

# **CS321:**

## **Computer Peripheral & Interfacing Lab**

### **Group 2: IntelliBag**

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## INTRODUCTION & FEATURES

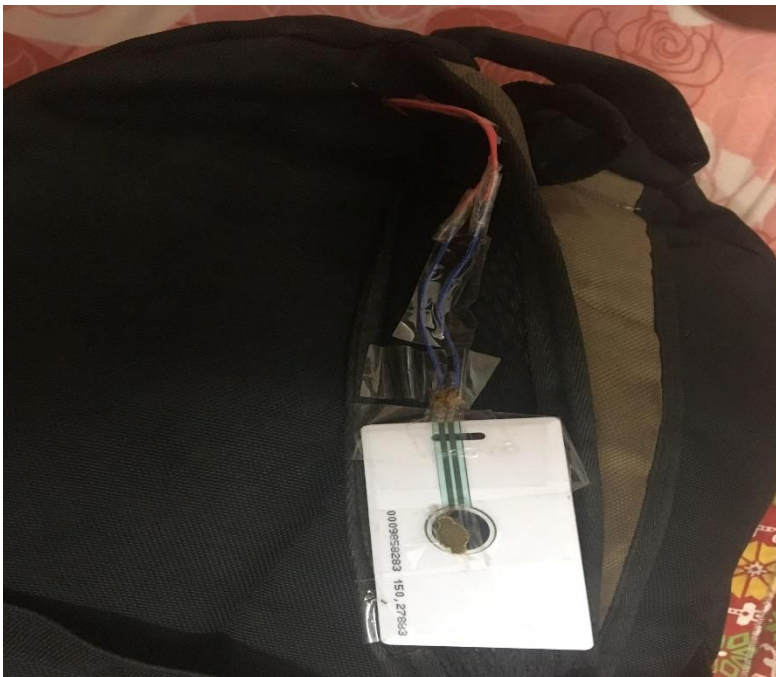
In a world where watches are being replaced by smart watches, phones by smartphones, TV by smart TV, we thought we should replace bag with a smart bag. Our Intellibag detects the contents of bag using RFID and notify you if something corresponding to the day's schedule is missing. The bag detects when outside light is dim and hence you wouldn't be able to see the contents of bag, and a very powerful LED inside bag is lit up when you open the zip (LED is only lit up when zip is opened and turned off when zip is closed). Our Intellibag is host of various security features as well, if you are wearing the bag and someone tries to open the zip, a buzzer is raised, this is also useful if you forget to close the zip before wearing it. The bag can be tracked by using its Bluetooth and you can also raise the buzzer using Bluetooth, making it easier to track the bag. The force sensor on strap calculates the weight inside bag and publishes it onto mosquitto server via MQTT, making your fitbit subscribe to that data would result in incorporation of weight you were carrying while walking in your realtime calories consumption count and its analysis.

# SETUP

## 1. RFID



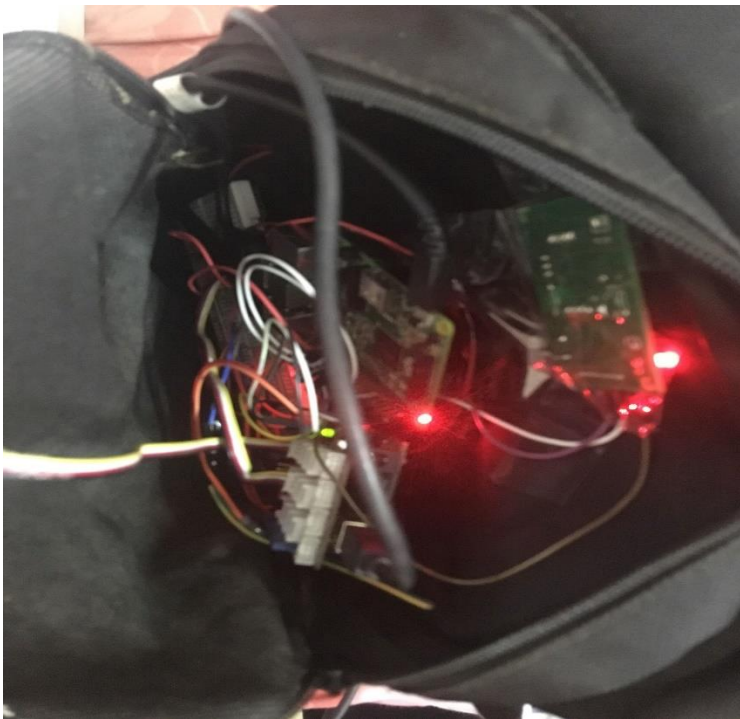
## 2. Force Sensitive Resistor



### 3. Light Sensor



### 4. Arduino, Pi, Buzzer & Bluetooth



## 5. Zip check



6.

# HARDWARE MODULES

## SENSORS

### 1. 1x EM-18 RFID



#### What is this?

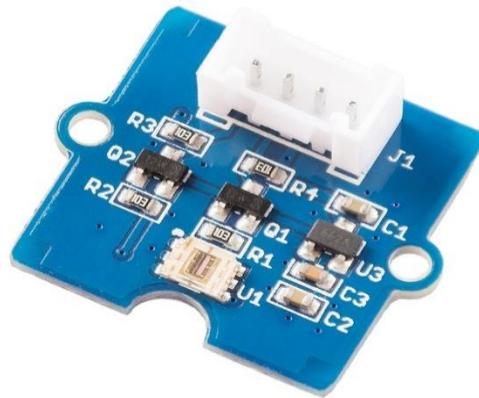
The EM-18 RFID Reader module operating at 125kHz is an inexpensive solution for RFID based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply. Show the card within the reading distance and the card number is thrown at the output.

#### Why?

We need to keep a track of all the items currently inside the bag. We are assuming that all the items have a RFID tag and hence an item will get scanned while it is being inserted or removed.



## 2. 1 x Digital Light Sensor



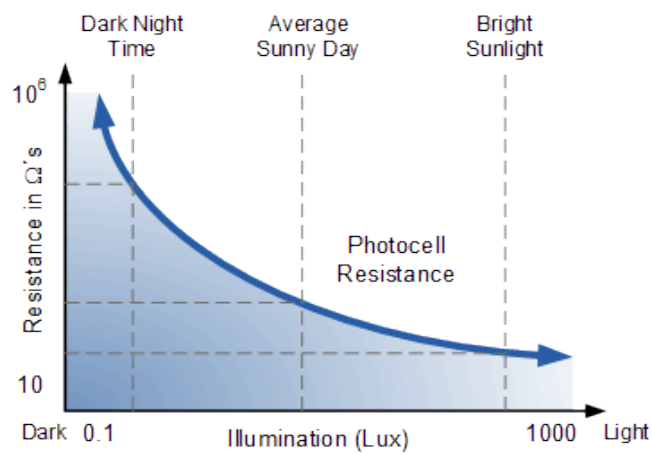
### What is this?

This module is based on the I2C light-to-digital converter TSL2561 to transform light intensity to a digital signal.

### Why?

We need to check whether outside light is enough to see clearly the contents of bag, else we light up the LED inside the bag

### Characteristic Graph



### 3. 1x Force Sensitive Resistor



#### What is this?

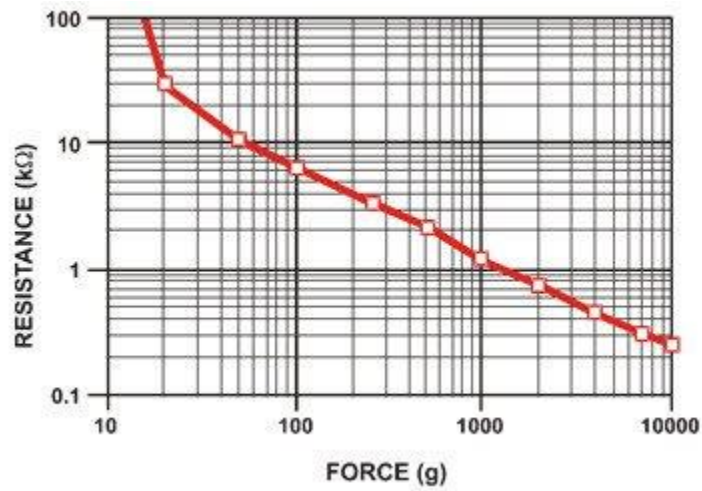
Force sensing resistor can be defined as a special type of resistor whose resistance can be varied by varying the force or pressure applied to it. If force is applied to a surface of sensing film, then the particles touches the conducting electrodes and thus resistance of the film changes.

#### Why?

We need to know when a person is wearing the bag. By putting a Force Sensitive Resistor on strap, we can know when the person is wearing the bag, by detecting the force on strap. The heavier the contents of bag, more is the force applied.



## Characteristic Graph



## 4. 1x HM10 Bluetooth Module



What is this?

HM-10 is a readily available Bluetooth 4.0 module based on the Texas Instruments CC2540 Bluetooth low energy (BLE) System on Chip (SoC).

## Why?

We need to connect Arduino to mobile phone so that user can send various commands, like raise buzzer, check contents of bag and also for tracking the bag.

### 5. 1x Magnetic Reed Switch



## What is this?

In a reed switch, the two contacts (which look like metal reeds) are made from a ferromagnetic material, coated with a hardwearing metal such as rhodium or ruthenium (to give them a long life as they switch on and off), and sealed inside a thin glass envelope filled with an unreactive gas (typically nitrogen) to keep them free of dust and dirt. The two contacts join in the presence of magnetic field and the circuit is completed.

Why?

We need to know when zip is closed. By placing a magnet on one zip and a reed switch on another, we can detect when the zip is closed by completion of the circuit.

6. 1x Wifi Dongle with antenna



What is this?

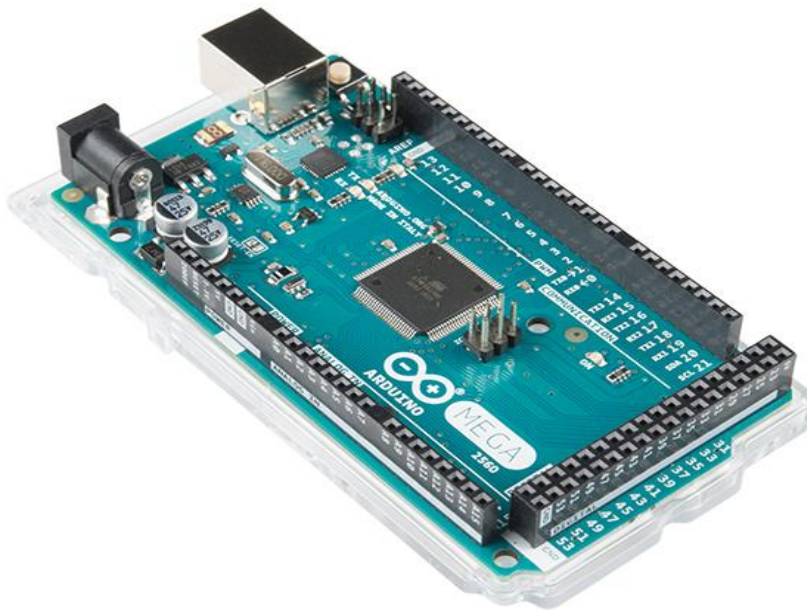
This dongle gives wifi compatibility to the raspberry pi

Why?

We need to connect pi to internet so that we can publish the data

# MICROCONTROLLERS

## 1. 1x Arduino Board (Arduino Mega 2560)



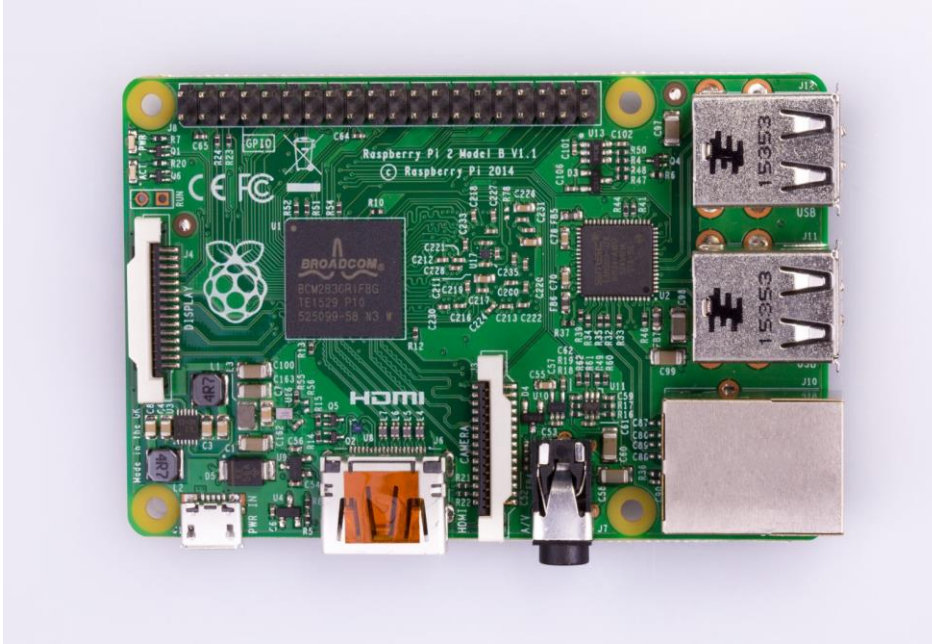
### What is this?

The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

### Why?

To control light sensor, buzzer, force sensitive resistor, reed switch, Bluetooth module, we have used arduino.

## 2. 1x Raspberry Pi 2



### What is this?

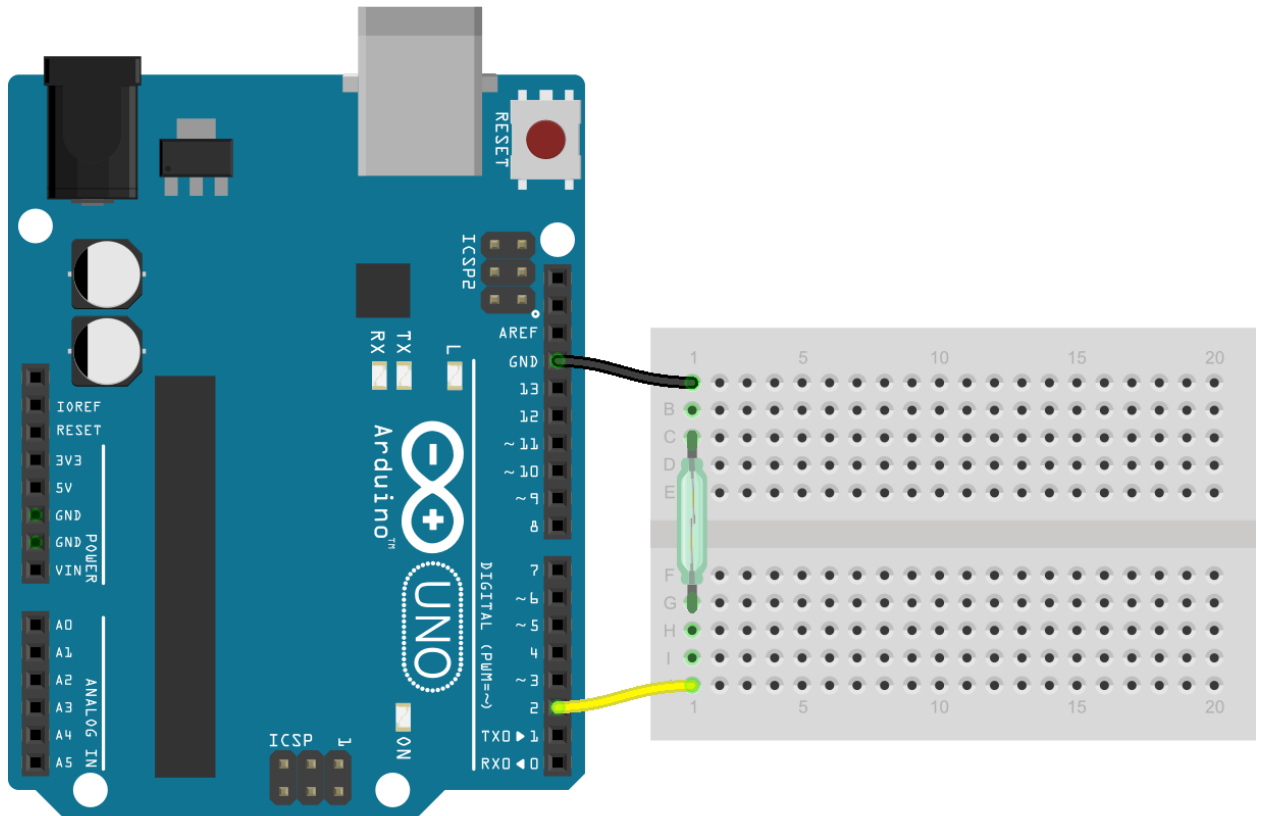
The Raspberry Pi 2 Model B is the second-generation Raspberry Pi. It has 1 GB RAM, 900 MHz ARMv6 processor.

### Why?

We need to connect RFID and also keep a track of the contents of the bag. Pi is useful over Arduino because of its ability to run Python scripts and save JSON files. We also need Pi to connect to internet.

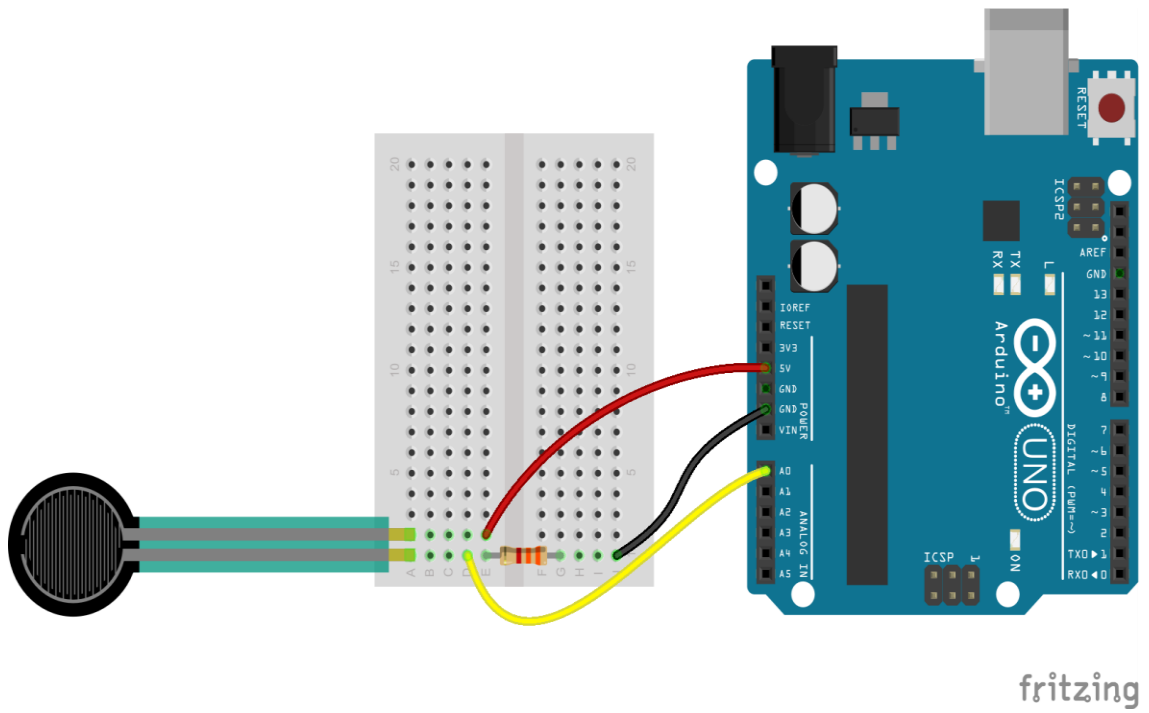
# CIRCUIT DIAGRAMS

## 1. Reed Switch

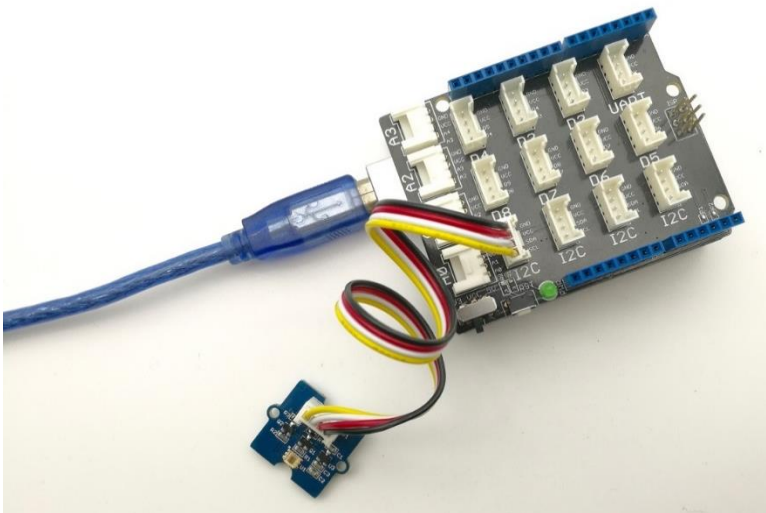


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## 2. [Force Sensitive Resistor](#)

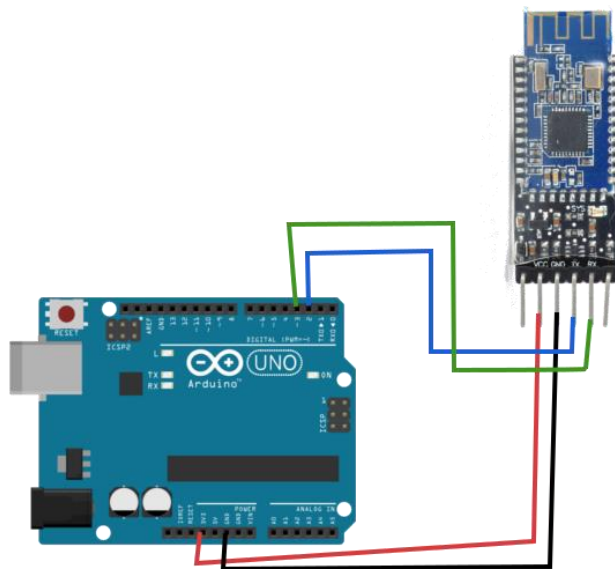


## 3. [Light Sensor](#)

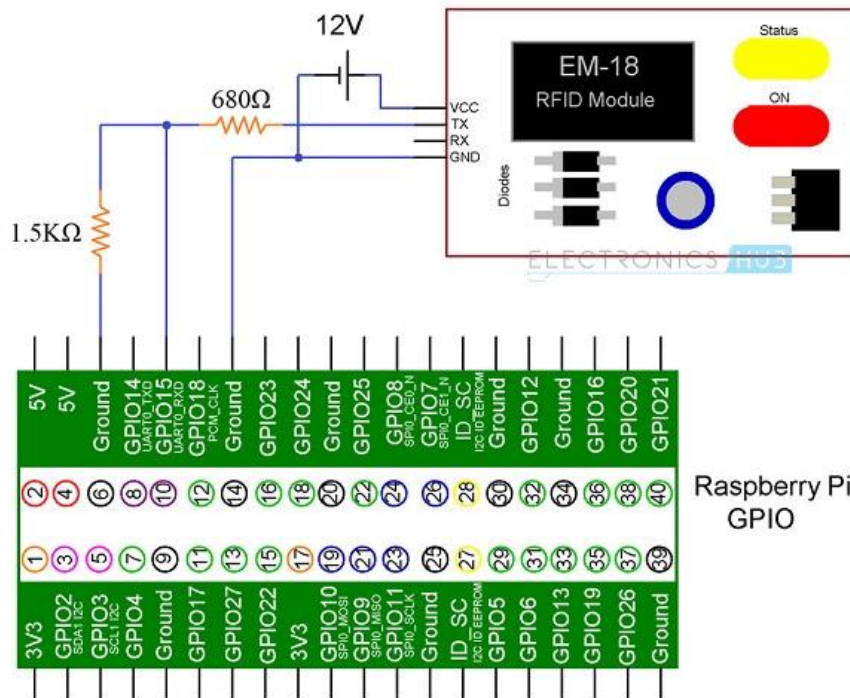




#### 4. [Bluetooth Module](#)



#### 5. [RFID](#)



## MQTT

We are publishing the data of force sensitive resistor, through MQTT, to mosquitto server. If a fitbit (or any other similar calorie consumption monitoring device) is made to subscribe to this data, it can take into consideration the weight person is carrying, which is proportional to the value of force, while calculating the calorie consumption. We need to use MQTT as fitbit gives a realtime consumption of calories, with proper analysis of duration and time of activity.

We are connecting to a mobile hotspot (for MQTT data transfer) and also through Bluetooth to the owner's mobile. So we can detect the current location of the phone itself, send this data back to pi which can publish this so that the child's parents can know his/her realtime location. This doesn't require any extra sensor.

## PRECAUTIONS

1. As our bag was small, due to paucity of space, all the connections are fragile and the bag need to be handle with care
2. The voltage supply should not be more than 5V.

## LIMITATIONS

1. We are using a power bank with 2.1A port but the raspberry pi needs 2.5A.  
As a result, the range of EM18 RFID is reduced and tags need to be within 2.5 cm of it to be scanned. Connecting it through laptop resulted in proper performance of RFID and hence better performance is expected with proper power bank.
2. The data collected during absence of internet connectivity is lost.

## **FURTHER SCOPE**

1. The feature of publishing current location, as described in the MQTT section, can be implemented.
2. We were working on bag with single zip, we can extend our design for two zip bags.