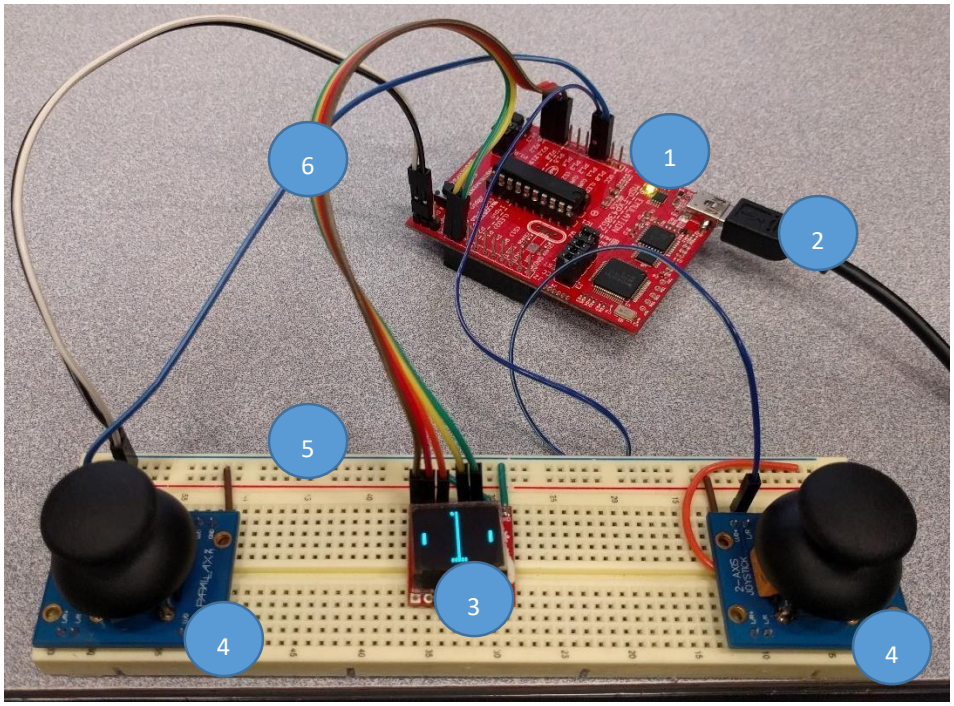
Project:

Program pong onto an MSP430G2553



Materials:

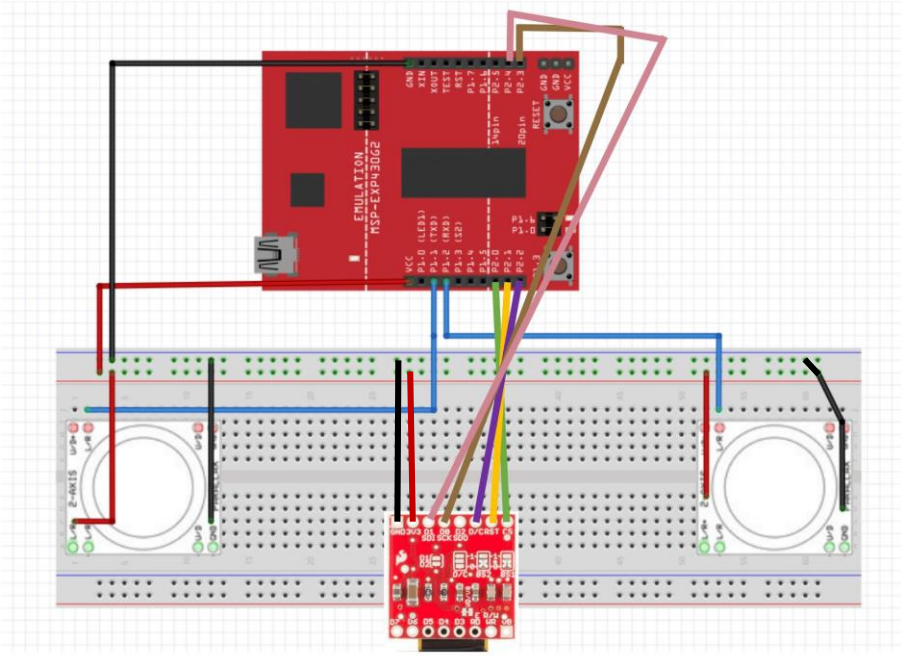
1) 1x MSP430G2553 or compatible board (here)
2) 1x USB mini A to USB A (should have come with board)
3) Sparkfun Micro OLED Breakout (here)
4) Parallax 2-axis joystick (here)
5) Breadboard of at least 34 rows
6) 15x connection wires (9x female-male, 6x male-male)

Introduction

Have you ever wanted to play classic Atari Pong on a .66 inch display? What about a 16Mhz microprocessor? Well here is your chance! The below instructions will provide you with enough information to build this unique experience yourself. You will use two joysticks, a mini OLED display, and a MSP430 to create the classic 2-Player Pong experience. The MSP430 communicates with the OLED display using a SPI interface and the joysticks communicate to the MSP430 using the onboard Analog-to-Digital Converter.

Wiring and Programming for Easy Duplication

Wiring:



The above wiring diagram depicts the wiring scheme used for the MSP430 Pong program. Please refer to the tables below for a tabular version of the wiring diagram.

Left Joystick

JOYSTICK	MSP430
L/R+	VCC
L/R	1.1
GND	GND

Right Joystick

JOYSTICK	MSP430
L/R+	VCC
L/R	1.1
GND	GND

Sparkfun OLED Display

DISPLAY	MSP430
GND	GND
3V3	VCC
SDI	2.4
SCK	2.3
SDO	N/A (not used)
D/C	2.2
RST	2.1
CS	2.0

Programming:

After wiring all of the components together, as shown in the wiring diagram, it is time to upload the Pong code to the MSP430. The most recent version of the Pong software can be downloaded from our Github repository located at https://github.com/HumbleHominid/Pong. Please follow

the below steps to program your MSP430. Note: You are required to have downloaded and installed Code Composer Studio Version 5.5.0.

1. Open Code Composer Studio
2. Click File > New > CCS Project
3. Name the project. (Something like Pong)
4. Make sure the Device Family is “MSP430”.
5. Device Variant: “MSP430Gxxx Family” and “MSP430G2553”
6. Click Finish
7. Erase everything in the center text area
8. Copy and Paste Pong.c from the Github repository into the text area.
9. Click the debug icon in the toolbar
10. When the play button shows up, click it

If the program was successfully uploaded, and your wiring is correct, it should start a game of Pong on the screen. If the MSP430 is unplugged and plugged back in, it will start Pong again with no manual intervention.

Daunting Task

The hardest part about this entire project was configuring SPI to communicate with the OLED. The datasheet on the display is very limited. We just couldn’t figure out how to get the display to turn on. We tried to use the oscilloscope to troubleshoot the waveform, finding out that the waveform was perfect. Googling didn’t help either because this display is very obscure and rarely used by anyone. Our only saving grace was Sparkfun’s poorly written and commented C++ library for Arduino. After hours of trying to decipher the cryptic library, we found out not only that twenty-three initialization commands had to be sent over SPI, but the D/C pin had to be pulled low to accept commands! That meant that when sending data, the D/C pin must be pulled high. Each of the initialization commands have a different purpose such as setting contrast and color.

Conclusion

The MSP430Pong project was a very fun and rewarding experience. Not only did the team get to experience programming the MSP430, we got to have fun recreating an Atari classic. The project had many challenges along the way: limited memory, manual bit-banging, and limitations of c to name a few. Even with all of the challenges, the team managed to push through and finish the game. We will all remember this experience for years to come.