AUTOMATIC BOTTLE FILLING SYSTEM USING LABVIEW

1RM.NACHAMMAI, 2P.BHARGGHAVI

1,2 Third Year, Instrumentation and Control Engineering, Saranathan College of Engineering, Trichy
Email: nachammairamasami@gmail.com, pbhargghavi@gmail.com

Abstract - The objective is to control a sequential process, a bottle filling system in a fully automated manner. With the help of NI-LabVIEW we have controlled this continuous control and discrete-state process control. Conveyor movement is monitored by the stepper motor, position of the bottle through proximity sensor, and level are controlled. Bottle is filled through a solenoid control valve. The continuous process is monitored by using a timing in LabVIEW. This process in real time could be conducted by using the NI-myRIO or NI-myDAQ.

Index Terms — NI-LabVIEW, proximity sensor, NI-myDAQ, NI-myRIO.

I. INTRODUCTION

Packaging industry plays a vital role in ensuring the product. In most industries PLC’s play a vital role in controlling a process and the cost of it is also really high. In order for small scale industries who can’t afford for such expensive devices could use this idea which could be easily implemented.

In real time application we could use a stepper motor for the controlling movement, proximity sensor for indicating the bottle’s presence and solenoid valve which must switch on as soon as possible as the bottle is sensed and must switch on and off for a particular period of time. Here time takes care of the level of the bottle to fill for an appropriate level.

The interfacing is done by using NI-myRIO a versatile device an invention of National Instruments. It acquires and generate signals. The advantage of this device is that it makes it possible for anyone to upload the program on to the device and it could be carried without the need of any human interference.

II. INTRODUCTION TO SOFTWARE

Laboratory Virtual Instrumentation Engineering Workbench, a very popular product of National Instruments. Virtual Instrumentation deals with the way of programming by the use of graphical images and icons instead of text based programming. It is easy to interpret by the user and its flow is similar to data flow programming.

It consist of three components – Front Panel, Block Diagram and Connector Pane. Programming is done through controls and indicators. It has versatile applications like audio processing, optical synthesis etc.; Position, velocity and current control in normal circuitry using LabVIEW.

The graphical language is named as “G” known as graphical programming. The execution is determined by the use the structure of a graphical block diagram on which the programmer connects different function-nodes by drawing wires. G is inherently capable of parallel execution.

Multi processing and multi-threading hardware is automatically exploited by the built-in scheduler, which multiplexes multiple OS threads over the nodes ready for executions. LabVIEW ties the creation of user interfaces (called front panels) into the development cycle.

LabVIEW programs/subroutines are called virtual instruments(VIs). Each VI has three components: a block diagram, a front panel and a connector panel. The last is used to represent the VI in the block diagram of other calling VIs. The front panel is built using controls and indicators. Controls are inputs- the allow user to supply information to the VI. Indicators are outputs- the indicate, or display the results based on the inputs given to the VI.

It is used for data acquisition, instrument control and industrial automation on a variety of platforms including Microsoft Windows, various versions of UNIX, Linux, and Mac OS X. The latest version of LabVIEW is LabVIEW-myRIO2014.
LabVIEW provides built-in template VIs that include the subVIs, functions, structures, and front panel objects you need to get started building common measurement applications.

Complete the following steps to create a VI that generates a signal and displays it in the front panel window.

1. Launch LabVIEW.
2. Select File » New to display the New dialog box.
3. From the Create New list, select VI » From Template » Tutorial (Getting Started) » Generate and Display. This template VI generates and displays a signal.

A preview and a brief description of the template VI appear in the Description section. The following figure shows the New dialog box and the preview of the Generate and Display template VI.

4. Click the OK button to create a VI from the template. You also can double-click the name of the template VI in the Create New list to create a VI from a template.

LabVIEW displays two windows: the front panel window and the block diagram window.

5. Examine the front panel window. The user interface, or front panel, appears with a gray background and includes controls and indicators. The title bar of the front panel indicates that this window is the front panel for the Generate and Display VI.

6. Select Window » Show Block Diagram and examine the block diagram of the VI.

The block diagram appears with a white background and includes VIs and structures that control the front panel objects. The title bar of the block diagram indicates that this window is the block diagram for the Generate and Display VI.

Adding a Control to the Front Panel

Front panel controls simulate the input mechanisms on a physical instrument and supply data to the block diagram of the VI.

1. If the Controls palette, shown in Figure below, is not visible in the front panel window, select View » Controls Palette.

2. If you are a new LabVIEW user, the Controls palette opens with the Modern palette, shown in the following figure, visible by default. If you do not see the Modern palette, click Modern on the Controls palette to display the Modern palette.
3. Move the cursor over the icons on the Modern palette to locate the Numeric Controls palette.

When you move the cursor over icons on the Controls palette, the name of the subpalette, control, or indicator appears in a tip strip below the icon.

4. Click the Numeric Controls icon to display the Numeric Controls palette.

5. Click on the Numeric Controls palette to attach the control to the cursor, and then add the knob to the front panel.

III. SEQUENTIAL PROCESS

Sequential process is one of the common operations in industries. Control of sequential operation is equally important for many processes. There are several sequential process existing in industries. In this study the simple bottle filling operation is considered for experiment. It is possible for a continuous control system to be part of a discrete-state process-control system. As an example, we consider this experiment.

This system consists of a conveyor on which the bottles are placed; the conveyor motor is controlled by VI. Periodically a bottle comes into position under the outlet valve is opened and the bottle is filled. This requirement may be necessary to ensure a constant pressure head during bottle filling. This process will require that a continuous-level control system be used to adjust the input flow rate during bottle-fill through the output valve. The continuous control system will be turned on or off just as other discrete device like motor. Thus the continuous control process is a part of the overall discrete-state process.

Schematic of bottle filling system:

Algorithm:
The basic algorithm for bottle filling system involves the following sequence. The objective is to fill bottles moving on a conveyor. Assume that when a command is given to stop the continuous control system, the input valve is driven to the closed position. Then the sequence would be

A. Start the bottle Conveyor
B. When a bottle is in position:
   1. Stop the conveyor
   2. Open the output valve
   3. Turn ON the Level-Control System to keep the level constant during Bottle Fill
C. When the bottle is full:
   1. Close the output valve
   2. Stop the level control System
D. Go to Step A and Repeat
**IV. PROCEDURE**

1. Open NI LabVIEW 8.5 and press <Ctrl_N> to open a blank VI.
2. Press <Ctrl_T> to tile front panel and block diagram windows.
3. Pull up the **Functions Palette** by right_clicking on the white space on the LabVIEW block diagram window.
4. Select **Express » Input** palette, and click the **DAQ Assist Express VI**.
5. Drag DAQ Assistant VI to the block diagram, now configure window appears.
6. Click on **Analog Input » Voltage**, select channel **ai0**, and click **Finish**, to sense bottle.
7. Click **OK** to close the Express block configuration window to return to the LabVIEW block diagram.
8. Repeat steps 7 to 11, now select channel **ai1**, and click **Finish**, to sense conveyor status.
9. Repeat steps 7 to 9, Click on **Analog Output>> Voltage**, select channel **ao0**, to control the conveyor.
10. Connect the blocks in Block diagram panel with appropriate input and output.
11. Make necessary connection from DAQ card to the bottle filling setup
12. Click the **Run button**. The sequence operation is executed.
13. Save the file with extension “.vi”, a virtual instrument.

**V. FRONT PANEL**

**VI. BLOCK DIAGRAM**

**VII. REAL TIME APPLICATION**

**ABBREVIATIONS and ACRONYMS**

NI-Labview – Laboratory Virtual Instrumentation Engineering Workbench
NI-myRIO- Re-configurable I/O
NI-myDAQ- Data Acquisition

**ADVANTAGES**

- Cost effective
- Simple construction
- Easy interfacing
- Portable
- Compatible – accepts future inclusions
- With the help of such a model we could reduce hardware and software requirements when compared to the existing models.

**APPLICATIONS**

- Industries like cement manufacturing, beverages and packing industries can use this LabVIEW based modules in their process.
- Self-help groups can use this for enhancing their productivity efficiency.
- It could also be used in food processing, pharmaceutics etc.;

**CONCLUSION**

Thus we have accomplished a sequential control process using simple techniques in LabVIEW.

Also it is clear that further changes in the system could be updated easily without any changes in the system. Cost involved is also less.

By using this system the company efficiency and productivity could be increased.

**REFERENCES**