Mechatronics Sensors Training Kit

Overview

The Mechatronics Sensors training kit is designed as basic educational equipment for design and modernization of intelligent systems. Sensors in mechatronics are used to obtain information about the status of various nodes of system. The training equipment enables the user to study the operating principles and characteristics of various sensors and methods of machine vision. The training kit is equipped with the following sensors:

- photosensors
- inductive sensor
- capacitive sensor
- magnetic sensor (reed switch)
- color sensor

The following test samples are used during the hands-on experiments:

- set of color samples
- set of dielectric samples
- set of metal samples

Applications of machine vision are used in mechatronic complexes for flow process automation, product quality control and noncontact measurements of parameters. In this course the basic functions of image processing and analysis are considered, suchas:

- edge detection
- pattern matching
- dimensional measurements
- reader function
- optical character recognition

The main functions of machine vision are studied using specially designed disks. For the configuration of electronic components connector block is designed. The course software has a simple user interface. During each experiment, the corresponding window with the necessary tables, coordinate planes, and calculation formulas are displayed on the monitor. Students will collect, display and save the obtained data in tables and graphs.

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List of Labs

Sensors

1. Barrier and diffuse photosensors
2. Capacitance sensor response distance dependence on the thickness of the dielectric
3. Capacitance sensor response distance dependence on the relative permittivity (ε) of dielectric
4. Study of operating principles and characteristics of the inductive sensor
5. Tests of the magnetic sensor - reed switch
6. Tests of the color sensor
7. Connecting sensors depending on the type of output stage

Machine Vision

1. Edge detection function
2. Pattern matching function
3. Dimensional measurements function
4. Reader function
5. Optical character recognition function

The educational platform gives students the opportunity to obtain the following knowledge and skills:

- studying operation principles of sensors
- sensors testing
- the study basic functions of machine vision
- acquisition of knowledge in the field of image processing and analysis

The Mechatronics Sensors training kit is based on the NI myRIO control-measuring equipment. Course software has been developed in the NI LabVIEW Graphical Programming Environment.

The course software has a simple user interface. The exercises include mechanical assembly and software implementation of the production task.

The training kit guidelines have been developed with theoretical material and stepby- step instructions for each experiment.

The Mechatronics Sensors training kit is delivered in a plastic container. The training kit is designed for high school and college students.