

## Project Proposal

### Wireless sensor station via radio link using auto baud rate detection

19<sup>th</sup> February, 2008

Ritu Bajpai, ritu\_ece@gwu.edu

#### ***Project Abstract***

I will be establishing a wireless radio link between a sensor and a base station. This project had already been done earlier by a student as a part of this class. I would be further working on this project by including a baud rate detection algorithm. Auto baud rate detection enables the base station to connect to more than one sensors transmitting data at different frequencies. To demonstrate this I will try to establish link between the base station and at least 2 sensors, probably a temperature sensor and a light sensor, transmitting data at different baud rates. The base station would be able to display the results on the LED array. I will be using one of the standard protocols for establishing communication between the two stations.

#### ***Strategy***

In order to connect two sensors to a base station I might need to use 3 microcontrollers. One could be the Z8 kit that I will be using for all the labs and the other one could be the Renesas microcontroller board which we have to use for lab 4. I could borrow an additional board from the instructor if he has one.

All the boards will have a transmitter and a receiver so that they can transmit and receive packets. The analog sensor data will be converted to digital data which will then be transmitted through the radio link, be received by the base station and be displayed on the LED display. The Z8 microcontroller has an ADC on board and I will probably be utilizing that.

I will be reusing many modules which will be developed as a part of the lab work during the course of this class. Other than that, I will be working on the packet receiving and transmitting protocol, its processing and auto baud rate detection algorithm.

#### Radio Module

```
Initialize() //set up GPIO, interrupts
Enable() //turn on the radio
Disable() //turn off the radio (for saving power)
Transmit(bit Tx) //send a bit over the radio
bit Receive() //receive a bit
radioProtocolStart()
radioProtocolTransmit(char *message, int len)
radioProtocolReceive(char *message)
```

## Project Proposal

radioProtocolAcknowledge()  
radioProtocolError()

Sensor  
InitSensor()  
enableSensor()  
readFromSensor()  
disableSensor()

### Client

The client (base station) waits for a button push, opens connection to server (sensor station), auto detects baud rate and displays results.  
Implements client side of protocol, displays output to LEDs, serial line.

### Server

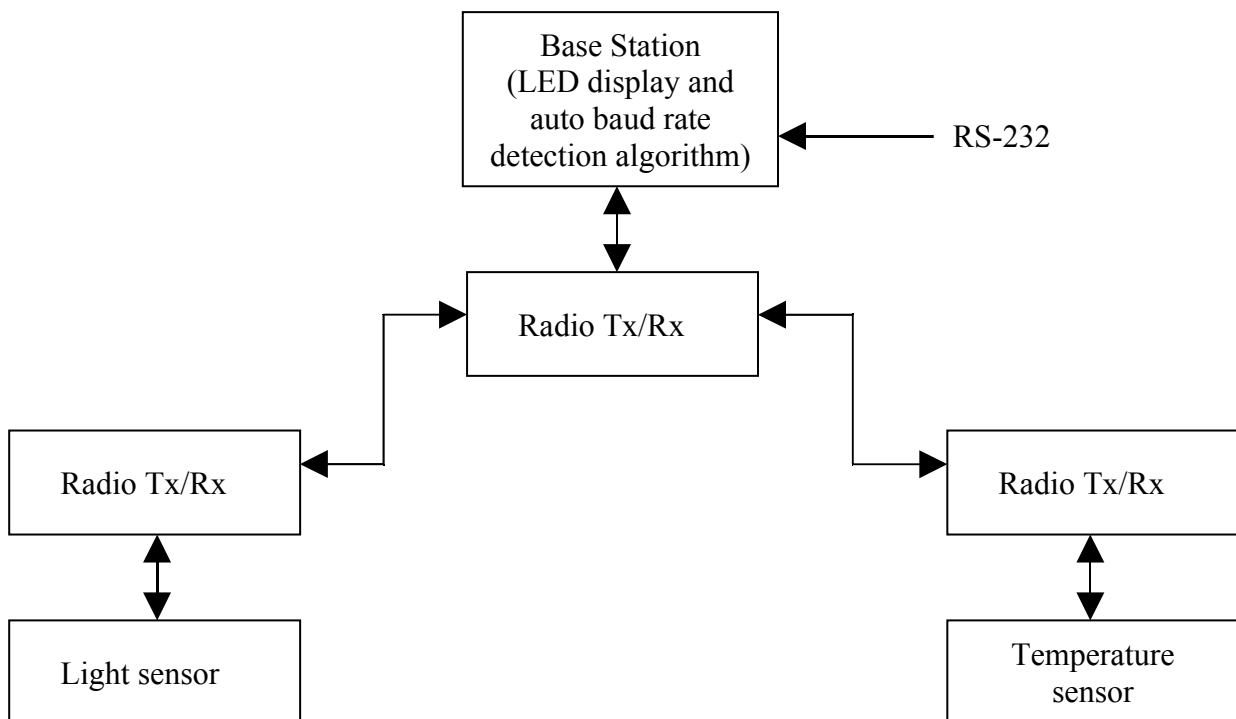
Server (sensor station) needs to be listening for incoming requests from the base station, gathers data, and sends results.  
Implements server side of the protocol, may have serial output for debug purposes.

Other modules to manage the system:

Timers

Interrupts

Buttons - note that a button press switches the rolls: the server (base station) makes a request to the client (sensor station), so the protocol must account for that behavior.



**Figure 1: Block diagram of the proposed project showing the radio link to be established between the sensors and the base station.**

## ***Unknowns***

Radio transmitter/receiver, sensors: I still have to decide what type of sensors I will be using and also how am I going to make a receiver and a transceiver.

Auto baud rate detection algorithm: I have to decide on the algorithm that I will be using for the auto baud rate detection.

Protocol: I will decide on the protocol based on which protocol will be simplest and yet will be able to accommodate all the functionality that I want my system to perform. I might use an error correcting or detecting scheme depending on the time and other challenges of the project.

## ***Implementation Plan***

- Read relevant datasheets and decide upon the sensors and the receiver/transmitter that I have to use.
- Read various auto baud rate detection algorithms and decide upon the one suitable for my project.
- Test the sensors independently if possible.
- Test the on board peripherals like ADC.
- Decide upon the transmission protocol to be used.
- Code, test and debug the software modules.
- Create brochure
- Present project
- Need to have backup plan if equipment does not work: order new radio transmit/receivers; get a different Z8 sensor board, etc.
- Try to always have a working, minimally functional prototype at all times – any minor
- function should give some verifiable output, probably through the LED

## ***Resources***

Check for the resources available with the instructor:

Sensor station Z8

Sensor station Renesas microcontroller board

Sensors

Three RF radio transmitter/receivers

Already have:

Base station Z8

Functioning LED API