



Raspberry Pi Interface with Galil Controllers

An HMI or Human Machine Interface is needed in many motion control applications. These devices are used to allow a user to instruct a machine on what to do without the need of a full PC. There are many sources for HMIs and many can cost thousands of dollars. With the arrival of the Raspberry Pi Foundation and its Raspberry Pi models, a small but powerful option arrived. Adding to this, the official Raspberry Pi 7" touchscreen display, and the Galil application programmer interface this powerful trio form the foundation for an inexpensive but fully capable HMI that can be customized for any motion control application.



The following video shows this application in action:
<http://www.galil.com/raspberrypi>

The strength of this new HMI option can be found in the software that can be developed to run on it. There are free software tools that can allow a person to create just about any kind of interface to run on the Raspberry Pi. The software acts as the glue to take in the input from the user in the touch interface and the Galil gclib API translates those simple instructions into the commands to send to the motion controller and PLCs. This lowers the bar of entry to something similar to developing a modern mobile phone app. The online community provides plenty of assistance to get started and allows you to create interfaces to run on these fast and inexpensive computers.

This example Raspberry Pi based HMI is using the Raspberry Pi 3, the latest version of the Raspbian Linux operating system, Python for its programming language, Kivy for its user interface framework, and Galil gclib for communication with the motion control hardware.

The Galil gclib C API can be used on various platforms in many different programming languages. Its function is to communicate with the Galil controller at a higher level and dictate the overall application flow. Because gclib is written in low level C it can be used in other higher level languages such as Python. Galil has provided a Python wrapper and example code to make installing and using the API very easy.

Most motion applications can be broken down into the following simple flow diagram.

Mechanical System & I/O ↔ Motion Controller & PLC ↔ HMI

In this application a technician enters values into an interface for the material to be processed. The technician enters



Figure 1: Touchscreen and Motion Controller

the desired length of material and the number of pieces to cut. The Python application takes in the commands from the technician and relays the information to the motion control system. Its main job is to handle the overall application and rely on the other systems to report success or failure. The motion controller performs the needed motion elements to physically move the motors and cutting tools.

A “Cut To Length” screen displays the user interface items needed to modify the cut to length application including entering the number of cuts, the desired length, and the begin button to start the process. The Python application downloads the needed code to the controller and requests information from the controller to display to the user.

This application is a powerful demonstration of the advancements in computer hardware that have driven down prices but increased performance. Advancements in software have provided easy to use tools with free and open source programming languages and frameworks. By combining these advancements with Galil Motion Control products, interfaces can be easily made for any motion control application. The Raspberry Pi with touch screen display used in this demonstration cost around \$100. All software used in this demonstration is free or open source.



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