

Ian Hartwig

Team B: No Name

Teammates: Ian Rosado, Stephanie Chen, Trevor Decker

ILR 04

Feb. 26, 2015

Individual Progress

I spent this week bringing up and building the toolchain for our embedded controller. We have decided to continue using the STM32F4 evaluation board. This board gives us access to an ARM Cortex M4 processor with up to 112 GPIO pin and many extra peripherals like configurable PWM, SPI, I2C, DMA, and a reasonable quality ADC. The board also has an on-board touch screen. Although we are not planning on using this as a main part of our interface, it does touch most of the special peripherals, and was useful to bring up. We also considered building a distributed system of smaller microcontrollers, but we think that a single, more powerful controller will result in a less complex control system. The current board output can be seen in figure 1.

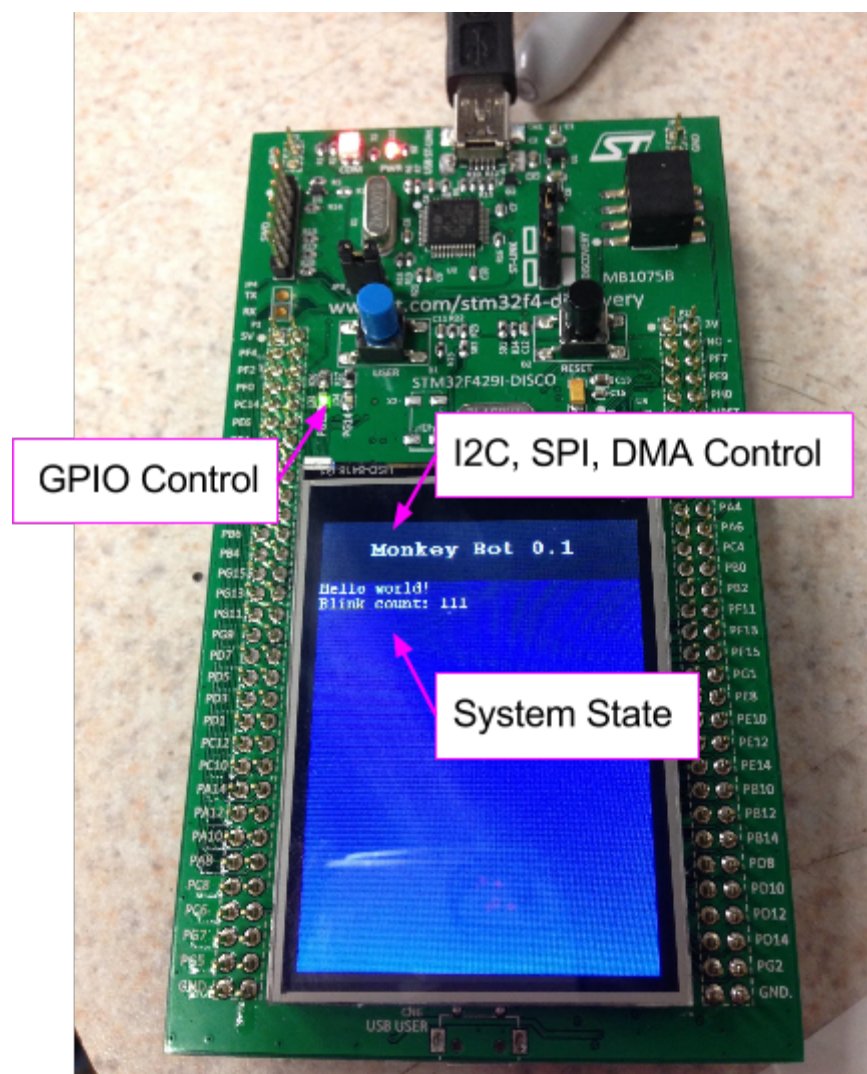


Figure 1: Embedded System Bring Up

Challenges

Unfortunately the base code for a microcontroller of this size is significantly more complex than an 8 bit microcontroller like an AVR/Arduino. To get an LED blinking required 2,387 files with 28,273 lines. This included lots of provided hardware abstraction layer (HAL) and board support code¹ from ST Microelectronics. Enabling the screen and writing to it with the printf function requires writing the system call stubs and compiling them into a custom version of libc, for which we used newlib². This resulted in 5653 new files with 118,806 lines. We also had to put together a build system, but this was made easier by the ARM Holdings sponsored version of the GCC compiler and toolchain³.

In other areas, we have received some parts for the mechanical builds of the arm and gripper, but we have not had enough time to put all of the systems together. We continue to refine the design for our gripper to find the best option.

Teamwork

Ian Rosado and Stephanie Chen continued to work on the prototype gripper. They have machined mechanical components to build the second prototype. Trevor continued work on the vision and high level control system. He has been able to get streaming video processing to work.

Plans

Personally, I need to extend the baseline code in the control system to support analog signal reads and PWM outputs these are critical for motor control and torque/current feedback. We need to work on mechanical parts so that they will be ready for the presentation before break. We also need to put together a presentation.

¹ <http://www.st.com/web/en/catalog/tools/PF259243>

² <https://sourceware.org/newlib/>

³ <https://launchpad.net/gcc-arm-embedded>