MANF 486: Mechatronic Systems Laboratory

Lab #8 - Smart Sensor

School of Engineering

Introduction

Sensors are used in systems all around us to tell us something about the environment or scenario they are monitoring. Traditionally, standard sensors have two jobs: To receive inputs from a physical environment and to send the resulting data to some type of master device. This master device could be a PLC, SCADA system, etc. This setup often is sufficient for the given application but in some cases there is another step that is desired to be performed by the sensor itself. This is where smart sensors, the topic of this lab, come in .

The third additional step that is performed by a smart sensor occurs between the standard sensors two steps. This additional step requires the sensor to have a microcontroller built into its hardware. The microcontroller allows for the sensor to perform a number of tasks in this new second step such as predictive maintenance, fault compensation, and adaptation to a process. It may be unclear at this point as to why offering these functions at the sensor level rather than at the master device but we will discuss this further below.

Standard sensors rely on an output from their master device to tell them what to record, how to record, and the details of the data acquisition. This does work in most cases but with the rise in smart sensor technology, we can increase efficiency, accuracy, and reliability in data acquisition through the replacement of standard sensors to their smart counterparts.

The rise of the IOT industry is another reason that smart sensors are so valuable. Due to their ability to process data prior to outputting the signal, IOT networks are able to read data from smart sensors without the need of another device. The sensors are connected over a network (e.g. WSAN) and with the use of sensor hubs, data can be directly uploaded to the cloud. This implementation of smart sensors with the use of IOT networks is a driving force behind industry 4.0.

In this lab, we will be looking at how different distance measurement devices utilize their smart capabilities and how we can implement them within a PLC program. This will require us to understand how data is sent from smart sensors and how it needs to be received by the PLC program in order to be useful to us.

The question must be asked: Why as manufacturing engineers do we need to understand how smart sensors work and how to implement them in a real world scenario? This is because as we have learned in class, technology evolves within the world of manufacturing quickly, and it is important that we keep up with these advances in order to stay relevant. A technology such as smart sensors offers increased reliability, accuracy, and reliability which are all characteristics that are highly sought after in the world of manufacturing.

Solution Description