Sense, Think And Act Of A Robotic Module Based On Labview

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Abstract: *For years, Lab VIEW has enabled engineers and scientists to develop sophisticated autonomous systems. At its core, Lab VIEW is widely used for sensor and actuator connectivity and currently offers more than 8000 drivers for measurement devices. By providing a single environment that is a framework for combining graphical and textual code, Lab VIEW gives you the freedom to integrate multiple approaches for programming, analysis, and algorithm development. Furthermore, with new libraries for autonomy and an entirely new suite of robotics-specific sensor and actuator drivers, Lab VIEW provides all of the necessary tools for robotics development.*

In this project, sense think and act of a robotic module is developed. In the sensing process three sensors (i.e.LM35temperature sensor, Humidity sensor, Light Dependent Resistor sensor) are used. These sensors values are screened by connecting to the NI 9221 DAQ card. In the thinking process, four flip-flops (i.e. T flip-flop, D flip-flop, JK flip-flop, SR flip-flop) are used. The derived equations of these flip-flops are calculated and by using these derived equations the block diagram is created by which the output of these flip-flops are obtained. In the acting process, the movement of the robot is controlled by using lab view, in the lab view four different keys are assigned for the forward, backward, left and right movement of the robot.

I. Introduction:

Lab VIEW software has made it easy to program complex robotics applications by providing a high level of abstraction. The ability to import code from other languages - including C and HDL - and to communicate with a wide variety of sensors using built-in drivers dramatically reduces development time, so you can focus on adding your own algorithms and intelligence. The same powerful platform is capable of targeting a variety of processors including off-the-shelf real-time and FPGA-based systems as well as custom microprocessor and microcontroller devices. Lab VIEW development environment as well as other foundational products including the Lab VIEW Real-Time, Lab VIEW FPGA, Vision Development, Lab VIEW Control Design and Simulation, and Lab VIEW NI Soft Motion modules.

The new Lab VIEW Robotics Module includes all of the software tools needed to design a sophisticated autonomous or semi-autonomous system. Robots are very complex mechatronics systems, so to simplify them, we can apply a simple paradigm - **sense, think, and act**. Every autonomous or semi-autonomous robot, in some form or another, must sense it's environment, make a decision, and act on the environment. The new Lab VIEW Robotics module provides APIs and example programs for each step of the sense - think - act process.

II. DAQ(Data acquisition):

DAQ card is used both in the sensing as well as in the acting process. In the sensing, DAQ 9221 is used for screening the values by converting the analog values to digital values and in the acting part DAQ 9423 is used to convert the digital input values.

a. NI DAQ 9221(Universal Analog Input):

The NI 9221 is a four-channel universal C Series module with 24 bit resolution designed for multipurpose testing in any NI Compact DAQ or Compact RIO chassis. With the NI 9221, we can measure several signals from sensors such as strain Gauges, RTDs, thermocouples, load cells, and other powered sensors. The channels are individually selectable, so you can perform a different measurement type on each of the four channels. Measurement ranges differ for each type of measurement and include up to ±60 V for voltage and ±25 mA for current

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Fig. 1.NI DAQ 9221

The NI 9221 channels are isolated from other modules in the system. The module protects each channel from overvoltage. The input signals are scanned, buffered, conditioned, and then sampled by a single 12-bit ADC.

b. *NI DAQ 9474:*

The NI 9474 is an eight-channel, 1 µs high-speed sourcing C Series digital output module. It works in any NI Compact DAQ or Compact RIO chassis. Each channel is compatible with 5 to 30 V signals and features transient overvoltage protection of 2,300 Vrms between the output channels and earth ground. Each channel also has an LED that indicates the state of that channel. With the NI 9474, we can connect directly to a variety of industrial devices such as motors, actuators, and relays.

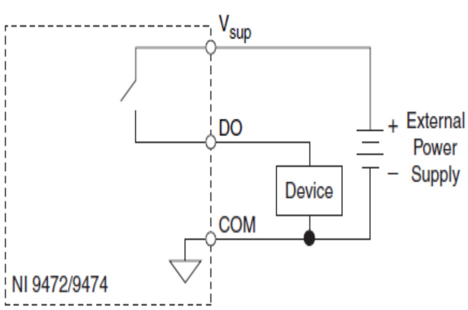


FIG.2.NI DAQ 9474 INPUT CIRCUIT

The NI 9474 module is a correlated digital module, which means it can perform correlated operations, triggering, and synchronization when installed in an NI Compact DAQ chassis. We can directly connect the NI 9474 to a variety of industrial devices such as solenoids, motors, actuators, relays, and lamps.

III. Sensing:

In the sensing process, three sensors (LM35 temperature sensor, Light Dependent Resistor sensor, Humidity sensor) are used. These analog sensors are applied as the input to the NI DAQ 9221, these values are screened and the output values are taken in the digital form in the front panel of lab view.

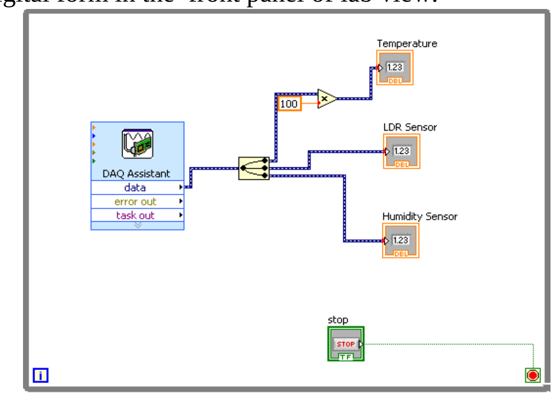
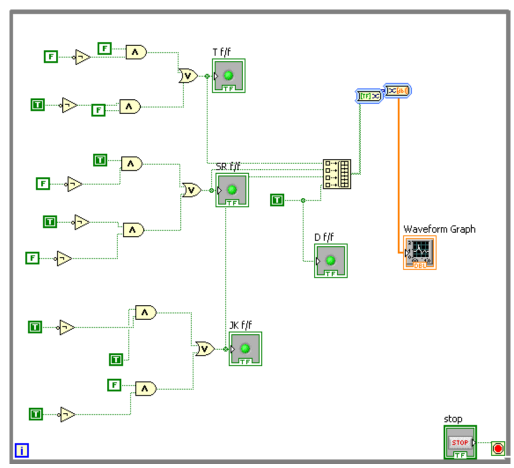


FIG.3. GRAPHICAL CODE FOR SENSING:



IV. Thinking:

FIG.4.GRAPHICAL CODE FOR THINKING

In the thinking process, T flip-flop, D flip-flop, JK flip-flop, SR flip-flop are used. Characteristic equations of each flip-flops are calculated, using these output characteristic equations the functioning of each flip-flop is observed in the front panel of the lab view.

V. Acting:

In the acting process, movement of the robot is controlled by assigning keys in the lab view front panel. In the lab view four different keys are assigned

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for the forward, backward, left and right movement of the robot. These operations of the robot are done by

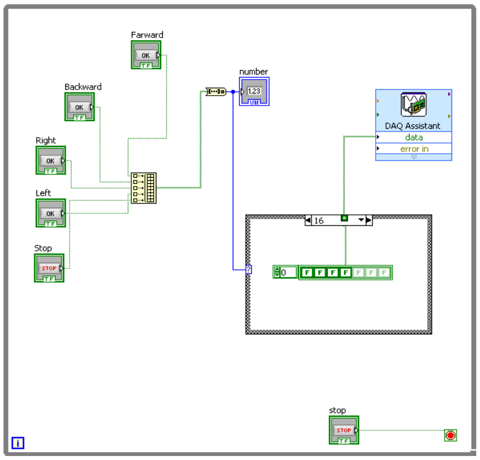

FIG.5.GRAPHICAL CODE FOR ACTING

using the case structure, in the case structure it consists of four cases. Four cases have four different operations to carry out.

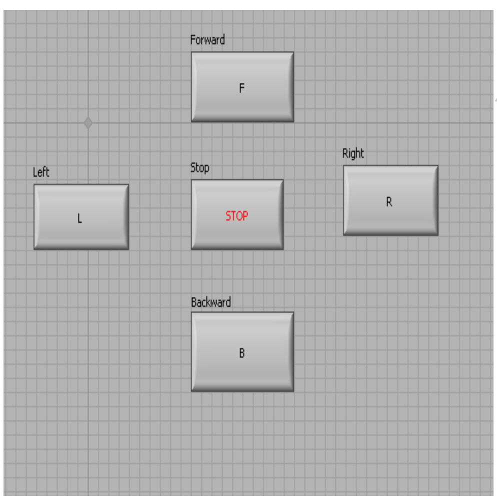

FIG.6.FRONT PANEL FOR ACTING

Type	Values
Temperature Sensor	27.256
Humidity sensor	3.568
LDR sensor	4.254

TABLE.1. SENSOR VALUES

VI. Conclusion:

Sense, think and act of the robotic module is done. By monitoring the robot we can find the three different sensor values in a particular place or in an environment by linking up the sensing and acting part. By assigning four different cases for four different operations in the lab view, the outputs obtained from the four different flip-flops thinks and perform the operation from the logic by linking up the thinking and acting.

VII. References:

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