CS/EE 120B

Custom Project: Audio Spectrum Analyzer

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Description

For my final project I created an Audio Visualizer. This device reads music input from an auxiliary cable and displays its digital counterpart in real-time. There is also a second headphone jack that can be connected via audio splitter to add another form of output such as speakers or headphones for audio comparison.

The input is measured is displayed on the LCD as a series of white bars. Upon the press of a button, the white bars can change into custom characters. I have added three custom characters: smiley face, upside-down smiley-face, and a music note. New custom characters can be implemented into the program very easily.

A challenge I faced was having the output bars travel down. The 16x2 LCD screen does not have an option to clear a single space. The only command that the LCD has is to clear the entire screen. To work around this, I created another custom character that is completely blank. Using this, I could display the output bars and fill the rest of the LCD with blank characters to give it the "look" of moving up and down.

User Guide

- When the character-change button is pressed down, the ADC input will pause. The custom character will display and the ADC will continue upon release
- ADC input accounts for volume as well. For best results, the input volume of the music must be high

Technologies & Components

- Atmel Studio 7.0
- ATmega1284
- 3x Adafruit Breadboard-friendly 3.5mm headphone jack
- 16x2 LCD Display
- Button
- ADC

Visual Representation

16*2 LCD

VSS		
VDD		
VEE		
RS		
RW		
E		
D0		
D1		
D2		
D3		
D4		
D5		
D6		
D7		

ATmega1284

(PCINT8/XCK0/T0) PB0 1   40 PA0 (ADC0/PCINT0)
(PCINT9/CLKO/T1) PB1 2   39 PA1 (ADC1/PCINT1)
(PCINT10/INT2/AIN0) PB2 3   38 PA2 (ADC2/PCINT2)
(PCINT11/OC0A/AIN1) PB3 4   37 PA3 (ADC3/PCINT3)
(PCINT12/OC0B/$\overline{SS}$) PB4 5   36 PA4 (ADC4/PCINT4)
(PCINT13/MOSI) PB5 6   35 PA5 (ADC5/PCINT5)
(PCINT14/MISO) PB6 7   34 PA6 (ADC6/PCINT6)
(PCINT15/SCK) PB7 8   33 PA7 (ADC7/PCINT7)
$\overline{RESET}$ 9   32 AREF
VCC 10   31 GND
GND 11   30 AVCC
XTAL2 12   29 PC7 (TOSC2/PCINT23)
XTAL1 13   28 PC6 (TOSC1/PCINT22)
(PCINT24/RXD0) PD0 14   27 PC5 (TDI/PCINT21)
(PCINT25/TXD0) PD1 15   26 PC4 (TDO/PCINT20)
(PCINT26/INT0) PD2 16   25 PC3 (TMS/PCINT19)
(PCINT27/INT1) PD3 17   24 PC2 (TCK/PCINT18)
(PCINT28/OC1B) PD4 18   23 PC1 (SDA/PCINT17)
(PCINT29/OC1A) PD5 19   22 PC0 (SCL/PCINT16)
(PCINT30/OC2B/ICP) PD6 20   21 PD7 (OC2A/PCINT31)