



UPPSALA UNIVERSITY

INFORMATION TECHNOLOGY

WIRELESS COMMUNICATION AND BUILT-IN SYSTEMS

TinyOS - An Movement Detection System
Z1 User

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Introduction

The goal of the assignment is to write your first program in TinyOS. You will start with an existing program: The clicker application that was introduced in the lecture. The clicker application counts clicks and visualizes the number of clicks on the LEDs. Your goal is to modify the clicker application to a simple Movement Detection Program. The Movement Detection Program is to turn on the LEDs present on the Zolertia Z1 mote whenever the accelerometer detects that the Z1 mote has been moved.

Tips

Directory and folder is marked with *italic font*.

Linux terminal code is marked with **typewriter font**.

nesC code is marked with **green typewriter font**.

Make yourself ready for the lab

For more details, please refer to the Hello World! lecture.

1. Open VirtualBox and start the virtual machine.
2. Source the `tinyos.env` file using the command `source tinyos.env`.
3. When the Z1 mote is connected to your device and make sure that it is connected to the virtual machine rather than the host computer.
4. Use the command `motelist` to check which port is the mote is connected to.

The Task

Your Task is to write an Movement Detection Program. You should use accelerometer data to detect movement.

Whenever a movement is detected, then the node should visualize it via LEDs. If the node has not moved for some time then the Z1 mote should turn off its LEDs.

You could use the three LEDs on the board to signify a change in their respective positions. For example, **LED0** turns on if the mote is moved in the **x**-axis. Similarly, **LED1** turns on if the mote is moved in the **y**-axis and **LED2** turns on if the mote is moved in the **z**-axis. This would mean that either one/two/three LEDs would turn on depending on how the mote is moved.

- To learn how to use the accelerometer, check the Zolertia example page:
http://zolertia.sourceforge.net/wiki/index.php/Code_Examples_with_Z1
- It is enough to check the acceleration with sampling rate of 10 Hz, i.e., reading the accelerometer 10 times a second.
- The accelerometer driver provides the interface `Read<uint16_t>`. However, accelerometer readings are signed. Cast values that you get from the `readDone(...)` events to signed integers.
- To read the sensor output from serial port, you can first install picocom:
`sudo apt install picocom`
Then read the serial port:
`picocom -b 115200 /dev/ttyUSB0`
Stop picocom: press ctrl button and then without releasing it press a and then q.
- The accelerometer values range from -512 to 511.
- A bug in the accelerometer driver in TinyOS may cause starting the driver to fail. If this happens, hold the node's reset button for two seconds. The driver should initialize correctly again.