

**AUTONOMOUS CONTROL AND SIGNAL ACQUISITION SYSTEM**

*Dr. Bunget has an autonomous control and signal acquisition system that he wants to be repaired and improved upon. This requires that we identify the current issues with the system and repair them as well as make innovations to the system to meet customer needs. The position control needs to be autonomous, and the acquisition of the oscilloscope signal and the transducer position needs to be synchronous. The user should be able to control the position, speed, and how often the signals are captured. The waveform of the scan should be appended into a spreadsheet. The system code also needs to be updated to a newer version of Python. Additionally, this system was damaged during transportation and now needs to be repaired. As for upgrading the system, the framework needs to be strengthened for increased rigidity to ensure accuracy of the system. Other improvements focus on replacing some parts to meet our overall goal of making sure the system is stable and accurate so that measurements done in the future can have as little error as possible. We were able to lay the groundwork for all these requirements to be met. We upgraded the system code to Python 3 and changed the microcontroller to an Arduino Mega as well as implementing PyFirmata for control. The electrical circuit was completely redone and now uses a 12 V adapter as the main power source and newer versions of the original drivers. The 20 mm slotted aluminum extrusions were replaced with 40 mm slotted aluminum extrusions. Ball screws were used in place of threaded rods for the x-axis and supported linear slide rails were used in place of unsupported slide rails. The cost for these upgrades totals below \$1000 making this an affordable project for student research.*