

# **CS-308-2014 Final Report**

**Home Automation**

**Automators**

**Team-4**

**Rohit Kumar(Leader) , 120050028**

**Rakesh Ranjan Nayak , 120050047**

**Nitin Chandrol, 120050035**

**Suman Sourabh, 120050031**

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# **1. Introduction**

We worked on the Home Automation problem. Our mission to provide convenience, comfort and energy efficiency in household activities through automation. It provides centralized control of home appliances activity through Mobile application. Sensors like Motion sensor, proximity sensor and temperature sensor are used to detect the activities and state of environment and notify user about it using bluetooth network. It is useful in home, offices and schools etc. Thus impacts a large number of people.

## **2. Problem Statement**

We are supposed to achieve the home automation prototype which can be integrated with already available home circuit network. Product will contain a mobile application which will have interface to connect to home devices using bluetooth sensor and control their working via App. It was supposed to have temperature sensor to detect temperature and then control speed of fan and AC etc appliances. Motion sensors were supposed to be used to automatic switch control of bulbs to save electricity. Proximity sensors were supposed to be used to notify user in case of movement near a high security region. It can be used for theft protection.

Our final product is the simulator of home automation where fan and bulbs are connected in the breadboard through micro controller(TIVA board). All the sensors(temperature, motion and proximity sensors) are connected to TIVA board to collect the environment state.

## **3. Requirements**

### **3.1 Functional Requirements**

It is solving following functional requirements -

1. Automated speed control of fan depending on temperature, which is detected using temperature sensor
2. Manual speed control of fan through mobile application
3. LED switch control through mobile application
4. Motion sensor based LED switch control
5. Proximity sensor based LED switch control which can be used as an alarm

### **3.2 Non-Functional Requirements**

It follows characteristics like -

1. Response Time - Control through Mobile App is very responsive in nature with the response time within a second
2. Testability - Debugging is simpler as we can directly measure the voltage in Micro-Controller and fix bugs.

3. Scalability - Product is scalable with new home devices can be integrated.

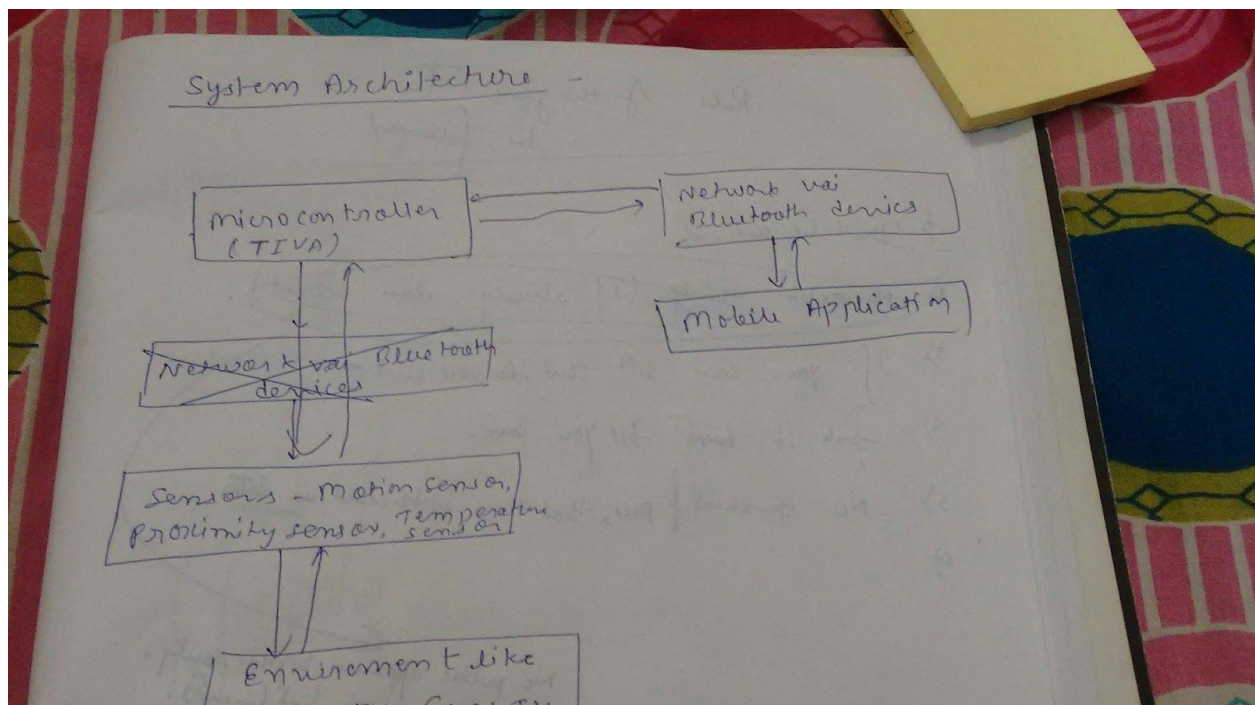
### 3.3 Hardware Requirements

1. Tiva Board - Microcontroller with inbuilt temperature sensor
2. Bread Board - To simulate home circuit
3. Bluetooth Module - To create bluetooth network to connect Mobile device to Tiva Board
4. Motion Sensor - To detect motion in nearby
5. Proximity Sensor - To detect object in proximity
6. Motor & Blades - To simulate fan and its speed change
7. LED & Jumper wires - LEDs to simulate bulbs and jumper wires for connections
8. Android Phone

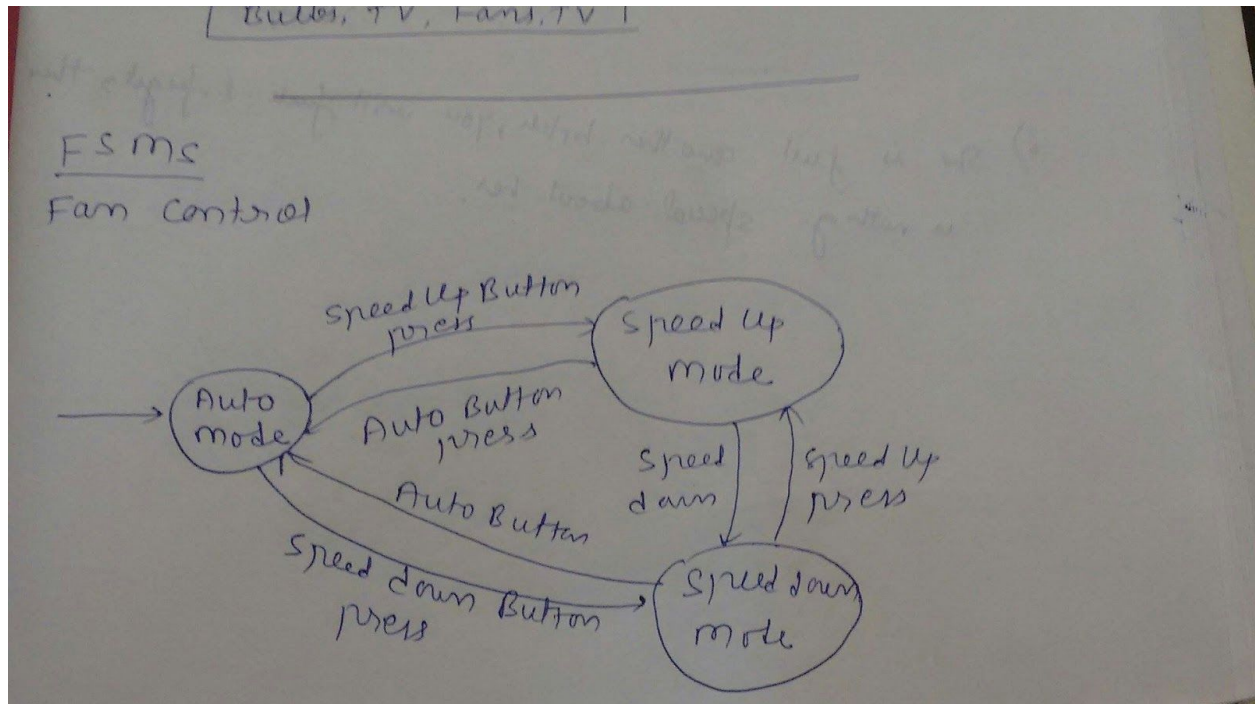
### 3.4 Software Requirements

1. Code Composer Studio
2. Android SDK

## 4. System Design

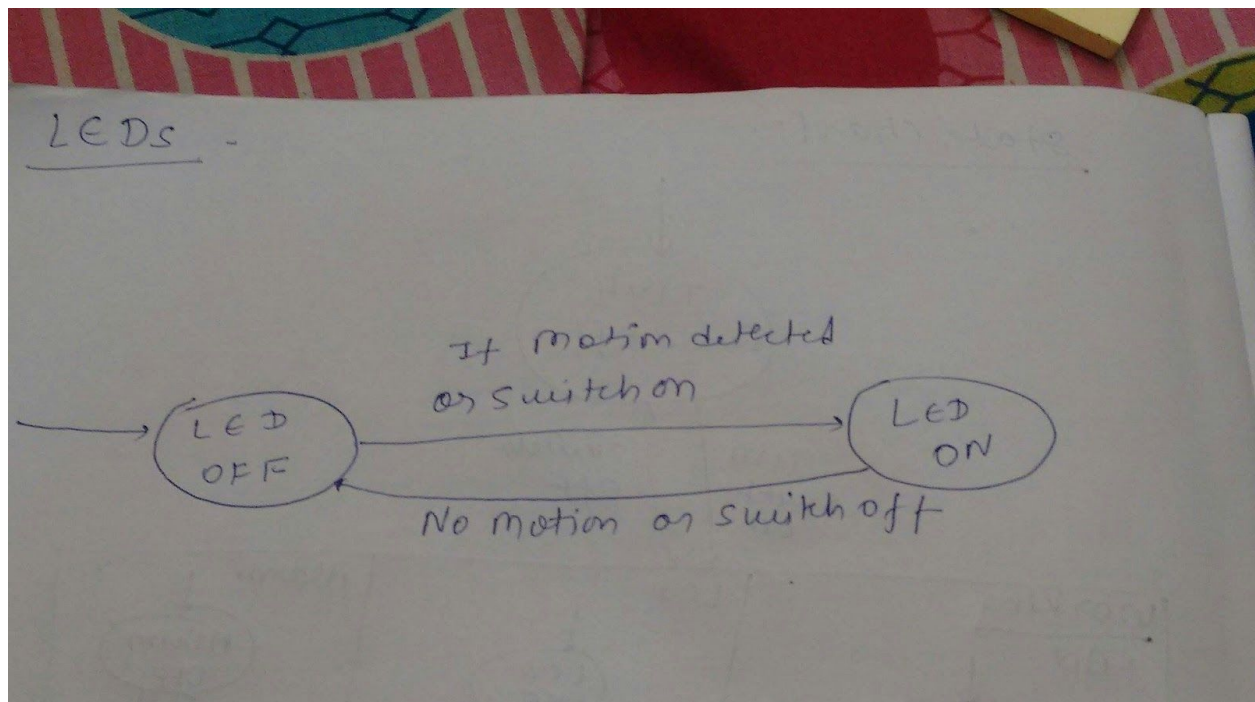


*System Architecture*

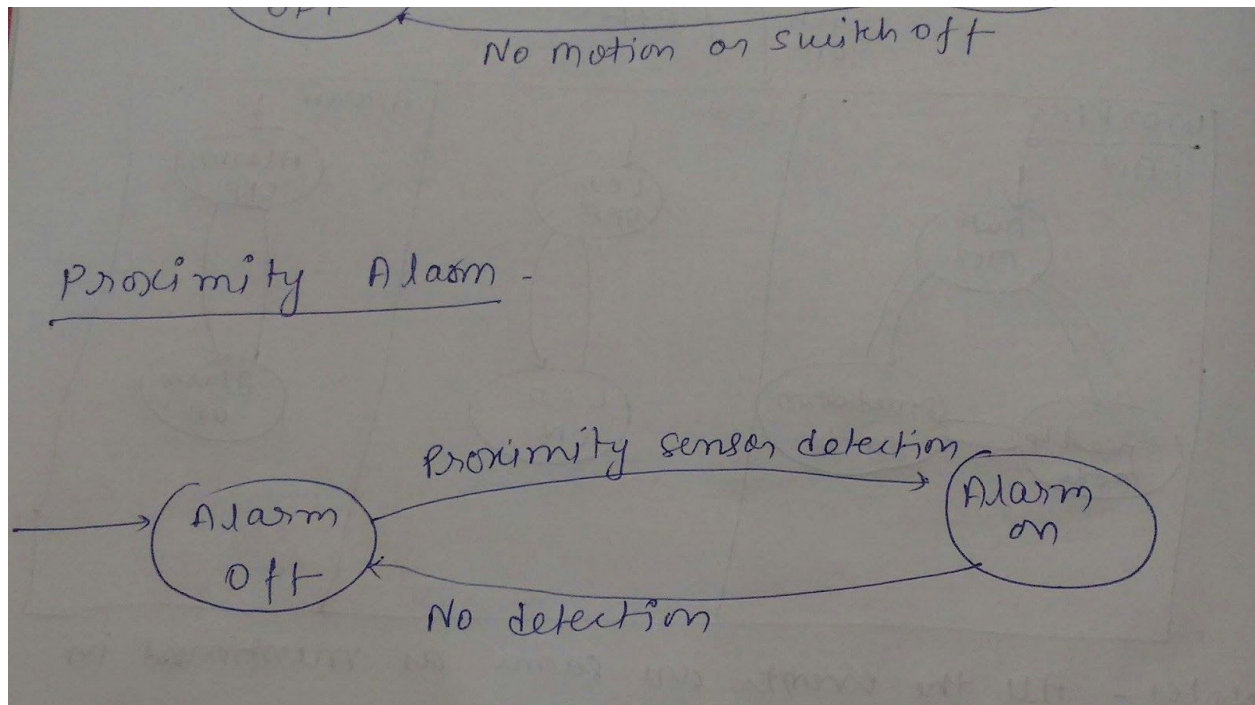


Fan FSM

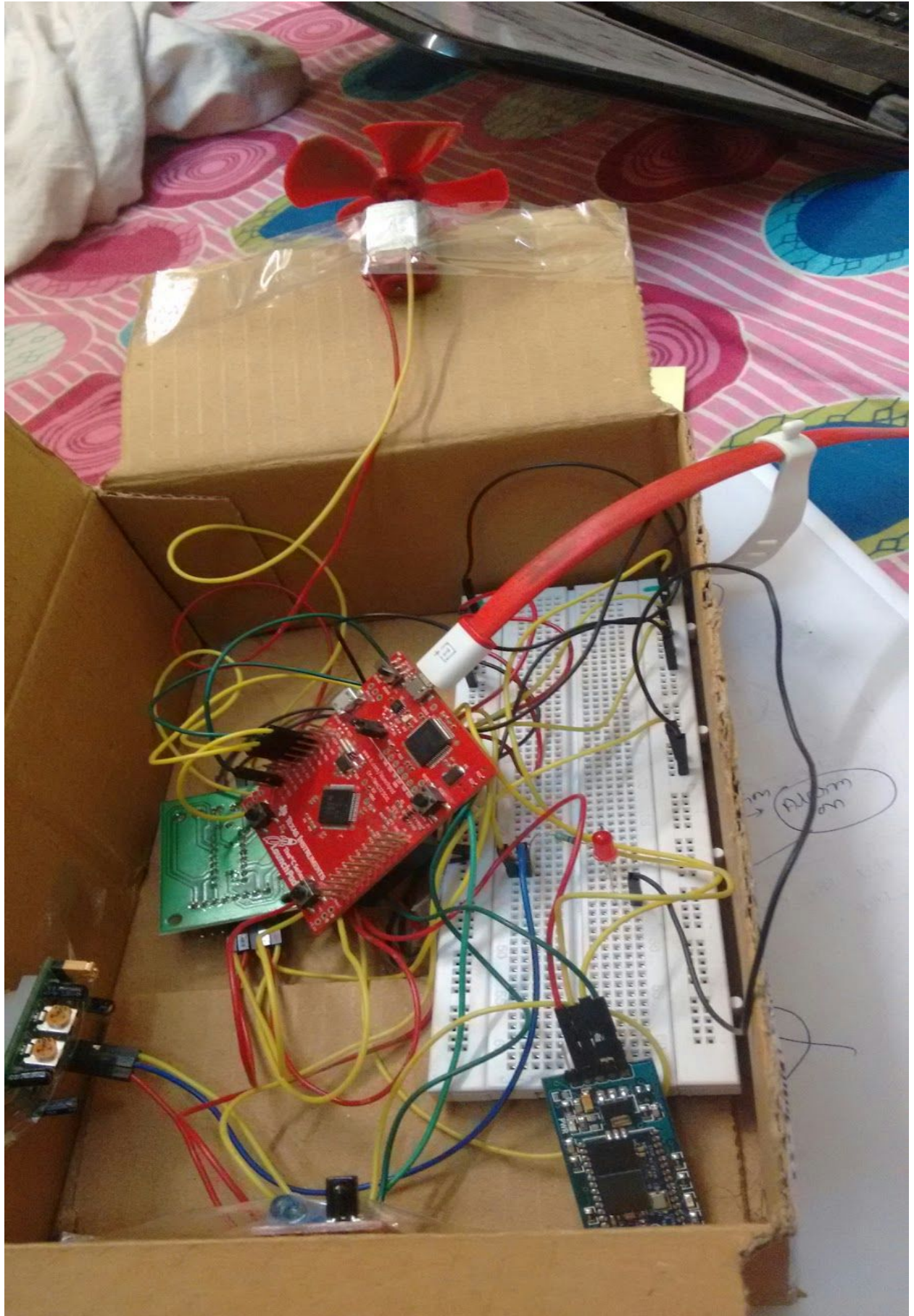
LED FSM



## Alarm FSM



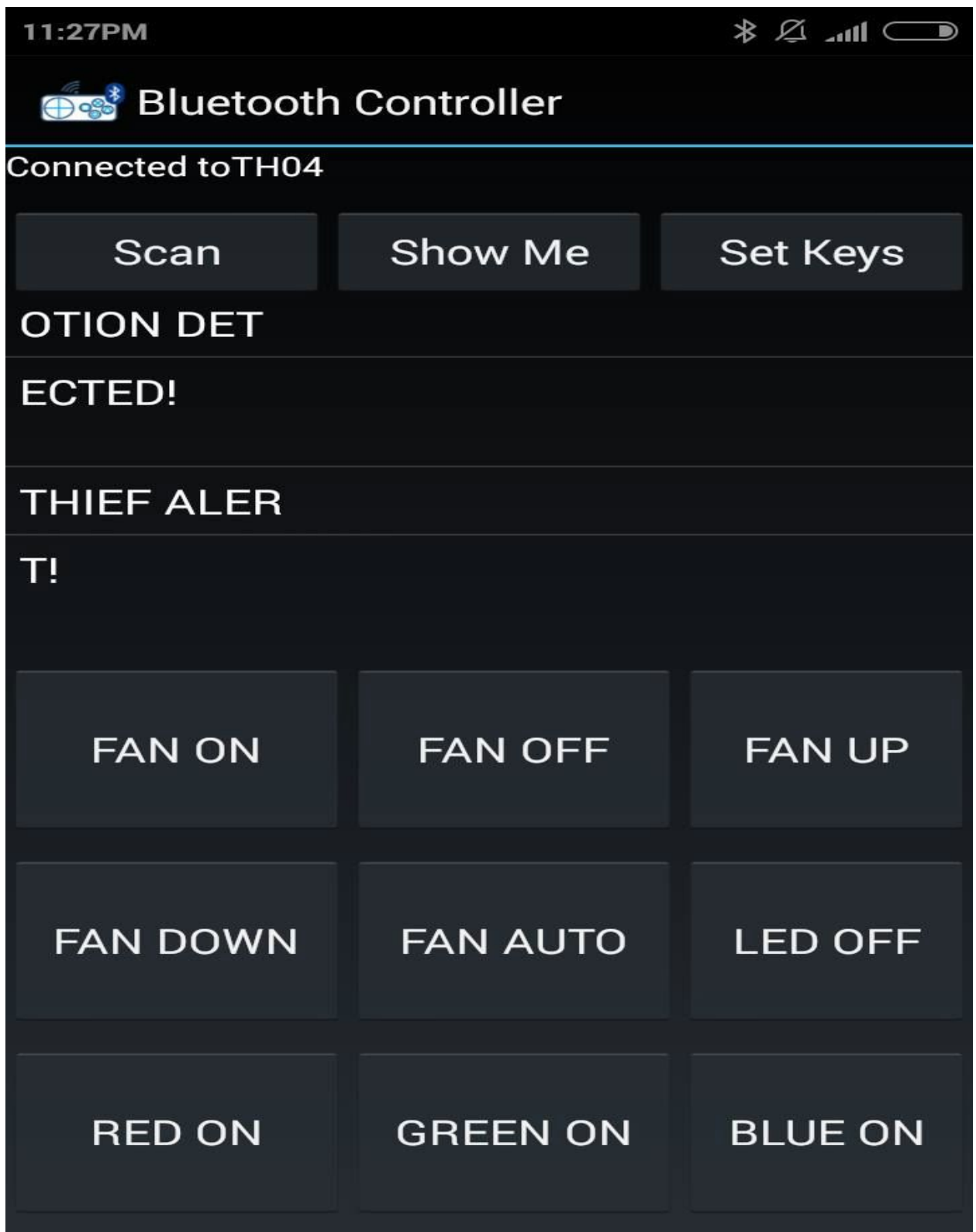




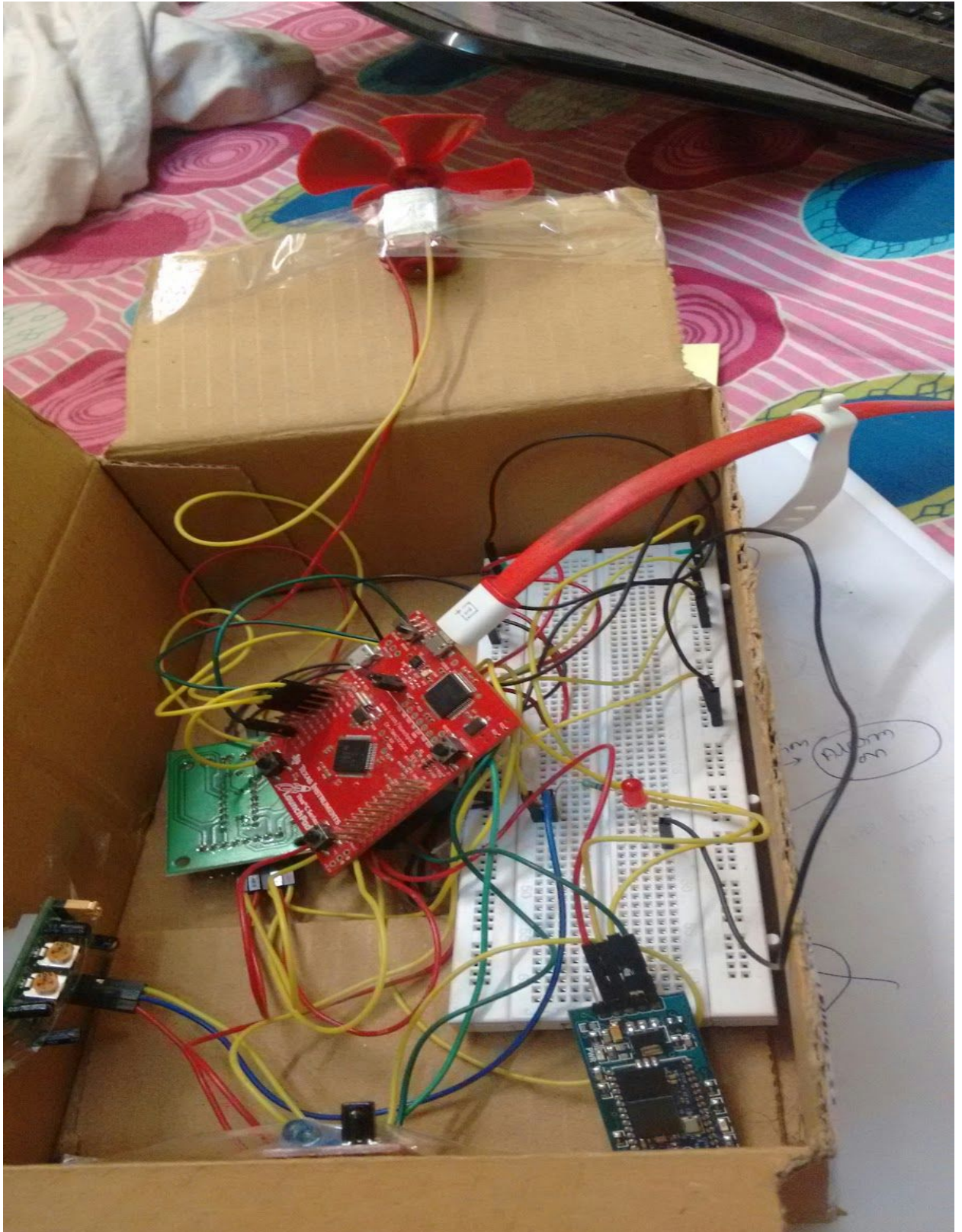
## **5. Working of the System and Test results :**

- Automated speed control of fan depending on temperature, which is detected using temperature sensor : PMW
- Manual speed control of fan through mobile application
- LED switch control through mobile application
- Motion sensor based LED switch control
- Proximity sensor based LED switch control which can be used a alarm

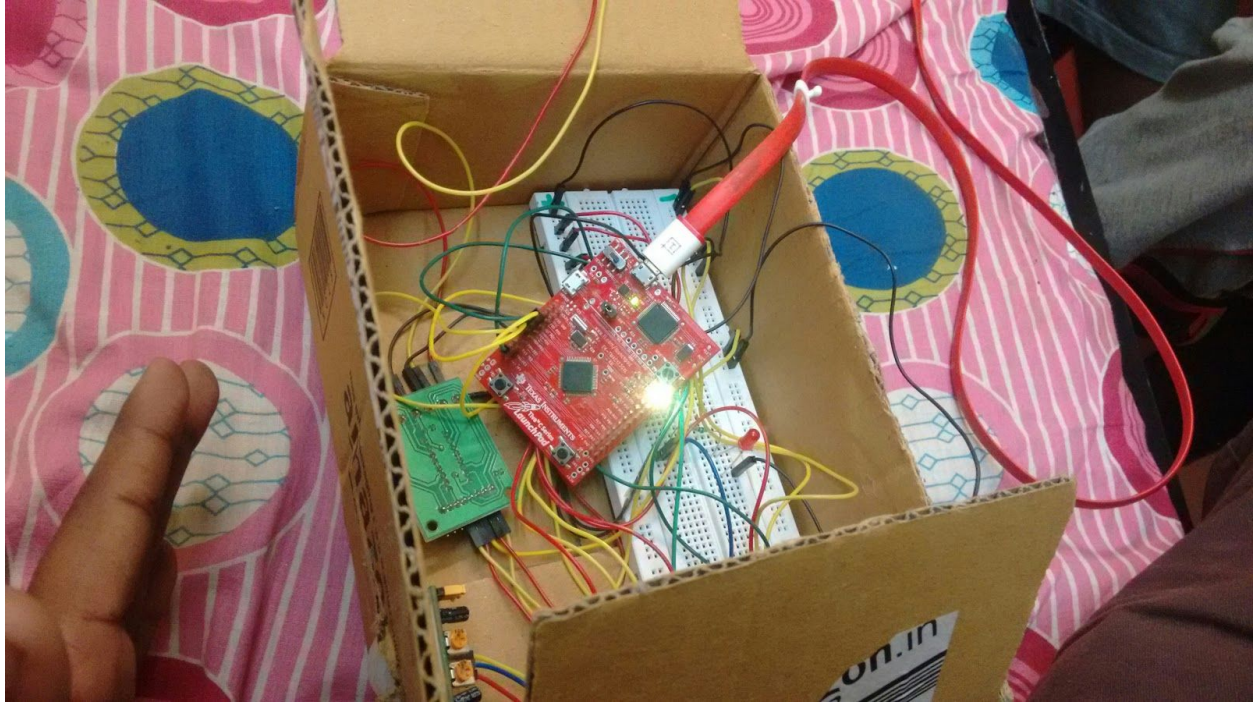




Mobile App Interface



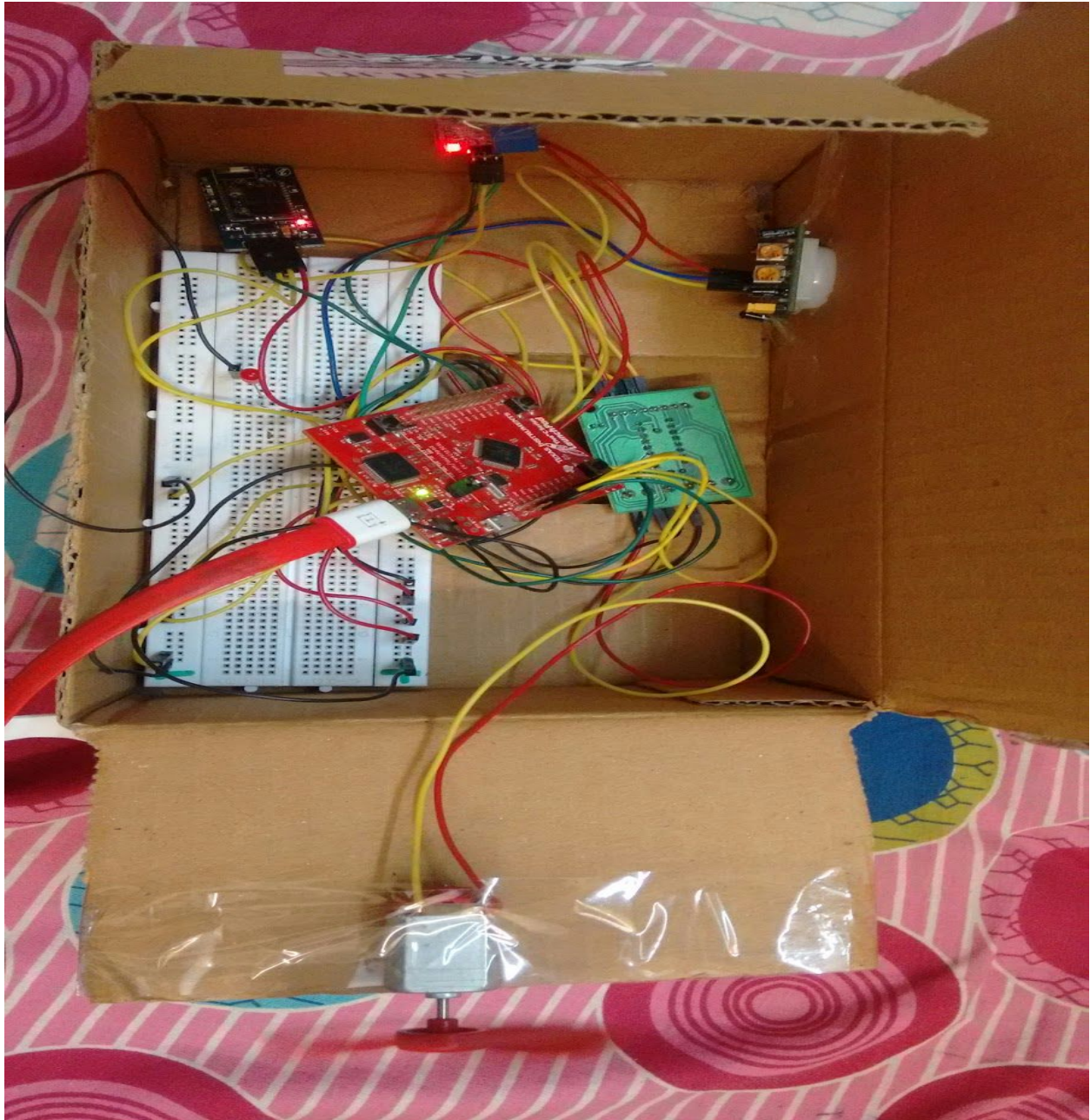
TIVA off state



Motion Sensor & LED Control



## Motion



### Proximity sensor & Fan control

#### Testing :

- Bluetooth:
  - When already connected to some bluetooth device, the bluetooth on the board shouldn't
- Fan:
  - Auto mode testing:  
Kept our kit in hot corridor and then air conditioned class back to back. The fan spun in full speed outside, but got slow in the air conditioned room.

- Manual mode:  
Irrespective of the room temperature, the fan is fully controlled by app.
- Lights:
  - When someone steps in front of the motion sensor the led glows.
- Theft control :
  - A notification appears on the phone when the door opens ( cover of the box opens ).

## 6. Discussion of System

a) What all components of your project worked as per plan?

1. Temperature based fan speed control
2. Manual fan speed control via Mobile Application
3. Centralized control of LEDs via Mobile Application
4. Motion sensor based LED control

b) What we added more than discussed in SRS?

1. Proximity sensor for theft protection

c) Changes made in plan from SRS:

1. We shifted from Wireless Module to bluetooth Module : As wireless Module integration via Energia was not compatible with CCS Module code of TIVA board integration with Sensors. Thus we shifted to bluetooth module.

## 7. Future Work

Re-Usable Components -

TIVA -Board : Microcontroller can be used for further extension of project

Possible Extension -

1. Integration with real life home circuit
2. Collect data of device uses and apply analytics to conclude power consumption patterns
3. Use Pulse detection sensor to detect drowsiness and control light switches based on that



## 8. Conclusions

Home automation is the need of today's world. It not only provides comfort to users , it also tackle sustainable energy issue. A low cost automation device with easy integration can create a large size user base. Product is scalable and easy to use. We faced issues while integration of different sensors, but proper documentation of devices helped us to tackle those.

## 9. References

1. Home automation using Bluetooth Device

<https://www.youtube.com/watch?v=RwECaBf-ZpA>

2. TIVA Board getting started

<https://www.youtube.com/watch?v=JpGNNCYjtFw>