CPE 301: Homework #7

Due on April 05, 2019 at 9:00am

Dr. Dwight Egbert Section 101

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Description of Purpose:
This homework gets us familiar with analog-to-digital converters. It's a way to bridge the gap in the analog environment. Potentiometers, Thermistors, accelerometers, and ambient light sensors are a few examples of those devices. We will set the analog inputs as neccessary using the arduino registers to further comprehend this ordeal.

```
int16_t adc_read(uint8_t mux)
{
    uint8_t low;

    ADCSRA = (1<<ADEN) | ADC_PRESCALER;                 // enable ADC
    ADCSRB = (1<<ADHSM) | (mux & 0x20);                 // high speed mode
    ADMUX = aref | (mux & 0x1F);                        // configure mux input
    ADCSRA = (1<<ADEN) | ADC_PRESCALER | (1<<ADSC);     // start the conversion
    while (ADCSRA & (1<<ADSC)) ;                        // wait for result
    low = ADCL;                                         // must read LSB first
    return (ADCH << 8) | low;                           // must read MSB only once!
}
void adc_start(uint8_t mux, uint8_t aref)
{
    ADCSRA = (1<<ADEN) | ADC_PRESCALER;         // enable the ADC, interrupt disabled
    ADCSRB = (1<<ADHSM) | (mux & 0x20);
    ADMUX = aref | (mux & 0x1F);                // configure mux and ref
    head = 0;                                   // clear the buffer
    tail = 0;                                   // and then begin auto trigger mode
    ADCSRA = (1<<ADSC) | (1<<ADEN) | (1<<ADATE) | (1<<ADIE) | ADC_PRESCALER;
    sei();
}
int16_t adc_read(void)
{
    uint8_t h, t;
    int16_t val;

    do {
        h = head;
        t = tail;                       // wait for data in buffer
    } while (h == t);
    if (++t >= BUFSIZE) t = 0;
    val = buffer[t];                    // remove 1 sample from buffer
    tail = t;
    return val;
}
```

Solution