LED Pong

Figure 1

Introduction

This is a short description of the 64x64 LED Pong board I made just for fun. Currently it plays Pong and Breakout that you select from a main menu. In the future I'll add more games, I already have plans of other games controlled by a Joystick.

It's pretty impressive that just one little micro processor can keep track of 8192 LEDs and update them 70 times per second for a flicker free display. This was done with the Parallax Propeller which has 8 COGs, the actual game is running on 4 of these so there are plenty of room for expansion. However it only takes one COG by itself to drive the 8192 LEDs so you can imagine how powerful each COG is.

Hardware overview

The two LED displays are the 64x32 Bi-color 3mm LED displays from Sure Electronics, these are very affordable but a little bit tricky to use. They were simply daisy chained together and then put together to form a 64x64 LED matrix.

http://www.sureelectronics.net/goods.php?id=718

The micro processor is the Propeller from Parallax, I used the Propeller Proto board so I could add the components to read the paddles and generated beeps.

http://www.parallax.com/tabid/407/Default.aspx

The whole thing was mounted on a small wooden board that was painted bright yellow.

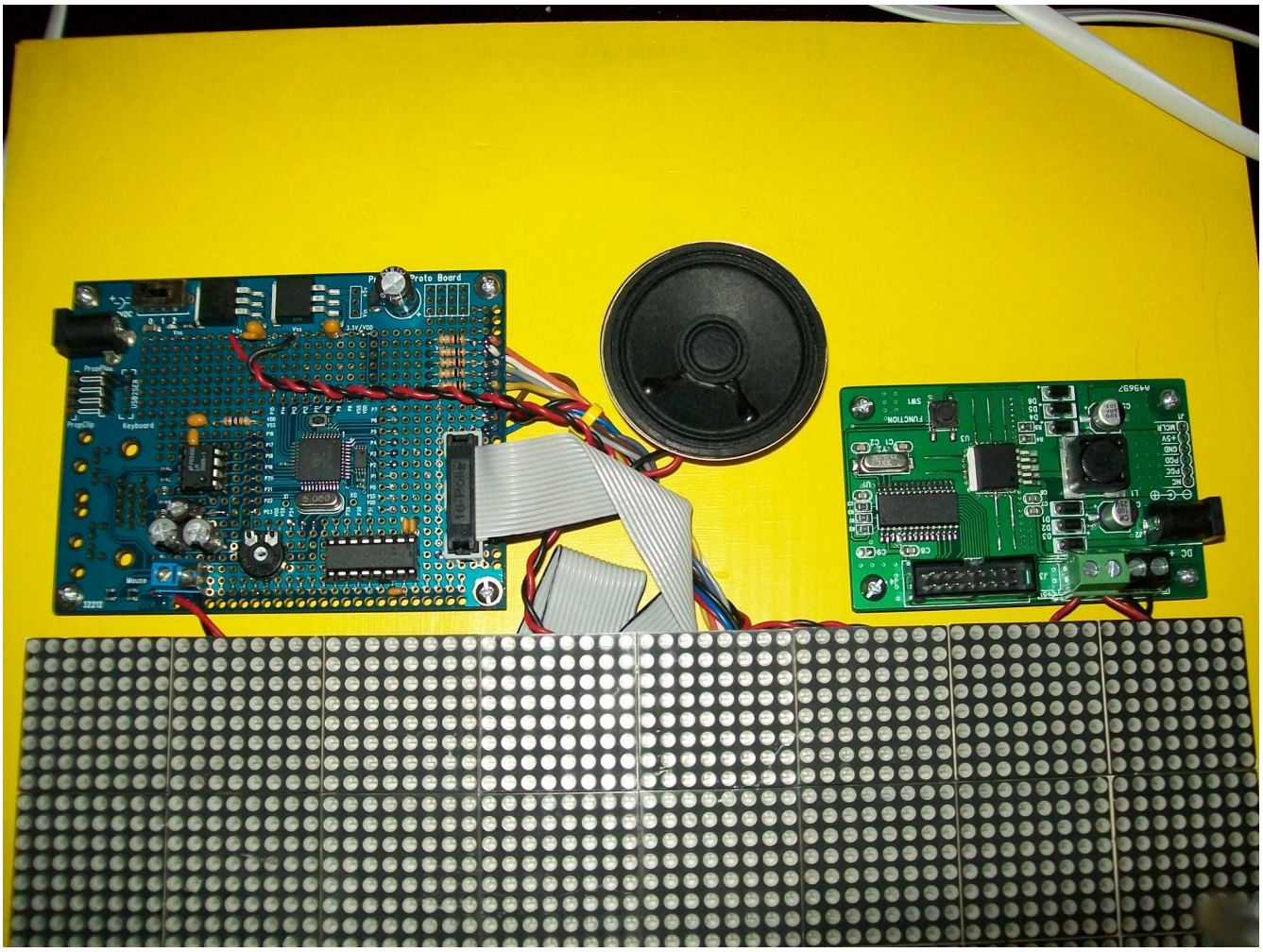

Figure 2

Power supply

The 12V 2Amps wall-wart is not shown but the 5V switching regulator is supplying power for both LED displays and the Proto board. The 5V was simply feed into the 5V system on the Propeller Proto board bypassing the regulator on the board and a 10pF by-pass cap was added. The regulator board is the Demo board that came with the LED and can be seen to the right in figure 2.

Sound system

Maybe “Beep system” would be more appropriate since all it does is beep. The LM 386 is used to feed the speaker through a standard 200 gain circuit from the data sheet. Pin P23 on the Propeller is connected to Vin and Vs is connected to 5V. On the Proto board these are the components in the lower left corner, I used whatever components I had but the end result is the schematics in figure 3.

The speaker was glued down with some rubber cement so I can pry it of if necessary.

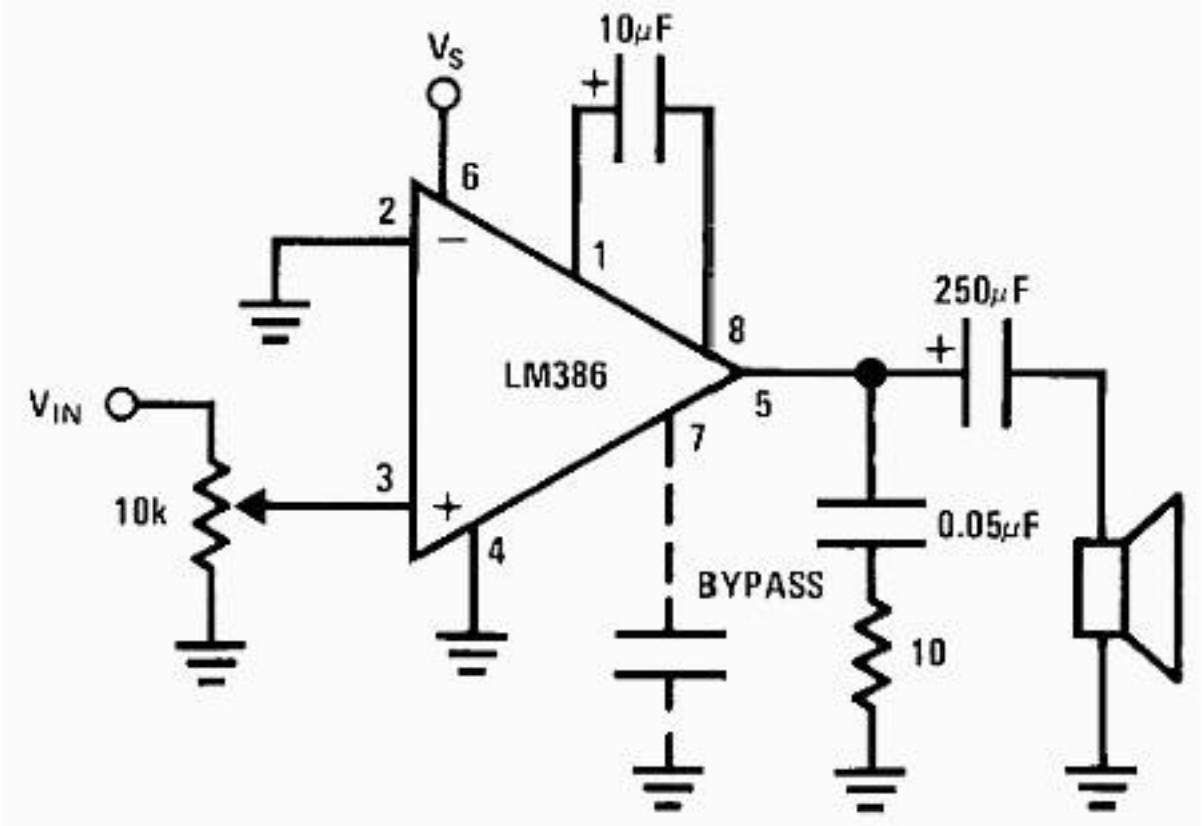

Figure 3

LED board Connection

The Led boards are connected to the Proto board with a 16 wire ribbon cable, this is straight forward according to Table 1. The Ribbon cable side is also marked with the LED board pins.

Ribbon Cable	Propeller Pin or Ground on board
1 - GND	GND
2 - A	P4
3 - GND	GND
4 - B	P5
5 - GND	GND
6 - C	P6
7 - EN	P10
8 - D	P7
9 - R1	P0
10 - G1	P2
11 - R2	P1
12 - G2	P3
13 - GND	GND
14 - L	P9
15 - GND	GND
16 - S	P8

Table 1.

Paddles

The paddles are made up of two 500K ohm linear potentiometers and two normally closed buttons hooked up to a DB9 female connector. The potentiometers and buttons were mounted in project boxes and a retro looking knob was used for the potentiometers.

The project boxes, potentiometers, buttons and knobs were all bought at Radio Shack, see figure 4 for the finished look.

The potentiometers are used as voltage dividers so pin 7 (3.3V) and pin 8 (GND) from the DB9 connector are connected to the outer two terminals and the middle one is connected to pin 5 or 9 depending on the Paddle. The two buttons were connected to pin 8 (GND) and pin 3 or 4, note that these are normally closed buttons, the advantage of that is explained later.

Figure 5 shows the inside of the Paddle, to stabilize readings I put a 10pF bypass cap over the two outer terminals of the potentiometers.

Table 2 describes the DB9 connector, this configuration allows standard Atari type joysticks to be used as well.

DB9
1 - Up
2 - Down
3 - Left or Pad 1 button
4 - Right or Pad 2 button
5 - Potentiometer 2
6 – Fire button
7 - 3.3 V
8 - GND
9 – Potentiometer 1

Table 2.

Figure 4.

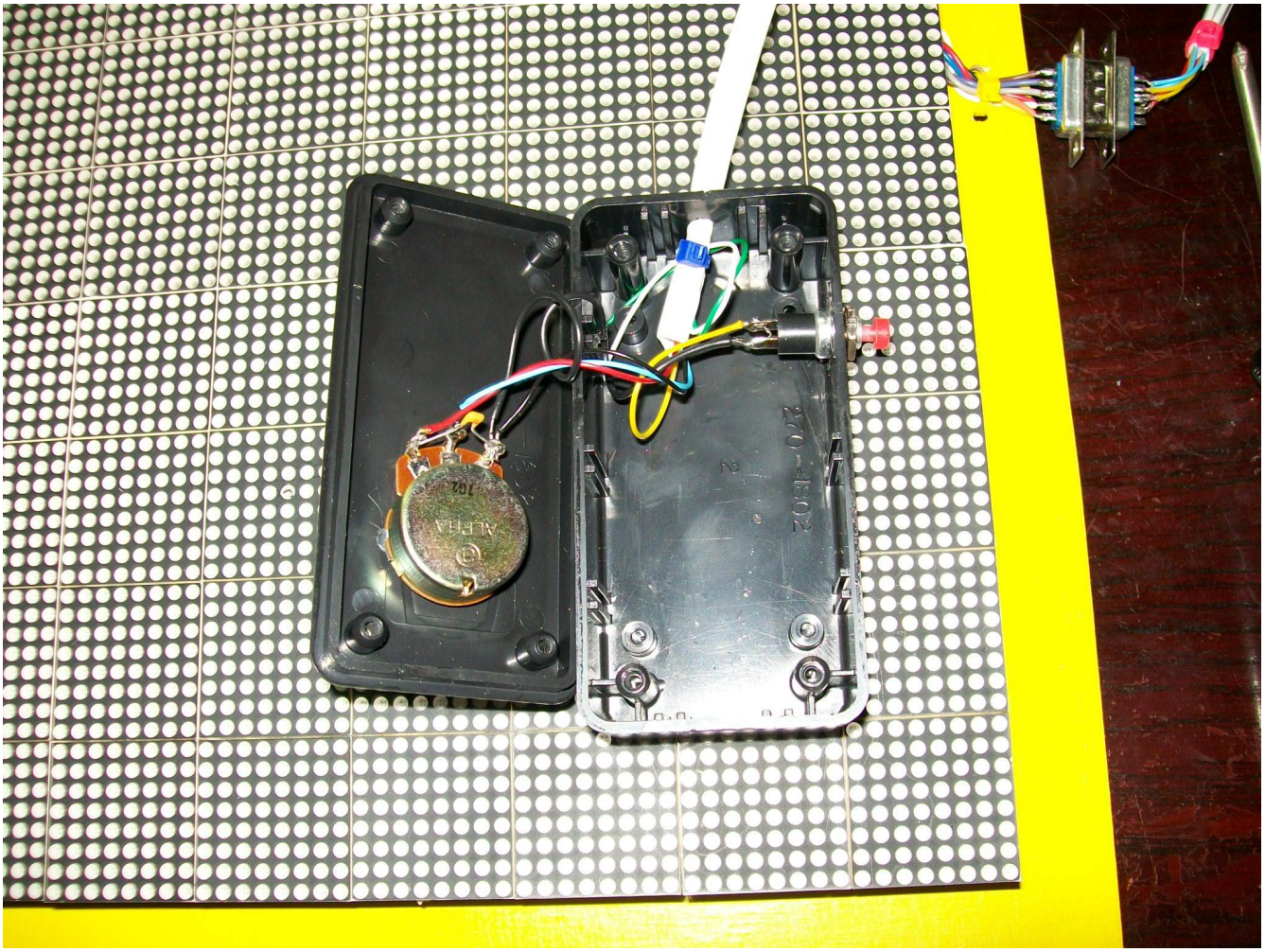

Figure 5.

Reading Paddles and buttons

The DB9 pins 1 to 4 are connected to pin P11 to P14 and pin 6 are connected to P15. These have 10K ohm pull up resistors connected so if nothing is connected they will read high. The paddle buttons are P13 and P14 and since they are normally closed these pins will read low when the button is not pressed and high when the button is pressed. If an Atari style joystick is used, the reading will be high until a button is pressed and the pin will read low. On the Proto board, you can see the 5 10K ohm pull up resistors right above the Ribbon cable connector.

The paddles are read with an MCP3008 A/D converter connected to pin P24-P26 on the Propeller, P24 is connected to Din and Dout (pin 11 and 12 on MCP3008), P25 to the clock (pin 13 on the MCP3008) and the P26 is connected to CS (pin 10 on the MCP3008). The paddles (pin 5 and 9 on the DB9) are connected to channel 0 and 1 (pin 1 and 2 on the MCP3008). 3.3V was used to drive the MCP3008 and the reference voltage was also 3.3v since that is what we supplied the paddles. The MCP3008 can be seen to the lower left of the Ribbon Cable connector on the Proto board. If you look closely you can see that 10pF bypass caps were added to the supply voltage as well as the input signal from the Paddles.

Conclusion

This project is not really completed yet, but completed enough for me to take a break over X-mas and challenge my brother on a few games of Pong.

If you do decide to make a board yourself, please let me know...