compared to when it is decreasing. Hysteresis errors can be detected by cycling the input over its range and observing if the output follows the same path. Corrections may involve mechanical adjustments or software algorithms to account for the hysteresis.

**QUANTIZATION ERROR:**

Quantization error occurs in digital sensors where the continuous input signal is converted to a discrete digital value, causing small errors due to rounding. A temperature sensor that rounds the actual temperature of 23.7 degrees to 24 degrees. Quantization errors can be reduced by using sensors with higher resolution. Filtering techniques can also help in minimizing the impact of quantization errors.