

Progress Presentation-I

e-Yantra Summer Internship-2018

LowCostSensorNode/SensorNetworkDevelopmentPlatform

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Overview of Project

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Overview of Project

Overview of Task

Task Accomplished

Challenges Faced

Future Plans

Thank You

- Project Name :- Low Cost Sensor Node / Sensor Network Development Platform
- Objective
 - A custom built power supply for optimized for low power sensor node applications
 - Ability to program via Arduino IDE/ Atmel Studio
 - Use NRF2401 for RF communication
 - Completely open source design and sample codes to make it useful for WSNs
 - Can be used as general purpose microcontroller board for learning interfacing and C programming
- Deliverables
 - A sensor node platform along with sample codes for rapid prototyping
 - A firmware for low power modes and nRF24L01 networking
 - Documentation on Hardware and Software
 - Documentation for Tiny OS

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Task No.	Tasks	Deadline
1	Study about different sensor nodes platform available and their USP. Take desirable aspects of each	1 day
2	Review low power modes in Atmega328p, NRF2401 literature review	1 day
3	Build prototype using arduino pro mini + NRF2401, test range theoretically and experimentally in outdoor environment	2 day
4	Research components available and select to fit price vs performance metric	2 days
5	Build pcb design, source components, evaluation in proteus (if necessary)	5 days
6	Prototype soldering and testing	2 days
7	Building a network of 3 nodes, relaying info, power consumption analysis	5 days
8	Making reusable firmware for NRF2401, interfacing soil moisture, temperature/humidity sensors	4-5 days
9	Loading tiny OS, initial experiments	2 days
10	Trying out the features available in tiny OS, feasibility check	3 days
11	Firmware documentation, hardware manual and reporting results	3 days

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- Study of Atmega328p data sheet
- Wireless module
 - XBee (250 Kbps, 1.2 km, Rs. 1158)
 - Bluetooth (1 Mbps, 10 m, Rs. 250)
 - nRF24L01 (2Mbps, 100 m, Rs. 100)
- Study of RF24 library with useful APIs
- Successfully uploaded boot loader on Arduino Pro Mini
- Selected components for circuit design
 - LDO (MIC5219)
 - Boost converter (FP6291)
 - Mosfet (PMV65XP)

Task Accomplished

- Prototype hardware for range testing

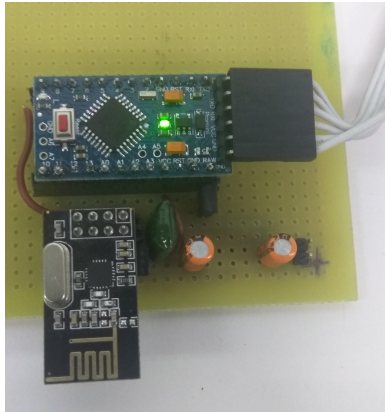


Figure: 1. Prototype Hard

Task Accomplished

■ PCB design of final circuit

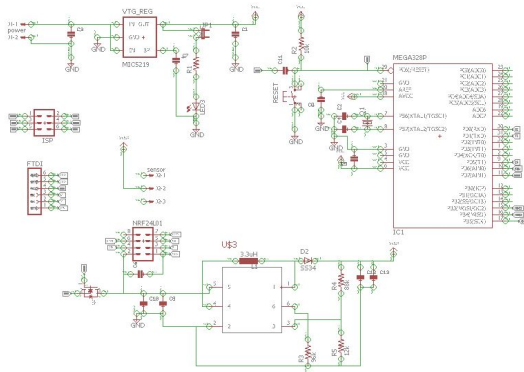


Figure: 2. Schematic design of board

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- Completed testing of star network by using two transmitter and one receiver.
- Measure current of Arduino Pro Mini
 - Normal mode current = **11.5 mA**
 - Sleep mode current = **0.6 mA**
- Measure current of nRF24L01
 - Normal mode current = **1.2 mA**
 - stand by mode current = **40 uA**
 - Sleep mode current = **900 nA**
- Test the range of nRF24L01 in outdoor environment with different data rate.
 - MIN (-18dBm) power = **0 to 6 m**
 - LOW (-12dBm) power = **0 to 8 m**
 - HIGH (-6dBm) power = **0 to 12 m**
 - MAX (0dBm) power = **0 to 16 m**

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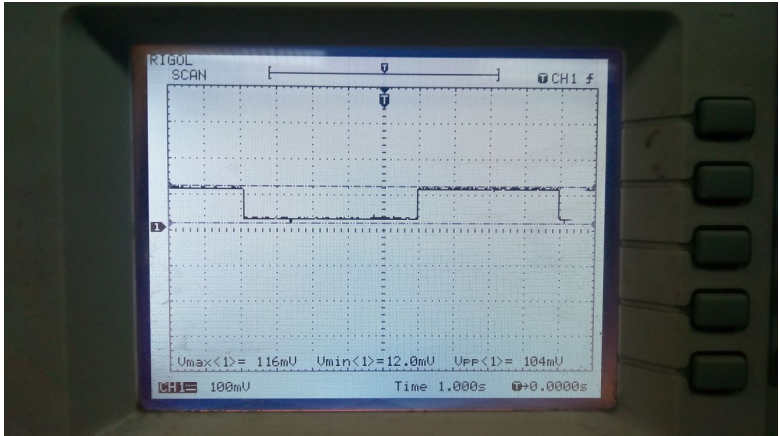


Figure: 3. Current of Arduino Pro Mini (Sleep mode, Idle mode)

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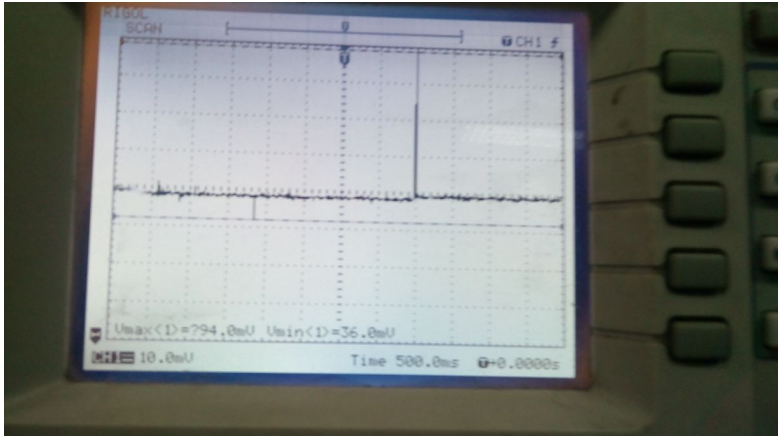


Figure: 4. Current of nRF24L01 (Active mode, Sleep mode)

Table: Range testing of nRF24L01(At different data rate)

Transmission Power level	MIN power (-18 dBm)	LOW power (-12 dBm)	HIGH power (-6 dBm)	MAX power (0 dBm)
Distance (meter)				
3.8	100%	100%	100%	100%
4.9	100%	100%	100%	100%
5.9	100%	100%	100%	100%
6.9	47%	100%	100%	100%
8	0%	100%	100%	100%
8.2	0%	100%	100%	100%
10	0%	74%	100%	100%
12.4	0%	0%	100%	100%
15.6	0%	0%	86%	100%

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- Prototype testing of nRF24L01.
- Range testing of nRF24L01 in outdoor environment.
- Setting of fuse bits (Low, High, Extended) using AVRDUde.
- Importing RF24 library in Atmel Studio.
- Differentiating data of two transmitter at one receiver.

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- PCB printing, soldering and testing.
- Solve the problem of RF24 library in Atmel. So, that we can make example codes for prototype.
- Duty cycling of Atmega328p
- Study about RF24mesh library.

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