

Abstract

This project is an experiment focused on the possible capabilities of the MOS 6502 based computer architecture and what use it still has to offer 40 years after its initial conception. My goal is to demonstrate its capability to communicate with modern day technology while also being useful as a more powerful controller as compared to Arduino for simple engineering based projects.

Project Goals

The goal of this project is to utilize the 6502's 6522 I/O controller to collect local environmental data and transmit the data over serial communications to a MATLAB program that will log and graph the data. The local environmental data consists of data collected from motion detector triggers, photo-sensor light levels, and button switch triggers. This data will not be logged under the 6502's memory as that would be inefficient, the data will be collected, transmitted to MATLAB and then deleted from the 6502's memory right before another event is captured.

Challenges

There have been some major challenges to overcome in this project. Although these challenges are easy to remedy sourcing the components in a timely manner is quite tough. The 6502 and its support chips are still manufactured to this day by Western Design Center (WDC) so it was possible to order new chips. However the main chip, the 6502, that I currently have is defective and cannot function. This puts brings my project to a halt until a new chip can arrive. Once a new chip can arrive the project can continue as there is no other reason why this won't be a functional project

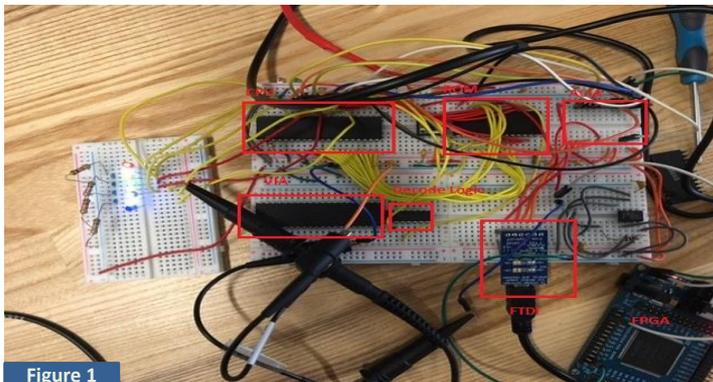


Figure 1

Figure 1

- From left to right
- 6502 CPU
 - EEPROM
 - Serial Interface
 - I/O controller
 - Glue Logic
 - Serial to USB
 - FPGA

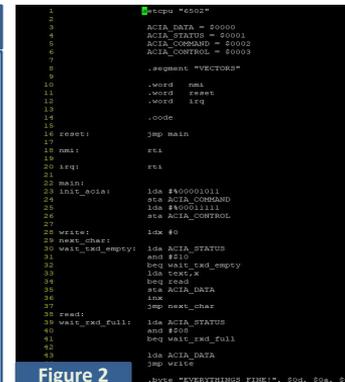


Figure 2

Figure 2

This is a free run assembly program, that was compiled and loaded onto rom. This program tests the functionality of all the chips on this computer and if everything is functional it will display a message on a serial terminal.

How does it work?

The CPU and Memory

The CPU is a reproduction 8-bit MOS 6502 processor capable of speeds up to 20MHz which is very fast in comparison to the original 6502's max clock speed of 2MHz. This CPU has 56 instructions, an 8-bit data bus, and a 16-bit address bus. Although old it is still more capable at hobbyist level projects in comparison to an Arduino.

The Serial Interfaces

The MOS 6551 bi-directional serial interface controller is an essential device for this project as it will allow the CPU to send data and instructions over serial to a modern day computer. Along with the 6551 I also use a FTDI USB interface to easily communicate with the computer through a terminal.

The I/O controller

The 6522 gives the CPU the capability of addressing and controlling bi-directional I/O allowing the most important aspect of the project to happen. That aspect being the ability to program the CPU to control other devices and collect data, much like the serial controller it is necessary to allow the CPU to connect with the outside world.

MATLAB

I will be using MATLAB to collect and log all data coming in and out of the 6502 computer. I will be using MATLAB because of how versatile it is for data collection and logging.