Circumferential Tire Wear Inspection System

By

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Products Used
LabVIEW 8.2
NI Stepper Controller PCI-7332
DAQ CB-SCC-68
SLS 5000 Laser Measurement Device

The Challenge
The client needed an application to assist in the testing of tire wear patterns for safety and quality verification. This system needed to be partly automated for performing calibration and suggested distance from the tire at the center locations to assist the operator in setting up the tests. The test would use the SLS 5000 laser measurement device to measure the amount of tread wear that had occurred over a set amount of road travel for tractor trailer tires.

The application would need to control motion for the positioning of a laser used for profiling the circumferential tire wear. It would also need to take high speed readings at uniform locations along the circumference of the tire. The system also needed to perform a self calibration after the operator sets the initial offset from the distance of the tire to be able to determine the amount of wear from test to test. The first time a tire is tested the information would be saved as a configuration file for that specific tire.

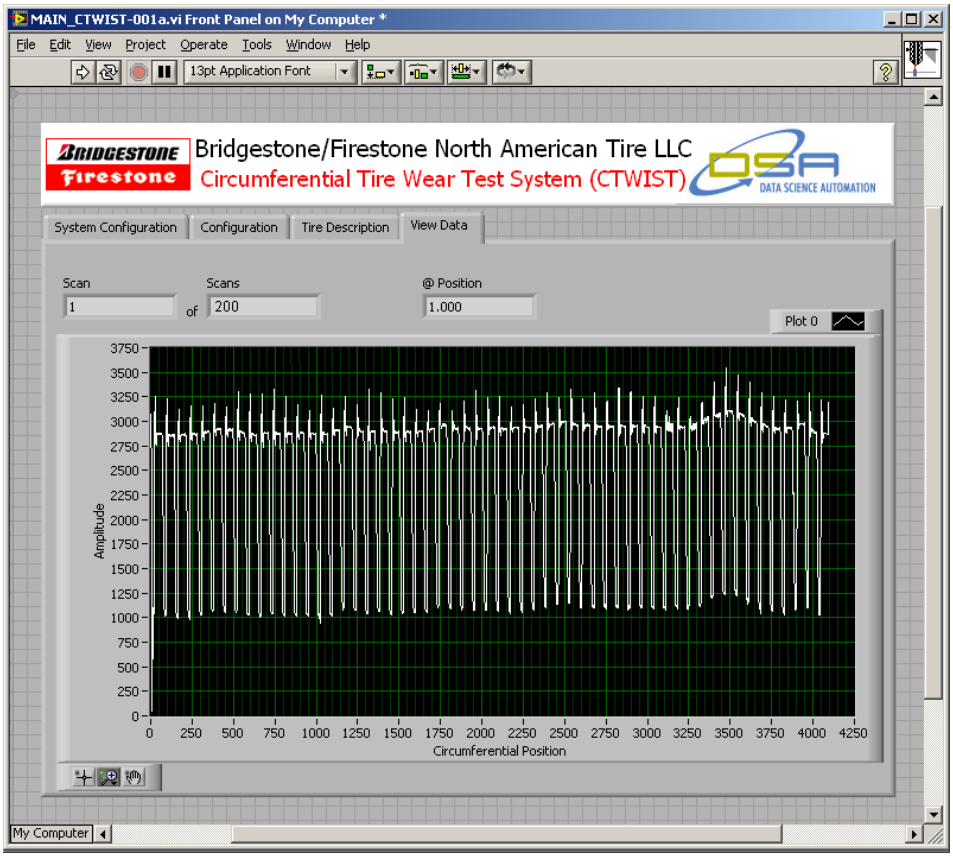

Figure 1

The challenge is for the application to handle manual and automated motion control depending on which one is appropriate for the portion of the test is being run.

The Solution

Data Science Automation was selected to develop software to better test the tires and track the data. Each tire would have a file associated with it that would contain information about the test results. The data for each test will be stored so that it can be compared to previous test data from the tire. The application would take 4096 measurements around the circumference of the tire in 200 incremental steps across the tire width for checking the road worn surface.

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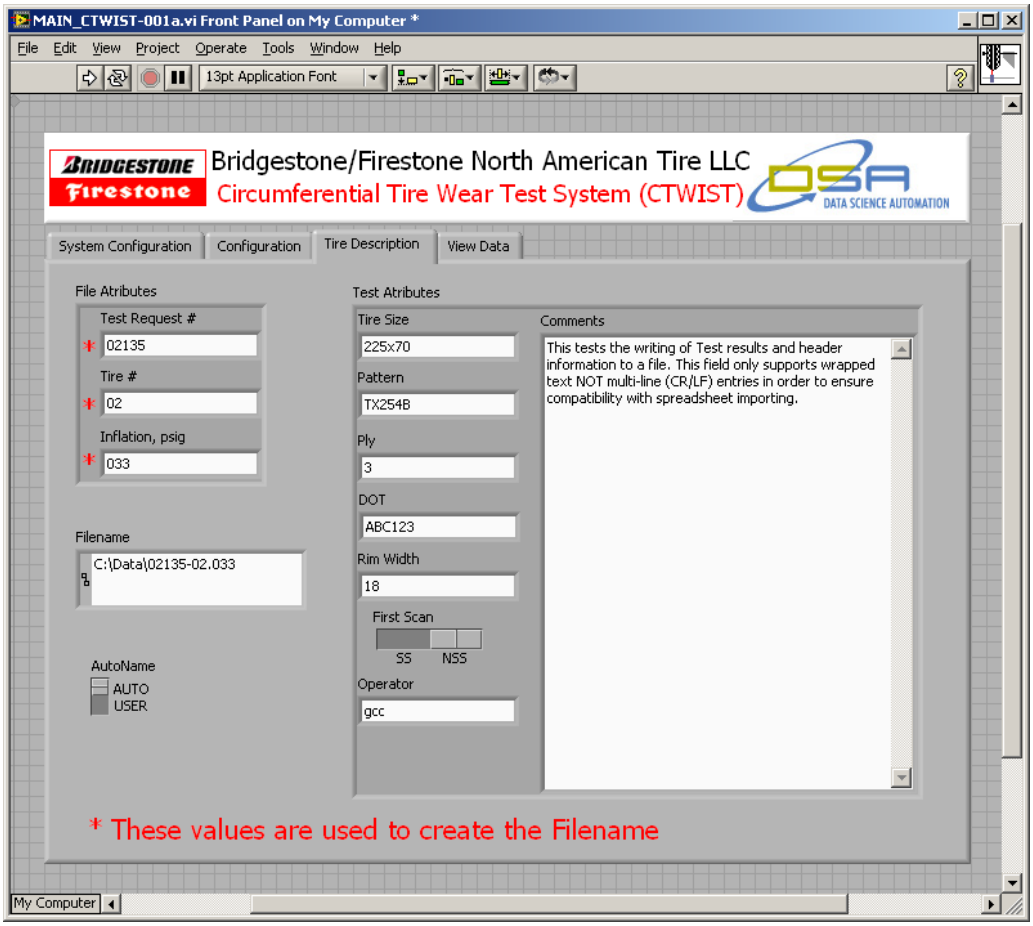

Figure 2

For new tests the tire description would be entered and incorporated into the file name. The test attributes will be used for the header information in the test file.

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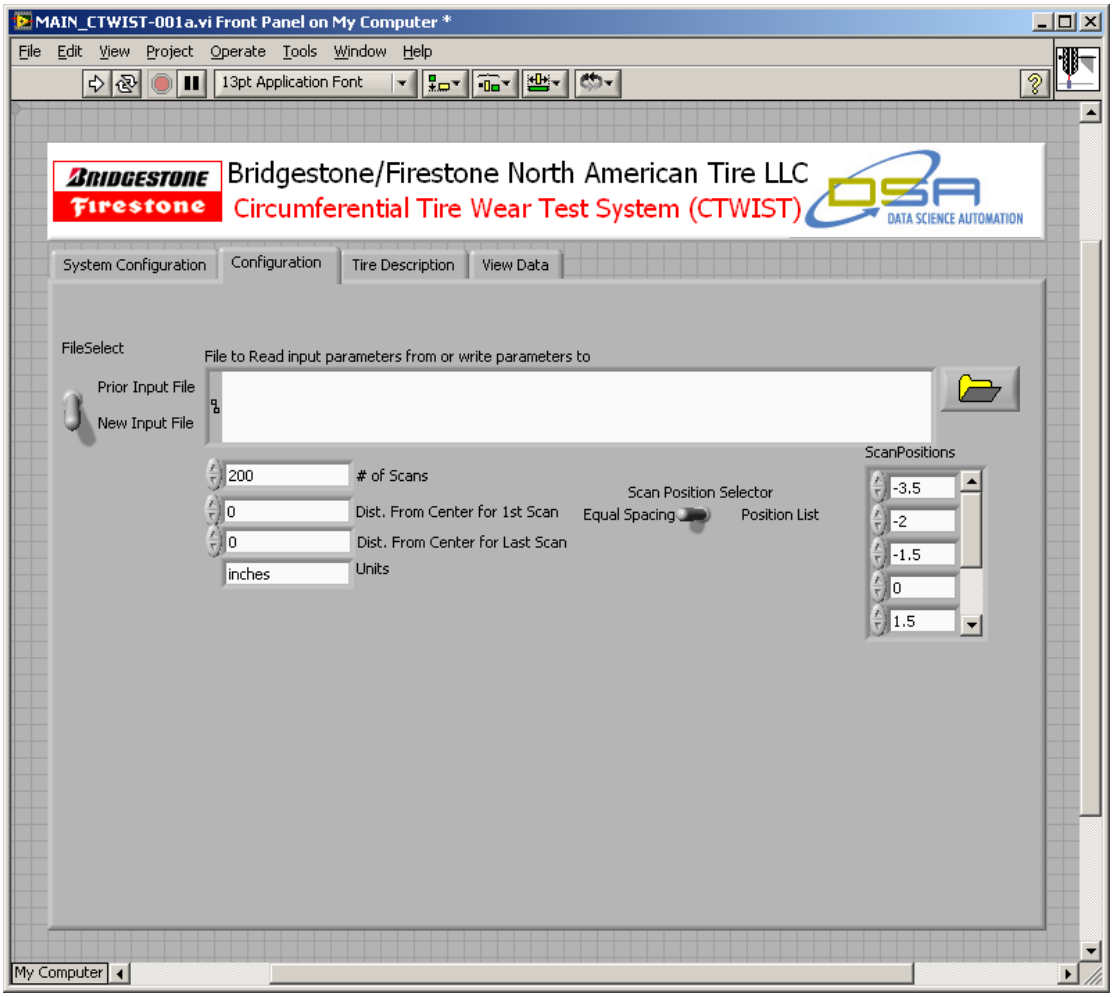

Figure 3

The configuration tab would allow the operator to either select a configuration file to input or a new configuration for a new tire to perform the tests on. The operator can also select to have equal spacing of the measurements or to manually enter the specific locations of interest of the tire tread by entering scan positions in inches. To select a prior configuration file the operator only needs to click on the browse button next to the file path indicator and locate the desired configuration file for a tire that had been tested in the past.

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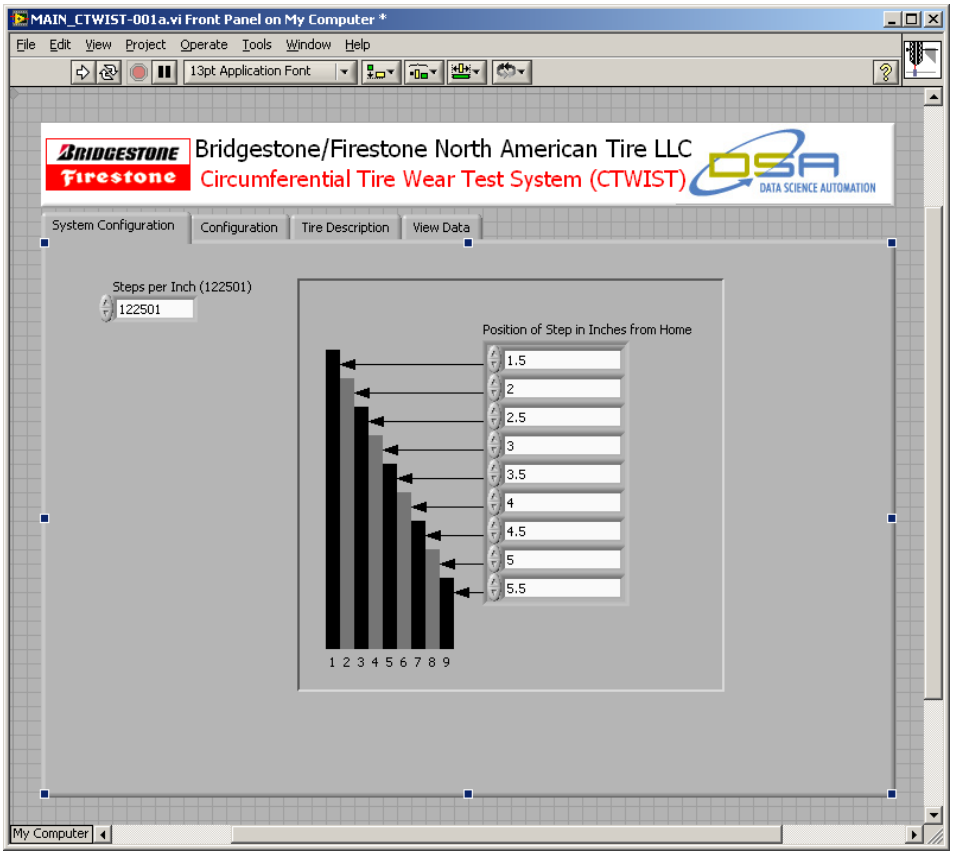

Figure 4

In the System Configuration tab the operator can change the parameters of the test device for initial calibration of the gearing of the motor and the distance of the laser calibration increments from home position. The initial stepper motor being used has 122501 steps per inch but if the motor gearing were changed the steps per inch can be changes with out the need to change the code.

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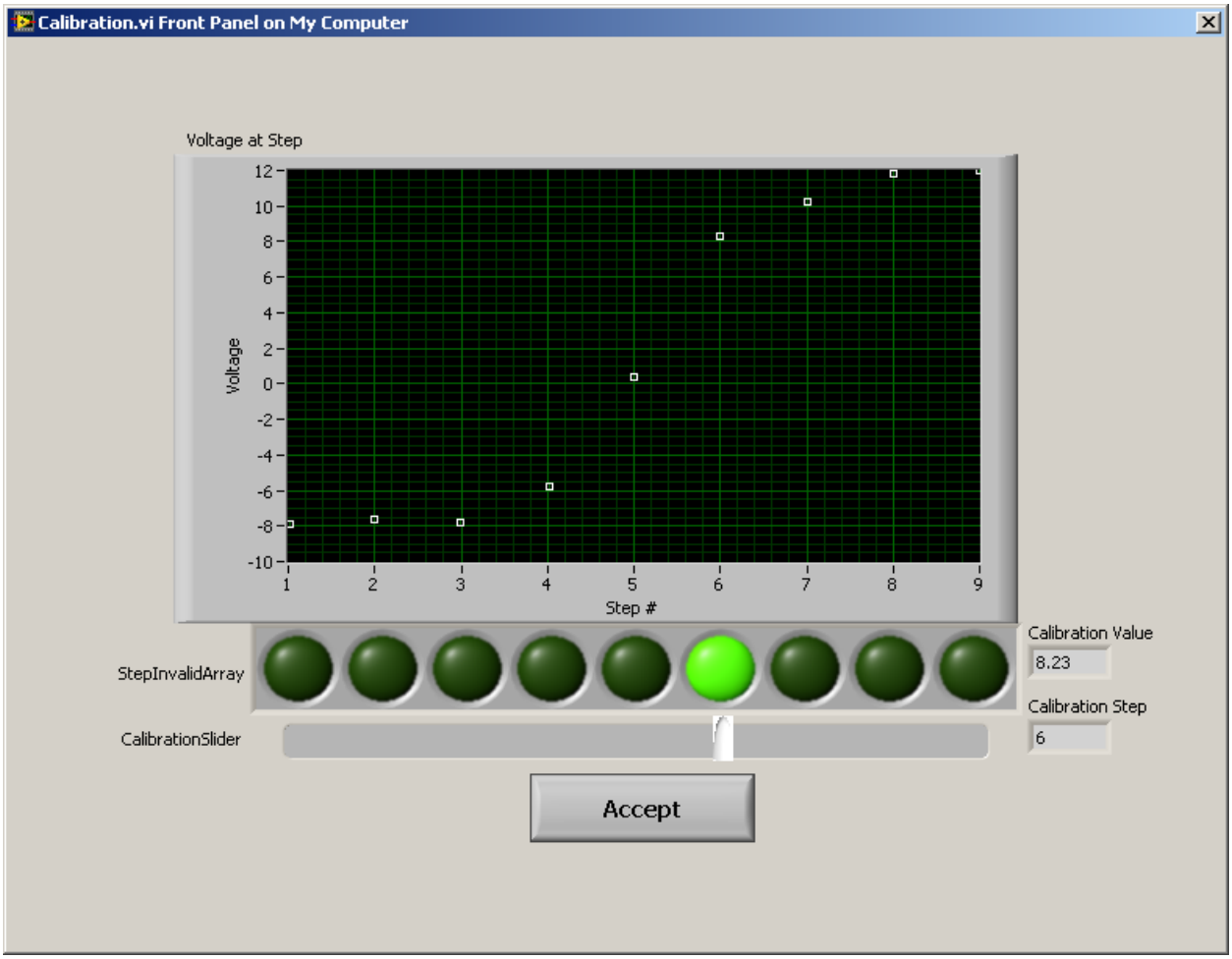

Figure 5

After an automated calibration has occurred the operator can chose the system recommended step number or manually select another step number that may suite their needs better. Once the step number is set the operator clicks the <Accept> button to continue the testing.

The Details

National Instrument's Vision & Motion Toolkit simplified software development greatly simplified this project. With the Vision & Motion Toolkit the motion aspect of the application was easily configured and flexible for changes that could be implemented in the future. The overall architecture for this application was a state machine due to its flexibility and ease of modification for other future complements to the application.

Summary

Labview's capability to control motion and conduct data acquisition made the application developed by Data Science Automation a success. The Vision & Motion toolkit also reduced development time by providing the needed functions.

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