Lab Report – Sensing Light

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October 16, 2014

Introduction

The task of this lab was to implement a light sensor which samples light levels every two seconds, displays the average of the samples gathered over the last six seconds, and sends the average to a base station connected to a computer.

I learned how to use the `Read` interface and that AM radio communication requires the use of `SplitControl`.

Implementation

I used an array to keep a moving window of measurements, from which the average is computed on demand. Each firing of the timer, a measurement is added and the average is displayed and sent to the base station.

The components used and the way in which they are wired is:

```
implementation {
  components SensorC, MainC, LedsC;
  components new PhotoC(), new TimerMilliC();

  components new AMSenderC(RADIOID);
  components ActiveMessageC as AMsgC;

  SensorC.Boot -> MainC.Boot;
  SensorC.Leds -> LedsC.Leds;
  SensorC.Read -> PhotoC.Read;
  SensorC.Timer -> TimerMilliC.Timer;

  SensorC.Packet -> AMSenderC.Packet;
  SensorC.AMSend -> AMSenderC.AMSend;
  SensorC.SplitControl -> AMsgC.SplitControl;
}
```

The interfaces used were:

```
module SensorC {
```

```
  uses {
    interface Boot;
    interface Leds;
    interface Timer<TMilli>;
    interface Read<uint16_t>;

    interface Packet;
    interface AMSend;
    interface SplitControl;
  }
}
```

Experiment

The following data were collected:

Data 1	Data 2	Data 3	Average	Deviation
0x32a	0x32d	0x32e	812	2.08

Angle	Distance (ft)	Data 1	Data 2	Data 3	Average	Deviation
0	0.5	0x398	0x398	0x397	920	0.58
	1.0	0x376	0x375	0x372	884	2.08
	1.5	0x36c	0x36b	0x36a	875	1.00
	2.0	0x34e	0x34e	0x34d	846	0.58
	3.0	0x33b	0x33a	0x33a	826	0.58
30	0.5	0x38a	0x38c	0x38d	908	1.53
	1.0	0x358	0x358	0x358	856	0.00
	1.5	0x34a	0x34b	0x349	842	1.00
	2.0	0x342	0x342	0x341	834	0.58
	3.0	0x341	0x341	0x341	833	0.00
60	0.5	0x37a	0x37c	0x37d	892	1.53
	1.0	0x35c	0x35d	0x35d	861	0.58
	1.5	0x33d	0x33d	0x33d	829	0.00
	2.0	0x336	0x332	0x332	819	2.31
	3.0	0x334	0x334	0x335	820	0.58
90	0.5	0x335	0x332	0x333	819	1.53
	1.0	0x32c	0x32d	0x32c	812	0.58
	1.5	0x337	0x337	0x337	823	0.00
	2.0	0x330	0x32f	0x32f	815	0.58
	3.0	0x32f	0x32c	0x32d	813	1.53

The data show a correlation between angle and brightness; as the light source moves from overhead to the side, the detected light level decreases. There is also a correlation between distance and brightness; as the light is moved farther away, the detected light level decreases.