Lab 1

The RFM12B-S2 Radio Module

The aim of this first lab is to become familiar with the rfm12 library and to re-familiarise yourself with the Il Matto development board, SPI and interrupts, in order to make the board communicate with the module and transmit data wirelessly.

Schedule

Preparation time	:	n/a
Lab time	:	3 hours

Items provided

Tools	:	n/a
Components	:	RFM12B-S2 Radio Module (1 each)
Equipment	:	Oscilloscope, Logic Analyser
Software	:	n/a

Items to bring

Essentials. A full list is available on the Laboratory website at
https://secure.ecs.soton.ac.uk/notes/ellabs/databook/essentials/

Revision History

October 13, 2015	Domenico Balsamo and Geoff Merrett	New lab for 2015/16

1   Aims, Learning Outcomes and Outline

These lab exercises will provide an introduction to computer networks and wireless communication using the Il Matto development board. In particular, you will learn how to use the RFM12B-S2 wireless transceiver (transceiver = receiver + transmitter) to enable communication between two Il Matto boards, and the basics of how to implement a protocol stack.

In this first lab you will not consider the implementation of any specific protocols, and you should not worry about protocol layering. We will explore this in future labs.

The aim of this first lab is to become familiar with the rfm12 library and to re-familiarise yourself with the Il Matto development board, SPI and interrupts, in order to make the board communicate with the module and transmit data wirelessly.

2   Preparation

None required.

3   Laboratory work

You should work in pairs for this lab exercise. Each pair should ensure that they have at least one working Il Matto between them, and that at least one person is familiar with the Il Matto and its programming.

Your objective for this lab is to interface your Il Matto with the RFM12B-S2 wireless transceiver, and be able to demonstrate the microcontroller communicating correctly with the wireless module.

The RFM12B-S2 is an FSK transceiver module which communicates over the unlicensed 433/915 MHz ISM (Industrial, Scientific and Medical) band. The modules complies with FCC and ETSI regulations.

This module has a wide voltage supply range of 2.2-3.8V DC. An SPI interface is used to send data and configure the RFM12 module. The configuration commands, described in the RFM12 IC Datasheet linked below, can be used to set the data rate, frequency band, wake-up timer, transfer data, receive data from the 16-bit FIFO, and much more.

Recommended steps:

1. Set up SPI and prove it is working
2. Set up HW interrupts and prove it is working
3. Adapt rfm12 library to work with ATmega644p (changing pins and registers)
4. Show using the library functions (*rfinit*(), *rf_tx*(), etc) that the microcontroller is able to correctly communicate with the module.

4   Resources

You can find more information about RFM12B-S2 on-line:

- https://www.sparkfun.com/products/12031

Moreover, during the lab it is very useful to use/read the following documents:

- RFM12B-S2 Datasheet:
  - http://cdn.sparkfun.com/datasheets/Wireless/General/RFM12B.pdf
- Programming guide:
  - https://www.sparkfun.com/datasheets/Wireless/General/RF12B_code.pdf
- RFM12B IC Datasheet:
  - https://www.sparkfun.com/datasheets/Wireless/General/RF12B-IC.pdf
- RFM12 Library for Atmel AVR uC's (ATMega8):
  - http://www.das-labor.org/wiki/RFM12_library/en