Jaypee Institute of Information Technology

Minor-2 Project Report

"SMART BAND"

Submitted To

Dr. Madhu Jain

Submitted By

Tarash Agarwal-1310217

Submitted in partial fulfilment of the Degree of Bachelor of Technology

DEPARTMENT OF ELECTRONICS AND COMMUNICATION,

JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY, SEC-62, NOIDA

TABLE OF CONTENTS

Acknowledgement 3

Certificate 4

Chapter 1 Introduction 5

Introduction 5

Chapter 2 Methodology 7

Basic principle involved 7

Circuit principle 7

Algorithm 8

Hardware and software requirement 8

Chapter 3 Description 10

Arduino Nano 10

Digital temperature Sensor DHT11 13

Accelerometer 14

315 MHz Transmitter and Receiver 15

Voltage Controlled IC's 15

Chapter 4 Advantages and Application 17

Chapter 5 Conclusion 18

Chapter6 References 20

ACKNOWLEDGEMENT

I am very much thankful to everyone who all have supported me as I am progressing effectively towards completion of our project. I am equally grateful to my project supervisor **Dr. MADHU JAIN**. Her moral support and guidance gave me enough motivation to work in the right direction. She has been very kind and patient while suggesting me the outlines of this project and addressing my doubts. I thank her for her overall support.

I wish to thank my parents for their tremendous contributions and support both morally and financially toward the project. I also show our gratitude to all my friends who contributed in one way or the other in the course of the project.

Signature of the Student:

Tarash Agarwal (13102175)

Date:

CERTIFICATE

This is to certify that the project titled Smart Band submitted by Tarash Agarwal in partial fulfilment for the award of degree of B.Tech (3rdyear) of Jaypee Institute of Information Technology, Noida has been carried out under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of this or any other degree or diploma.

Signature of the Supervisor:

Dr. Madhu Jain

Date

CHAPTER-1
INTRODUCTION

Smart devices are the devices which offers advanced technologies with functionality similar as a personal computer. With the growing speed of technological advancement, many smart devices have become the essential components of our daily performance. As we look for convenience, we also respect the devices, which can combine multiple features and which give us more mobility and entertainment. As the whole world is going into the new phase of technological performance, our needs become more sophisticated. On the one hand, we need speed, quality, and effectiveness on the other hand, these features should be combined in a solution small enough to **carry it in the pocket**.

Smart devices have come to exemplify one of the wisest and the most convenient technological ideas in the history of mankind. The unique combination of features makes they are extremely usable and useful for different purposes. In business or in pleasure they expand our capabilities and help us resolve our problems in timely manner.

This is because of the growing speed of all decision-making processes in business and life that technological companies have come to the need for developing a new unique technological device.

Most of the devices that are available right now in the market are Smart phones, Smart TV's, Smart Washing machines etc., but the demand for a more compact device has always been there. The most compact device that is trendy in the market now is Smart Watches and Smart Bands.

In my project I have aimed to develop a personalized smart-band that has multiple features to provide service to its bearer. I will provide features having a more personalized approach such as profile modes (normal, silent and meeting).User friendly software etc. It is a device which will help to keep track of your health by providing you data such as number of steps that you put forward in a day, will provide data such as air temperature and humidity and will even unlock your car for you!

This project uses wireless communication to inform your car door that it is present near it and the door should be unlocked. It uses temperature and humidity sensor to provide the corresponding data. The whole device is powered by a 12 Volts power supply provided by a battery.

Output devices such as buzzer, led and vibrator is used to provide notifications. Data is displayed on a LCD screen.

Many other devices and sensors are also used in the project and the projected has been made as compact as possible.

CHAPTER-2
METHODOLOGY

2.1 Basic Principle Involved:

The main component in the circuit is Arduino Nano microcontroller, this board has been specially designed to be used for the development of wearable technology. The board is about the size of your thumb and is as much powerful as any other microcontroller available in the market. The main part of this project is a pedometer system that detects the step taken by the user based on the hand movement. The system uses an accelerometer device and a robust code to detect a step.
The device constantly transmits 3.15 MHz signals that is detected wirelessly at another end which can perform any function, however it runs another system in this project case.

2.2 Circuit Design Principle:

This controller requires a supply voltage of +5V DC. In order to provide regulated 5V DC voltage to the controller we need to use 7805 power supply circuit. We can use 5V DC battery or 12V, 1A adaptor as a power source. Also for Nano board we can give supply directly by USB cable connected to our laptop.

2.2.1 **Reset Circuit Design:** The reset pin of the board is kept active till the power supply is in the specified range and a minimum oscillation level is maintained.

2.2.2 **Oscillator Circuit Design:** A crystal oscillator is used to provide external clock signal to the microcontroller.

2.2.3 **Compilation of Microcontroller Code:** Once the circuit is designed and drawn on fretting software, the next step is to write and compile the code. Here we use Arduino 1.0.6 software to compile and burn the code to the board.

2.3 **Algorithm**

i. The temperature and humidity data is obtained from the sensors continuously displayed on the LCD screen.

ii. The transmitter continuously transits a signal transferring a particular password.

iii. If user presses button 2 pedometer system starts and asks you to enter number of steps to cover.

iv. Then on pressing button1 and button 2 simultaneously it starts calculating the steps taken and alarms you when the no of steps that have enter are reached.

v. If you press the button 1 at any moment before the alarm you go back to the main screen.

vi. If button is pressed and hold when the alarm is on you go back to the home screen.

vii. If you press button1 and button 2 at the same time at the home screen, the profile changes as it cycles through the defined modes of normal, silent and meeting.

2.4 Hardware and Software Requirements

2.4.1 Hardware Used

i. Arduino Nano
ii. Accelerometer Chip
iii. DHT11 temperature and humidity sensor.
iv. 3.14 MHz transmitter and receiver pair.
v. LCD Screen 16x2
vi. Buzzer
vii. Vibrator Motor
viii. LED
ix. Push Buttons
x. Resistors
xi. Jumper wires.
xii. Connection chord

2.4.2 Software Used

i. Arduino Software (IDE)

ii. Microsoft Windows

CHAPTER-3
DESCRIPTION OF THE COMPONENTS USED

3.1 Arduino Nano

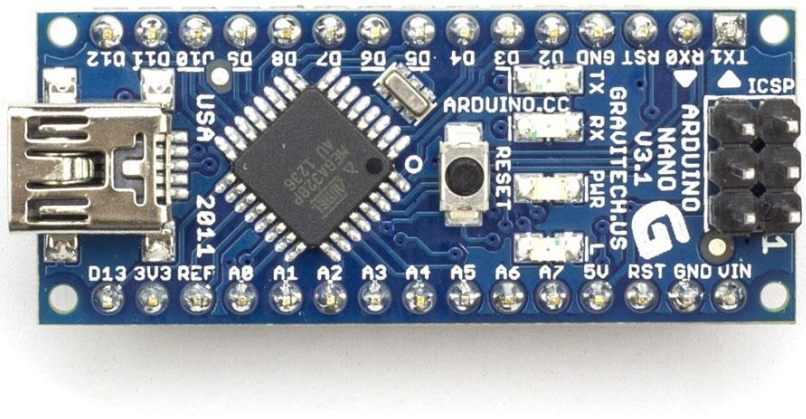

Fig.-1 Arduino Nano Front

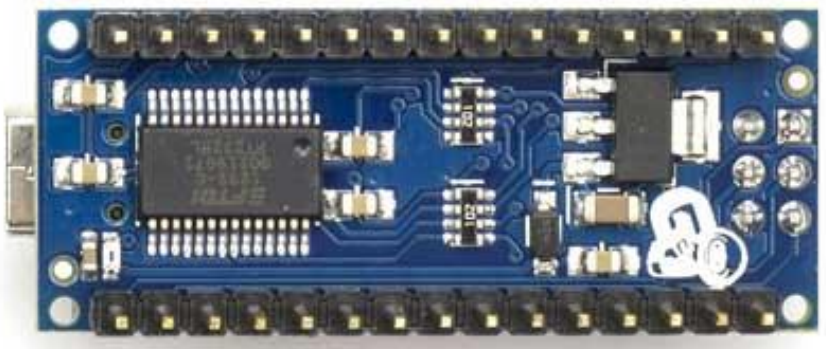

Fig-2 Arduino Nano Rear

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x) orATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Nano was designed and is being produced by Gravitech.

Table 1: Configuration of Atmel Atmega Microprocessor

Microcontroller	Atmel ATmega168 or ATmega328
Operating Voltage (logic level)	5 V
Input Voltage (recommended)	7-12 V
Input Voltage (limits)	6-20 V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	8
DC Current per I/O Pin	40 Ma
Flash Memory	16 KB (ATmega168) or 32 KB (ATmega328) of which 2 KB used by boot loader
SRAM	1 KB (ATmega168) or 2 KB (ATmega328)
EEPROM	512 bytes (ATmega168) or 1 KB (ATmega328)
Clock Speed	16 MHz
Dimensions	0.73" x 1.70"
Length	45 mm
Width	18 mm
Weight	5 g

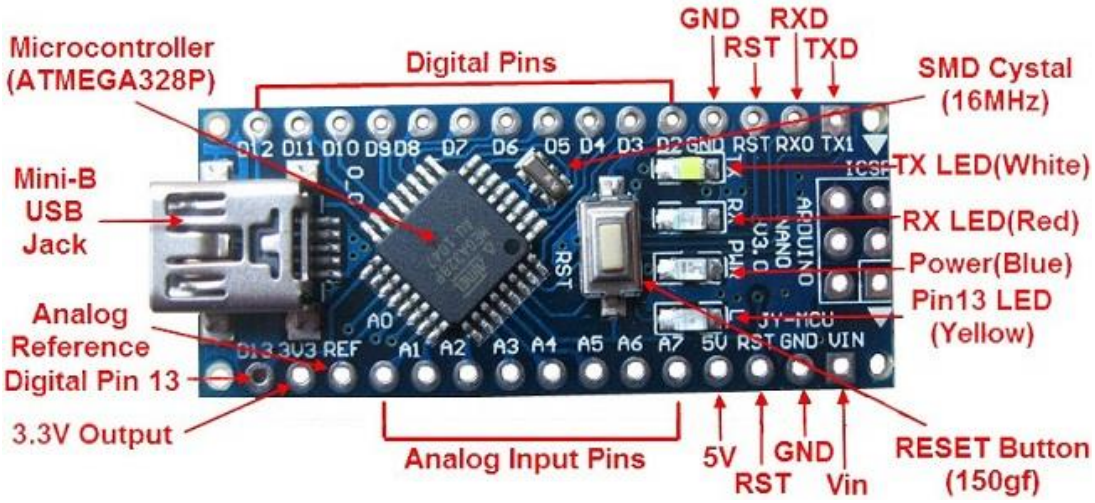

Fig-3 Detail pins of Arduino Nano

3.2 Atmega 328

The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface,

SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable. Power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughputs approaching 1 MIPS per MHz's

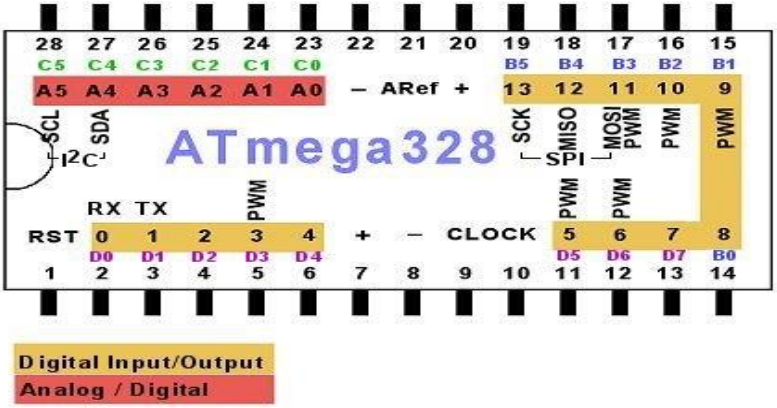

Fig-4 Atmega328 Microprocessor

3.3 Digital Temperature and Humidity Sensor (DHT11)

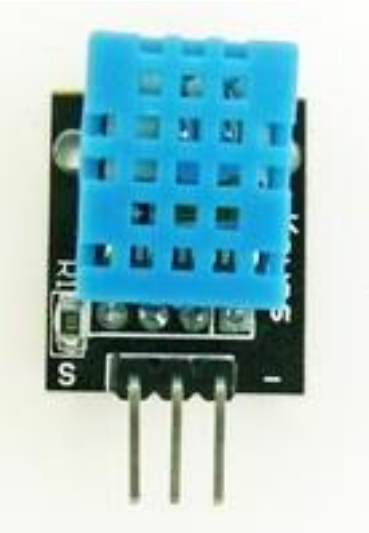

Fig-5 Digital Temperature Sensor (DHT11)

3.3.1 Specifications:

i. Humidity measuring range: 20% ~ 9 0% RH (0-50? temperature compensation.
ii. Temperature measuring range: 0 ~ +50 ?C ;
iii. Humidity measuring accuracy: 5.0% RH
iv. Temperature measurement accuracy: 2.0 C
v. Response time: (Updated by Rob Till art: now < 50 ms)
vi. Low power consumption
vii. **Features** single wire digital interface (the most simple system integration, ultra-low prices)
viii. Ultra-small size (12X15.5X5.5 mm)
ix. High reliability
x. Optimized long-term stability

3.4 Accelerometer

ADXL335 is a small, thin, low power, complete **3-axis accelerometer** with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

ADXL335 is 3v3 compatible device, it's powered by a 3.3v source and also generates 3.3v peak outputs. It has three outputs for each axis i.e. X, Y & Z. These are analog outputs and thus require an ADC in a micro-controller. Arduino solves this problem. We will be using the analog functions of Arduino.

Fig-6 ADXL335 3 Axis Accelerometer

3.5 RF Transmitter and Receiver

This **RF module** comprises of an **RF Transmitter** and an **RF Receiver**. The transmitter/receiver (TX/Rx) pair operates at a frequency of **434 MHz** an RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. HT12E-HT12D, HT640-HT648, etc. are some commonly used encoder/decoder pair ICs.

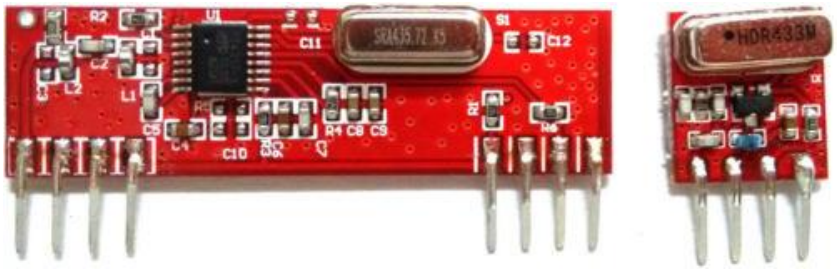

Fig-7 434 MHz RF Transmitter and Receiver

3.6 Voltage Regulator ICs

ICs regulator is mainly used in the circuit to maintain the exact voltage which is followed by the power supply. A regulator is mainly employed with the capacitor connected in parallel to the input terminal and the output terminal of the IC regulator. For the checking of gigantic alterations in the input as well as in the output filter, capacitors are used.

While the bypass capacitors are used to check the small period spikes on the input and output level bypass capacitors are mainly of small values that are used to bypass the small period pulses straightly into the Earth.

Fig-8 7805 Voltage Regulator IC's

7805 and 7809 are the member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The **voltage regulator IC** maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

CHAPTER-4
Advantages and Limitations

4.1 Advantages

i. No keys approach for various systems enhances security and reliability.

ii. Easy fitness monitoring with the step count.

iii. Various profile modes make the system user and environment friendly.

iv. Easy temperature and humidity monitoring.

4.2 Limitations

i. The system does not contain a clock and thus cannot tell time.

ii. Low power source and flickering of various devices.

CHAPTER-5
CONCLUSION

The project after completion is a success. All the systems are working fine and all we get a desired output. The project required both circuit designing and programming skills and all were implemented successfully.

We learn the basic concepts of the microcontroller and various circuitries to implement it.

The main problem with the project is to get an optimal power source, which will certainly be improved in further research over the project.

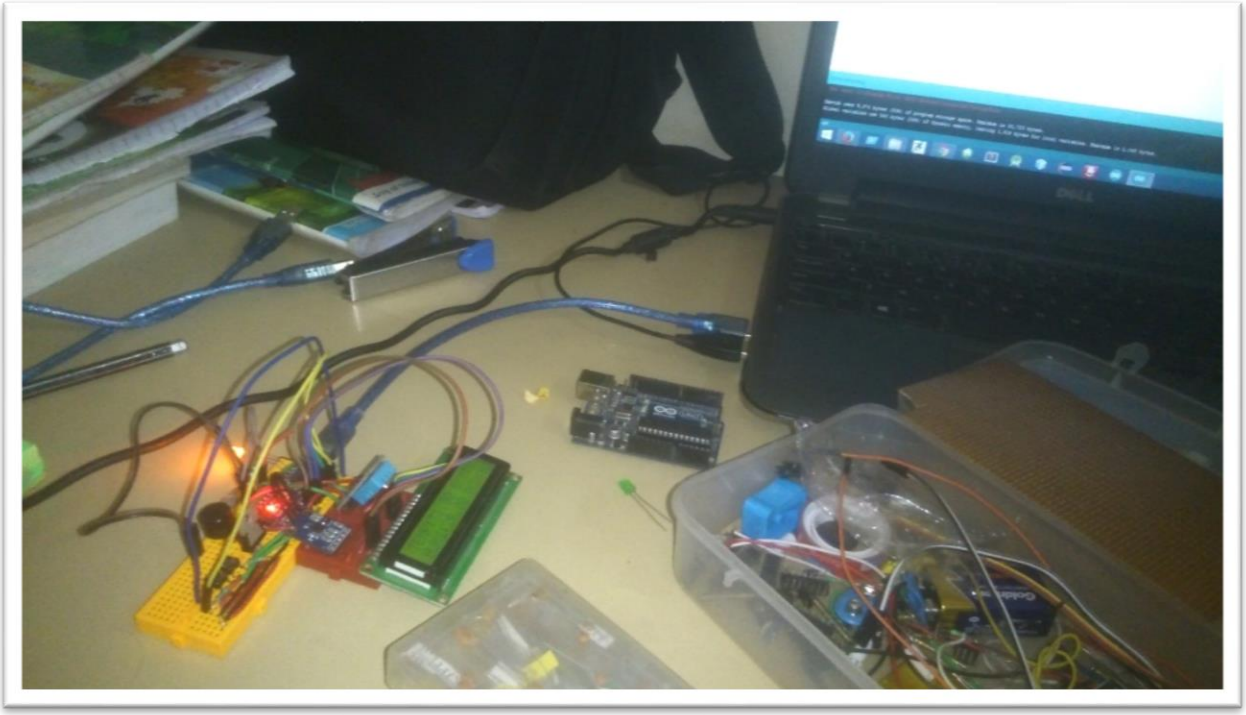

Fig-9 Project under Testing

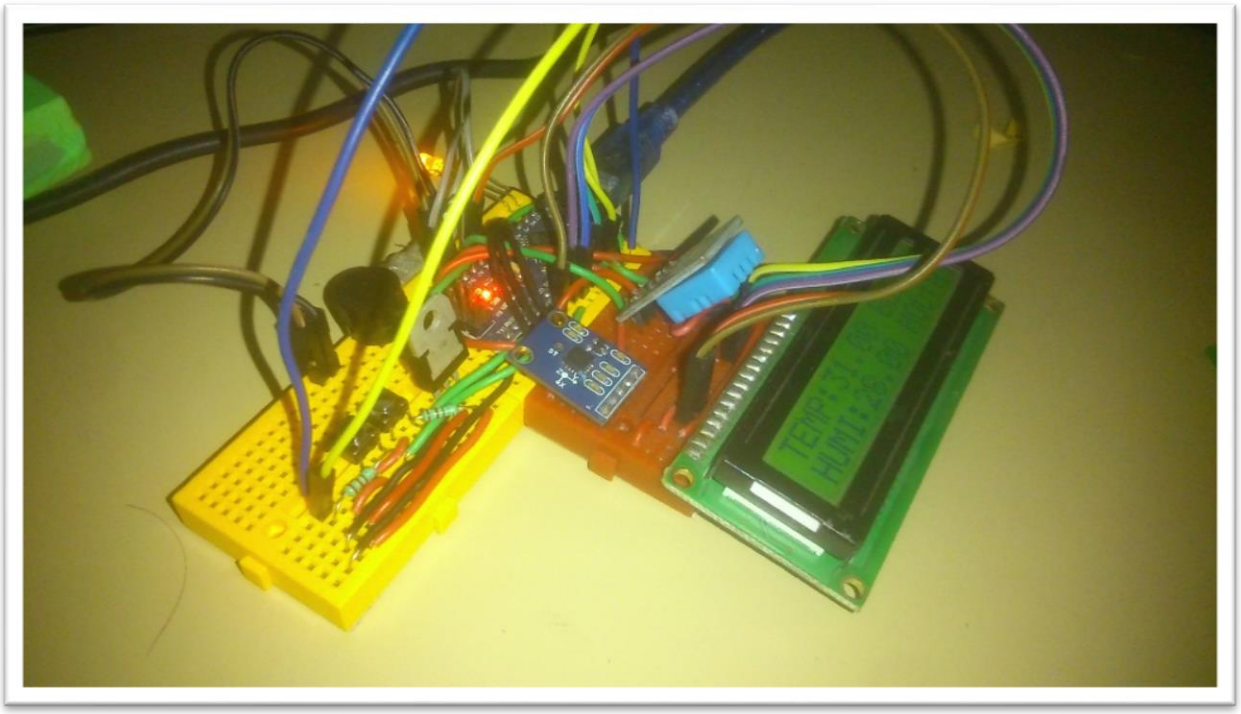

Fig-10 Project Almost Completed

Fig-10 Project in initial phase

CHAPTER-6
REFERENCES

[1] https://securelist.com/analysis/publications/69412/iot-research-smartbands/

[2] https://www.ijert.org/view-pdf/13463/design-and-implementation-of android-base wearable smart-band-to-enhance-security-and usability-of-device

[3] Muhhammad Ali Mazidi,Janice Gillispie Mazidi, Rolin D. McKinlay "*Microcontrollers and processors"*

[4] http://www.instructables.com/id/Arduino-Based-Smart-Glasses-by-a-13-Year-Old-Jorda/

[5] http://www.instructables.com/id/Simple-Easy-and-Cheap-DIY-Pedometer-with-Arduino/

[6] http://www.instructables.com/id/Temperature-Sensor-Tutorial/