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Lab 5 Report

Lab 5 is based to task with MTS 300 Sensor board and data collection and plotting from different sensors on Oscilloscope.

Exercise 1: In this exercise two different motes are used. One mote is installed with Base Station application to receive transmitted data from other boards.

Second mote in connected with MTS300 sensor board which has 4.6 KHz Speaker, Light and Temperature Sensor, Speaker, Tone detector and a Microphone. It has Oscilloscope program installed in it.

Oscilloscope will data collection program, which periodically take readings from sensor and send it in a message using radio. Number of reading and interval of message can be set according to application.

For the First experiment in Oscilloscope Photo Sensor is wired. So, mote will take reading from photo sensor, once every 10 readings collected, it will broadcast it in a form of message.

This broadcast is hear by mote installed with base station, which will receive that packet and transmit to PC via a serial bus. Here, this can be plotted via java application of Oscilloscope.

When Photo sensor is wired, and various intensity of light bombarded on photo sensor, some time its fully covered. The output is shown below. Range/Values for X axis and Y axis can be changed according the output value.
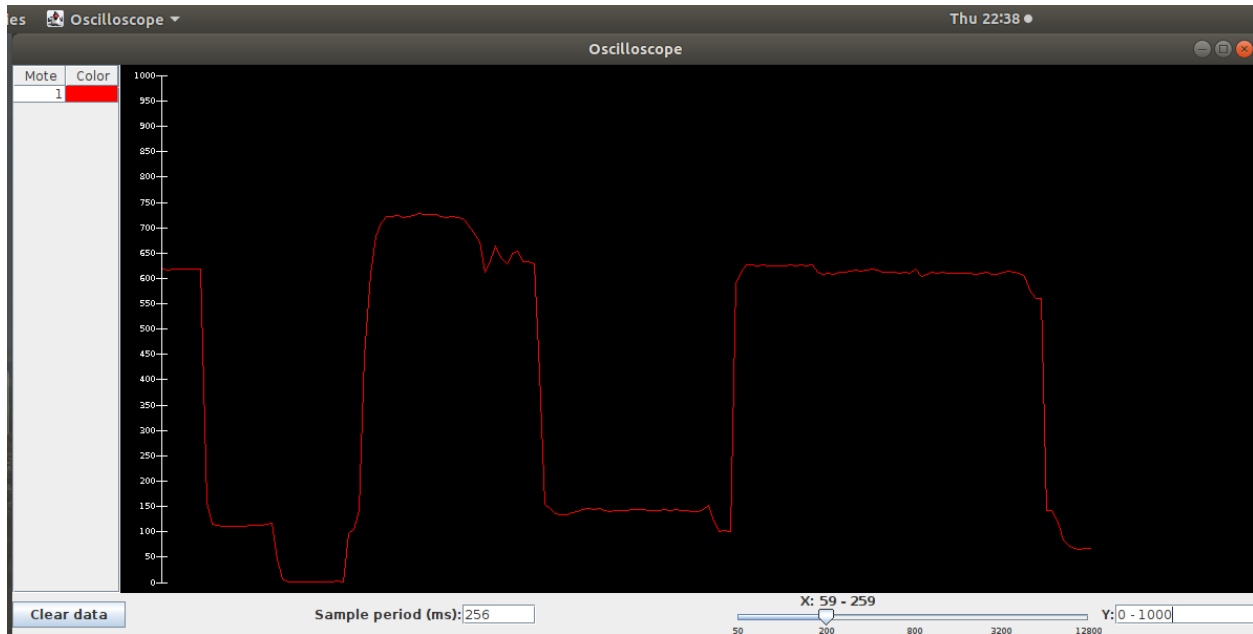
Exercise 2 & 3: This problem is proposed for accelerometer. Some sensor board has 2 axis or 3 axis accelerometers in it, which can give value of different axis variation.

Same code can be used for it. Instead of wiring photo sensor, X axis or Y axis can be wired to get output. For X axis AccelXC and for Y axis, AccelYC can be used in terms of syntax.

Unfortunately, my sensor board does not have any accelerometer or magnetometer on it. So, in that case it will give a steady line in GUI oscilloscope.

Exercise 4: This has use of Mic and Speaker. In this problem sound produced by a speaker built on board should be used for Mic as an input.

So, we need to produce sound using speaker, and that audio is used input as mic and have to plot output for Mic as a sensor.

To execute this, basically it has 2 part. One part is to wire Mic as a sensor and use speaker to produce some sound like beep.

To use speaker as an output device some changes need to make in code. Changes are shown below here.

```
configuration OscilloscopeAppC { }
implementation
{
  components OscilloscopeC,
      MainC,
      ActiveMessageC,
      LedsC,
      new TimerMilliC(),
      SounderC,
      new MicC() as Sensor,
      new AMSenderC(AM_OSCILLOSCOPE),
      new AMReceiverC(AM_OSCILLOSCOPE);

  OscilloscopeC.Boot -> MainC;
  OscilloscopeC.RadioControl -> ActiveMessageC;
  OscilloscopeC.AMSend -> AMSenderC;
  OscilloscopeC.Receive -> AMReceiverC;
  OscilloscopeC.Timer -> TimerMilliC;
  OscilloscopeC.Read -> Sensor;
  OscilloscopeC.Leds -> LedsC;
  OscilloscopeC.Mts300Sounder -> SounderC;
```

OscilloscopeApp.nc

Here SounderC as a component and wired it to use it in implementation in
OscilloscopeC.nc

```
module OscilloscopeC @safe()
{
  uses {
    interface Boot;
    interface SplitControl as RadioControl;
    interface AMSend;
    interface Receive;
    interface Timer<TMilli>;
    interface Read<uint16_t>;
    interface Leds;
    interface Mts300Sounder;
  }
}
  event void Boot.booted() {
    local.interval = DEFAULT_INTERVAL;
    local.id = TOS_NODE_ID;
    call Mts300Sounder.beep(30000);
    if (call RadioControl.start() != SUCCESS)
      report_problem();
  }
```

Last 2 pictures are changes made in OscilloscopeC.nc in implementation. First I've added Oscilloscope as a module to use it in implementation.

Second picture shows that when mote is started, beep function of Speaker is executed for 30 seconds. This way when mote is turned on every time speaker will beep till 30 seconds, and this output is used as an input for Mic.

2 axis implementation plot for this experiment is here:
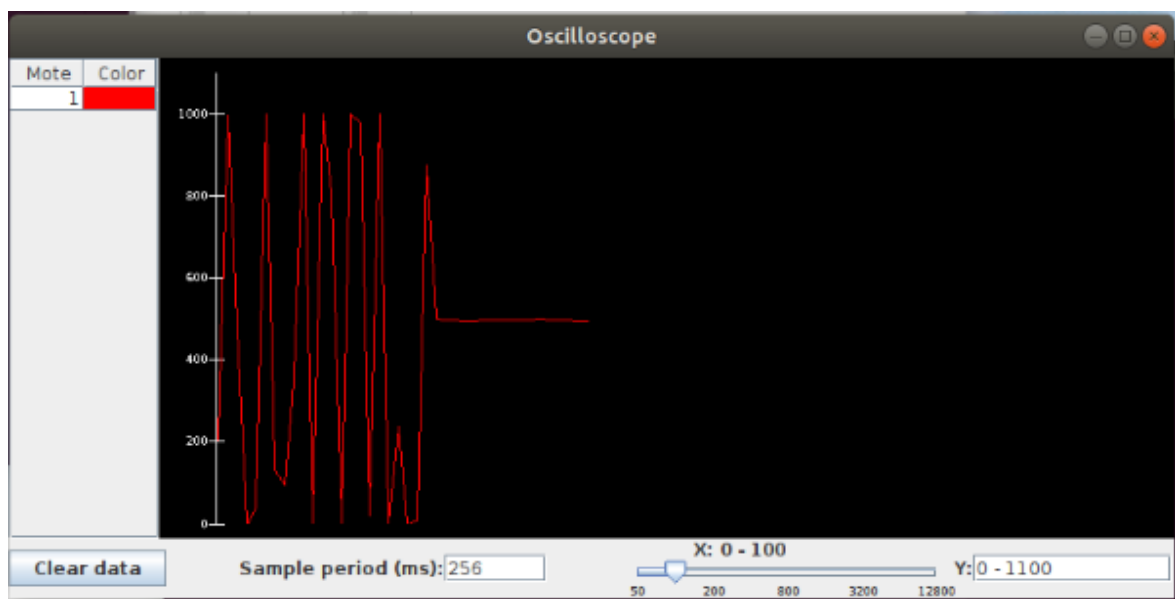
It can be observed that for starting of 30 seconds, it has varying value and once speaker is stop, it has almost stable graph since background was quiet.

Exercise 5: Temperature sensor is used as a main sensor to plot values. Temperature sensor can be wired simply by using TempC keyword for temperature as a sensor in OscilloscopeApp.nc

On sensor board there is temperature sensor is located, after using it as a sensor and installing in mote, temperature sensor made in contact with low temperature marble surface.

For sudden change sensor is brought under the heat of sun, which has comparably high value of temperature. Graph is plotted here.
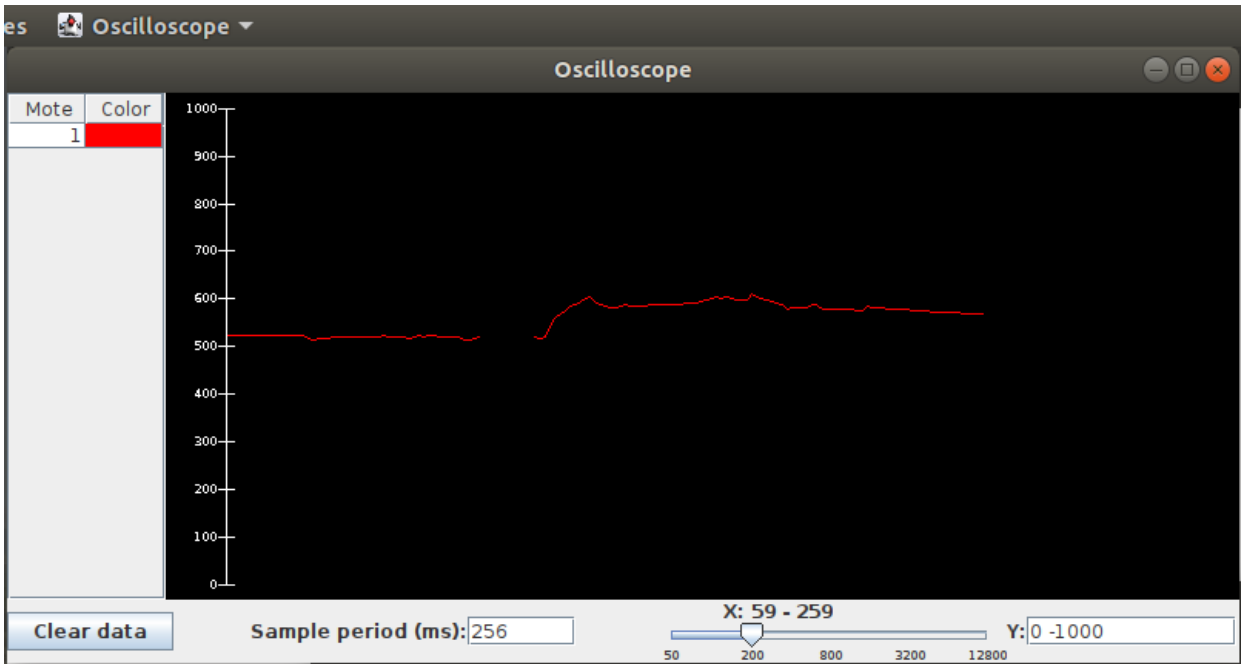
As we can see that in starting temprature graph is stable, when it touched with little lower temperature graph goes down a little and as it brought to sun heat, a rise can be seen in graph.

Hence, using differnet sensor we can plot graph of sensed data which are trasmitted over radio channel using Oscilloscope.