Project 6 and Final Project

Objective:

Project 6 dealt with the experimentation on Continuous Digital I/O with Software timing. One of the goals was to familiarize ourselves with digital input/output data acquisitioning concepts by using LabView as a tool and Guide. The second goal, was to develop the multi-channel, software-timed digital input/output VI, that sampled and updated digital lines until asked to stop by the user.

The Final Project objective is to construct a program in which we are able to control the rotation of a stepper motor. As we go through the process of creating this program we will familiarize ourselves with digital output data acquisitioning concepts using LabVIEW’s configuration approach. Some of the Key concepts dealt with was the DAQ Assistant and Time Delay VI’s. Also in this project, you will be introduced to a new concept called Array of Constant which plays an important role in programming of this project. Lastly, the other main goal of the project is to develop a software timed VI that generates a digital output to continuously control a stepping motor until the User decides to stop it.

Materials:

Project 6:
USB Cables
LabVIEW 2012 software
Textbook: Learn LabVIEW 2012 Fast by Douglas Stamps
Wiring Box
NI ELVIS II
Banana Cables
Digital input sources comprising a sensor
FGEN
Power Supply

Final Project:
USB Cables
LabVIEW 2012 software
Textbook: Learn LabVIEW 2012 Fast by Douglas Stamps
Wiring Box
NI ELVIS II
Multimeter or Oscilloscope
Bipolar Stepper Motor
H-bridge driver
Power Supply

Procedures:

Project 6:
1. Begin by creating the multi-channel, software-timed digital I/O VI. The Front panel and Block diagram are showcased in the following.

2. **Time Delay**

   Time Delay
   Inserts a time delay into the calling VI.
This Express VI is configured as follows:

Delay Time: 1 s

3. **DAQ Assistant**

DAQ Assistant

Creates, edits, and runs tasks using NI-DAQmx. Refer to the NI-DAQmx Readme for a complete listing of devices NI-DAQmx supports.

When you place this Express VI on the block diagram, the DAQ Assistant launches to create a new task. After you create a task, you can double-click the DAQ Assistant Express VI to edit that task. For continuous measurement or generation, place a while loop around the DAQ Assistant Express VI.

Configure DAQ Assistant as follows:
For continuous single-point input or output, the DAQ Assistant Express VI might not provide optimal performance. Refer to the Cont Acq&Graph Voltage-Single Point Optimization VI in examples\DAQmx\Analog In\Measure Voltage.llb for an example of techniques to create higher-performance, single-point I/O applications.

4. **DAQ Assistant**

   DAQ Assistant
   Creates, edits, and runs tasks using NI-DAQmx. Refer to the NI-DAQmx Readme for a complete listing of devices NI-DAQmx supports.

   When you place this Express VI on the block diagram, the DAQ Assistant launches to create a new task. After you create a task, you can double-click the DAQ Assistant Express VI to edit that task. For continuous measurement or generation, place a while loop around the DAQ Assistant Express VI.

   Configure DAQ Assistant as follows:
For continuous single-point input or output, the DAQ Assistant Express VI might not provide optimal performance. Refer to the Cont Acq&Graph Voltage-Single Point Optimization VI in examples\DAQmx\Analog In\Measure Voltage.llb for an example of techniques to create higher-performance, single-point I/O applications.
5. After the VI is constructed, continue to build the circuit in the breadboard needed for this project. An image of the Circuit is show below.

Final Project:

1. Begin by constructing the software-timed VI that generates digital output to continuously control a stepping motor. The front panel and block diagram are shown below.
2. **Time Delay**

   ![Time Delay Icon]

   **Time Delay**
   Inserts a time delay into the calling VI.
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   This Express VI is configured as follows:

   Delay Time: 0.01 s

3. **DAQ Assistant**

   ![DAQ Assistant Icon]

   **DAQ Assistant**
   Creates, edits, and runs tasks using NI-DAQmx. Refer to the NI-DAQmx Readme for a complete listing of devices NI-DAQmx supports. When you place this Express VI on the block diagram, the DAQ Assistant launches to create a new task. After you create a task, you can double-click the DAQ Assistant Express VI to edit that task. For continuous measurement or generation, place a while loop around the DAQ Assistant Express VI.

   Configure DAQ Assistant as follows:
For continuous single-point input or output, the DAQ Assistant Express VI might not provide optimal performance. Refer to the Cont Acq&Graph Voltage-Single Point Optimization VI in examples\DAQmx\Analog In\Measure Voltage.llb for an example of techniques to create higher-performance, single-point I/O applications.

4. In order to build the Circuit to generate a digital output to the stepper motor you must use the H-Bridge driver as in displayed in the images below.

![Circuit Image]

**Testing:**

**Project 6:**

For this project, we constructed a multichannel digital I/O with software timing VI and a circuit that is able to read simultaneous digital signals. This program is useful for control equipment via solid state or mechanical relays. Once everything is set for execution and all the right ports are selected, run the program. In this program, we have LED’s and switches in the
front panel that allow the user to control the state of the digital lines. The user is able to continuously turn on and off equipment until the program stops. So the User is able to turn on and off the LED lights by flipping the switches in the Front Panel.

Final Project:

In this project, we had the pleasure of working with program that controls the rotation of a stepper motor. Where we are able to make the motor rotate clockwise and counter clockwise. The rotation is controlled in the front panel of the VI by the user, in which the user has a switch to manage rotation. This program was constructed by using an H-bridge driver. The motor used is called a bipolar stepper motor, which is constructed of two coil windings around magnetically conductive stator and a multi-pole permanent magnet (Stamps 248). According to the book when a coil is energized, a north and south magnetic pole are created in the stator at the positive and grounded ends thus creating a Clockwise rotation. If the electrical current were to reverse it would cause the north and south magnetic poles to also reverse, sequentially creating a counter-clockwise motion. The use of an H-bridge driver is necessary for the reasons that the voltages sizes and amperages won't do well with the DAQ board and the computer, it may cause damages to power supply. After making all the connections, we ran the VI. We were able to control the rotational speed and the direction of rotation of the stepper motor through the “Direction” and “Delay Time” control in the Front Panel. However, before testing the motor we tested the program through some LED’s to see if all the signals were working properly. We encountered some problems trying to light up the second LED. After making a few modifications to the hardware we were able to successfully light all four LEDs. Then we tested the motor, and it responded well to system calls of the switches. An image of the final connection is shown in the image above of the Circuit and motor.