Working Electrical Engineering Projects with STM32 + Fun Kit

Daniel Beatty

October 2, 2020

Abstract

Abstract

1 Introduction

Why am I doing this? I have some examples provided by a client of mine. These might have worked in some STM32 development environments. However, software evolves to meet hardware and security needs. I suspect that I am not alone.

I would prefer to have a cross platform means to develop software. I would prefer the ability to analyze the kernels deployed on these devices. I would like to ensure that I can deliver a good product, and apply micro and macro architectures (aka design patterns) as well good algorithms.

So, I want to know how this mBed system work. I will start with the STM32 product line to develop this micro-architecture approach.

I plan to demostrate these techiniques on MacOS, Windows, and Linux (ARM).

2 The Base Line Integrated Development Environment Part 1

Big issues: 1. Basic Operation of the IDE 2. Combining packages Especially the mbed OS itself Libraries and Frameworks The "tiny interactions" The communication mechanisms.

Mbed Studios (a modified Eclipse Theia) released in June 2019. It is derived from the Eclipse 'Theia' line shown in a YouTube video[1].

3 Eight Bit Shift Register

Eight bit Shifter IC 74HC595

[1] https://www.youtube.com/watch?v=HsTtzqL-GP8

4 Optical Isolation

I remember a lesson from my embedded computing class back in the Spring of 1998. Professors Darrel Vines, Michael Parton, and Mike Giesselman told us over and over about the importance of optical isolation. These professors worked in pulsed power, and I wish I had the wisdom back then to realize just how important this subject is.

Pulsed Power delivers a large amount of current in a very short space and time. The amount of current involved can easily melt a microcontroller and destroy it. Yet, these controllers are essential in regulating such power elements to fulfill their purpose.

The fun kit comes with a 4N35 white paper can be found at[2]. The inputs on pins 1 and 2 can be thought of as in and out for a light emitting diode (LED). The light from the LED feeds a photo-transistor that can handle much higher currents.

5 Transistor Circuits

PN2222
: Transistor

6 Diode Circuits

This is a basic hello world type program. A programmer can build this blinky world program for the on board LED or a circuit example.

7 Simple Analog In

The terms simple and analog rare work together in practice. This work shows examples to highlight how the analog to digital converter works, distinction when an optical isolator, and safety mechanisms to protect your micro-controller from damage.

8 Thermo-resistor - Taking the Temperature

This is an example of an Analog in problem

9 Ethernet Web Server Libraries

[3]

[2] https://www.digchip.com/datasheets/parts/datasheet/161/4N35-pdf.php
[3] https://github.com/khoih-prog/EthernetWebServer_STM32

10 Digital Signal Processing

[4]

[4] http://www.emcu.it/STM32F4xx/STM32F4-Library/STM32F4-Library.html