

# PROJECT TOPIC: SMART DIAPER

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## 1.PROJECT SUMMARY

The Objective of this project is to develop a device that helps parents monitor their new born babies without the need of them being physical present near the baby. The device can read moisture levels from the diaper and notify the parent when a threshold moisture level is reached. The device also notifies the parent if the baby is awake when the device is put in sleep mode.

## 2.COMPONENTS USED

- Arduino Uno Microcontroller
- ESP 8266 Wi-Fi module
- Gyroscope module L3GD20H
- Soil Moisture sensor
- Voltage regulator module (3.3V and 5V)
- Bread board
- Jumper wires

### 2.1 Arduino Uno Microcontroller

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. The Uno is used to read sensor data from Soil Moisture sensor and the Gyroscope module L3GD20H and also to control the ESP 8266 Wi-Fi module.

### 2.2 ESP 8266 Wi-Fi Module

The ESP8266 Wi-Fi Module is a self-contained System on Chip with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. In this project the ESP 8266 is used to create a Web server where the application is displayed.

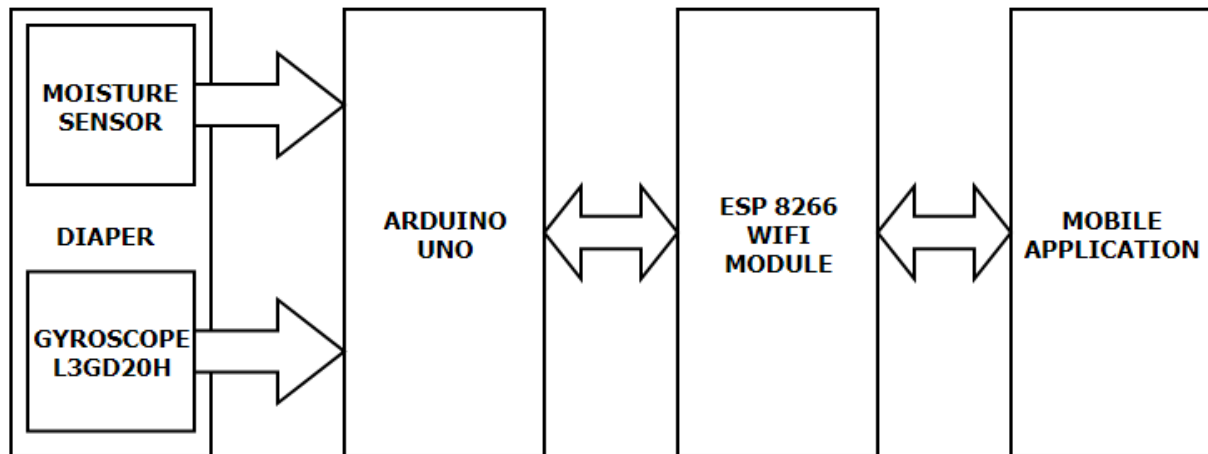
### 2.3 Gyroscope module L3GD20H

The L3GD20H is a low-power three-axis angular rate sensor. It includes a sensing element and an IC interface able to provide the measured angular rate to the external world through digital interface. This module is used to monitor the baby's movements when the device is in sleep mode.

### 2.4 Soil Moisture sensor

Soil Moisture Sensor is a simple breakout for measuring the moisture in soil and similar materials. Here it is used to measure the moisture in baby's diaper pad.

### 3.BLOCK DIAGRAM

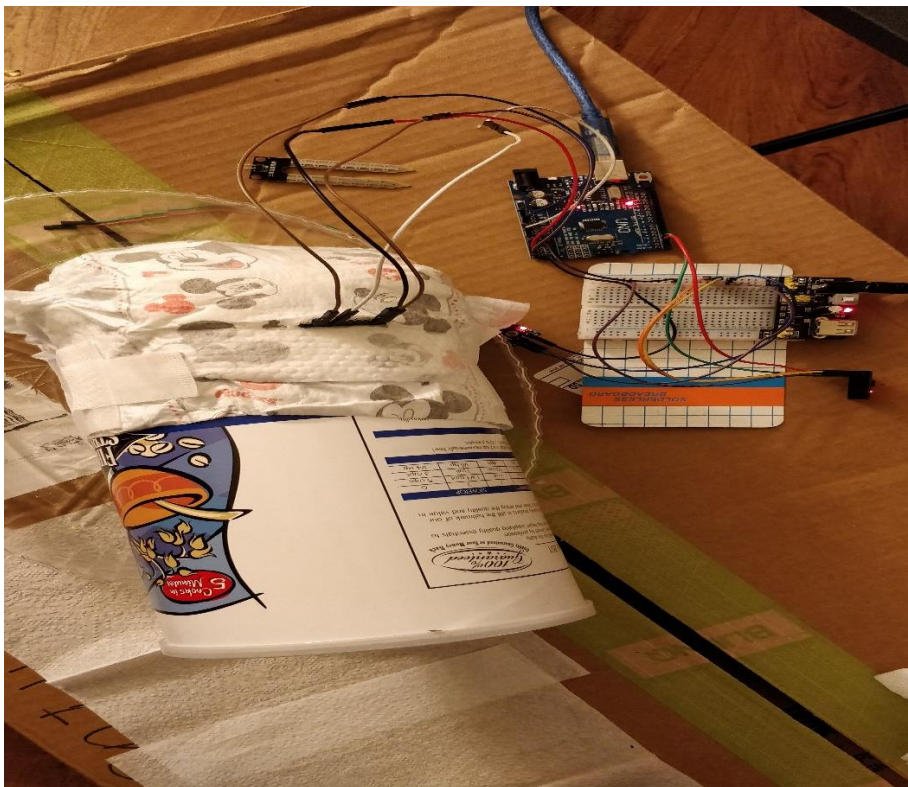
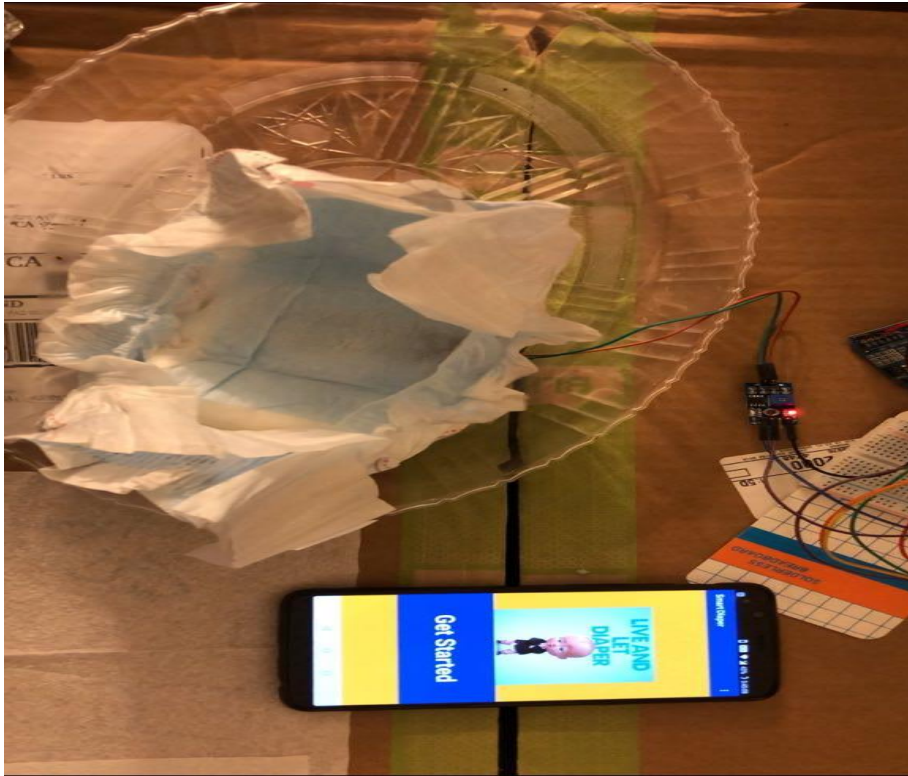


### 4. WORKING

The Arduino Uno continuously reads sensor data from the moisture sensor and the gyroscope module. The received moisture sensor data is used to determine the level of moisture content in the diaper bed and the gyroscope data determines the baby's movements in sleep mode.

Based on the sensor values received the corresponding levels of moisture are displayed on to the Web server using the ESP 8266 Wi-Fi Module. And based on the gyroscope's x-axis, y-axis, z-axis readings it is determined whether the baby is moving and the status is displayed onto the Web Server.

#### 4.PROTOTYPE PICTURES



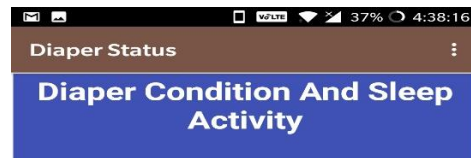
## 5.MOBILE APPLICATION

The mobile application is developed using the free online software THUNKABLE, it is used as the user interface in this project. The mobile app displays the web server broadcasted using the ESP 8266 Wi-Fi Module.



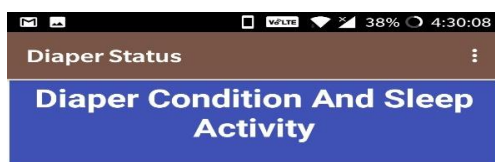
### DIAPER STATUS

LEVEL 1  
**LEVEL 2**  
LEVEL 3  
CHANGE DIAPER!



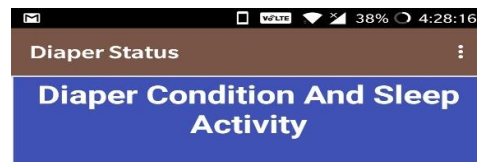
### DIAPER STATUS

LEVEL 1  
LEVEL 2  
LEVEL 3  
**CHANGE DIAPER!**



### SLEEP STATUS

**BABY IS AWAKE!!**



### SLEEP STATUS

**BABY IS SLEEPING!!**



## 6.FUTURE SCOPE

To bring this concept into a market product, soil moisture sensors can be replaced with Smart Passive Moisture Sensors Tags. These tags do not need a power source and can be energized using RFID readers. The Smart passive moisture sensors tags read real time moisture data and stores the data into its built-in memory when it is energized by the RFID reader.

Piezo Electric sensors can be used to detect presence of stool on the diaper by sensing the relative pressure values and can be used to notify that the diaper needs to be changed immediately.



## 7.REFERENCE

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4. A Beginner's Guide to the ESP8266, Pieter P, 08-03-2017.
5. <https://surtrtech.com/2018/01/31/interfacing-l3g4200-triple-axis-gyro-module-with-arduino/>