# IoT based smart energy management system

**Code** : B21PB02 || *UG4 ECE*

**Guide** : Dr. Paul Braineard

**Group details :**

| | | |
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# Synopsis

- Our main focus is to analyze power usage and manage devices  using IoT .
- We achieve this using sensors, actuators, micro controllers and a website.
- Arduino & Raspberry pi are used as microcontrollers.
- We created remote management & infographics using website.
- Remote control of intensity of a bulb using website.

# Work Preview

1st evaluation

- About Project.
- Sensors and modules.
- Methodology & concerns.

2nd evaluation

- Designed a website.
- Thingspeak for input data.
- SQL database

3rd evaluation

- Serial communication
- Working switches.
- Dataflow through raspberry pi & thingspeak.

Final evaluation

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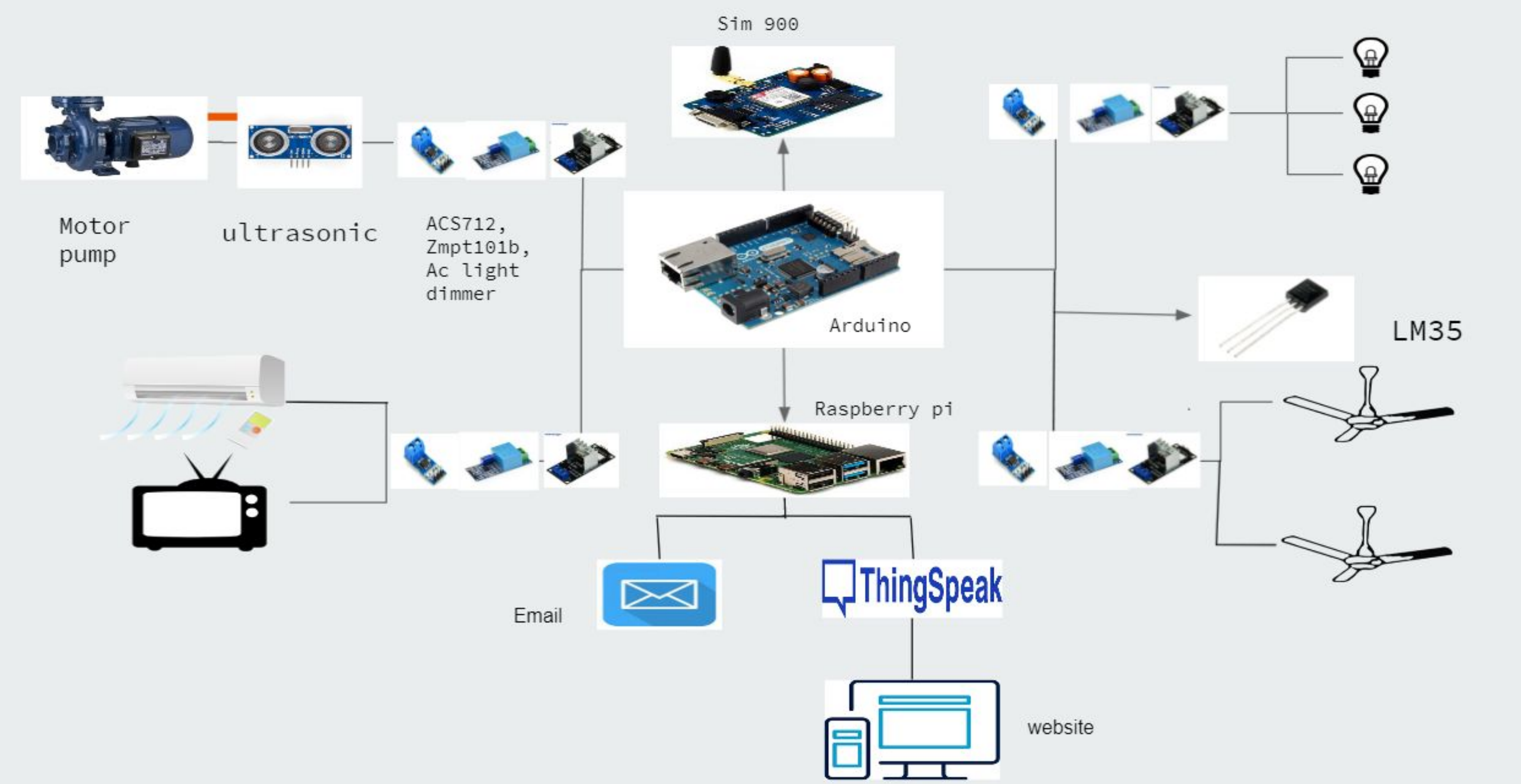
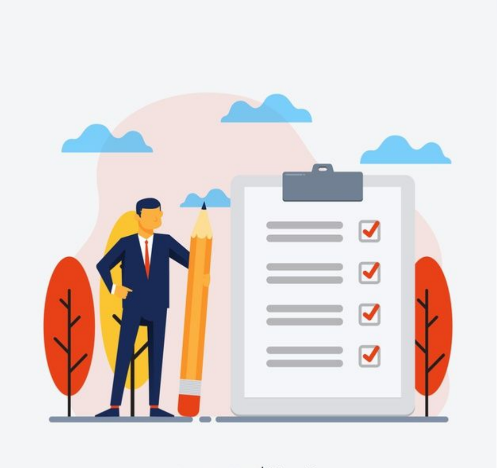

Sim 900
Motor
pump
ultrasonic
ACS712,
Zmpt101b,
Ac light
dimmer
Arduino
LM35
Raspberry pi
Email
ThingSpeak
website

# Work done

1) Integration of Dataflow through Arduino, Raspberry pi, thingspeak & website.
2) Calculation of Power bill based on power scaling slabs and send it via mail and text message.
3) Intensity control & data transfer through website is done by Django framework in thingspeak.
4) Website contains device feedbacks, Power consumption graphs & other features.
5) Hosting website online using Ngrok

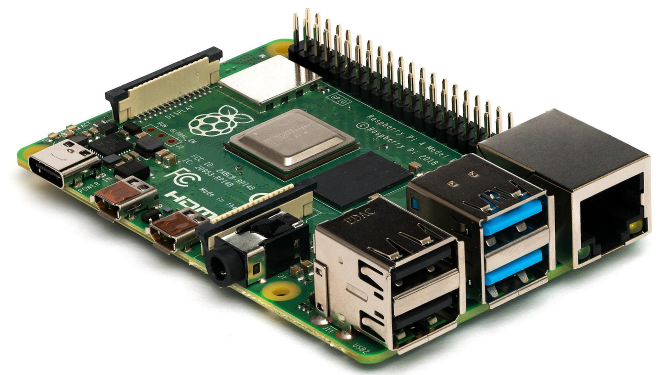


# In Arduino,

1. We defined variables, pins & baud rate for communication.
2. Message function for GSM, trig & echo for ultrasonic sensor has been included based on requirements.
3. serial.available to check inputs from raspberry pi.
4. We calculated current & voltages from sensors 10 times & calculated average value for use.
5. For further processing to raspberry pi, we generated the entire data such as power measurement, switch positions in arduino.

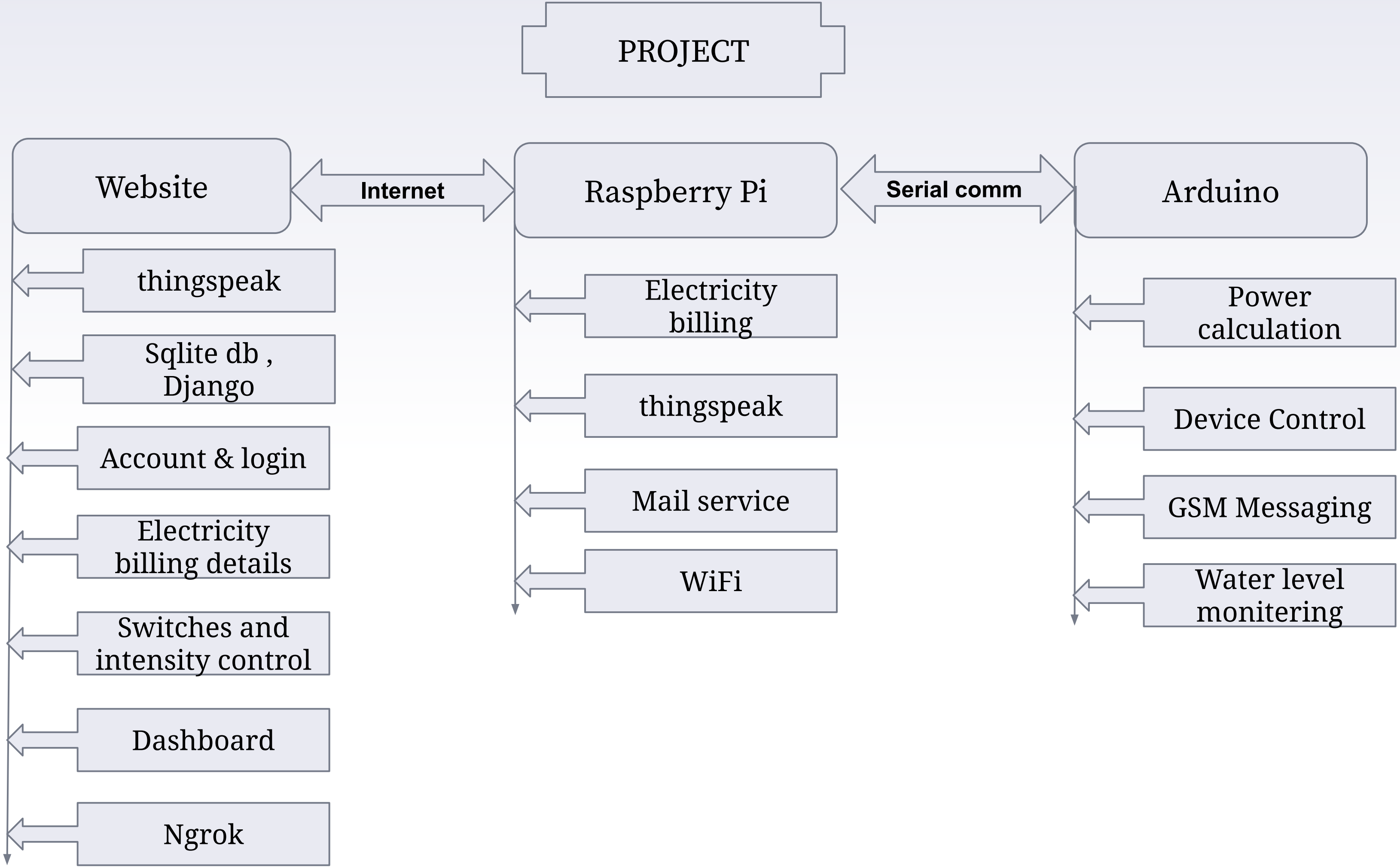
# In Raspberry pi,

1) We imported modules like requests, time, yagmail etc.
2) Serial communication is established using USB and we initialize timer.
3) Mailing function is used to send power consumption details to user.
4) Units consumed by user is calculated using instantaneous power from arduino and time taken and data is uploaded to thingspeak.



# Thingspeak & Ngrok

1) Thingspeak is an IoT analytics platform used to transfer live data through cloud.
2) We created 3 Rooms with 8 fields for options like ON/OFF, intensity control, power consumption etc.
3) Ngrok exposes local server ports to internet hence used for web hosting.
4) It provides real time web UI to introspect HTTP traffic running through our tunnels.



PROJECT

Website

Internet

Raspberry Pi

Serial comm

Arduino

thingspeak

Sqlite db , Django

Account & login

Electricity billing details

Switches and intensity control

Dashboard

Ngrok

Electricity billing

thingspeak

Mail service

WiFi

Power calculation

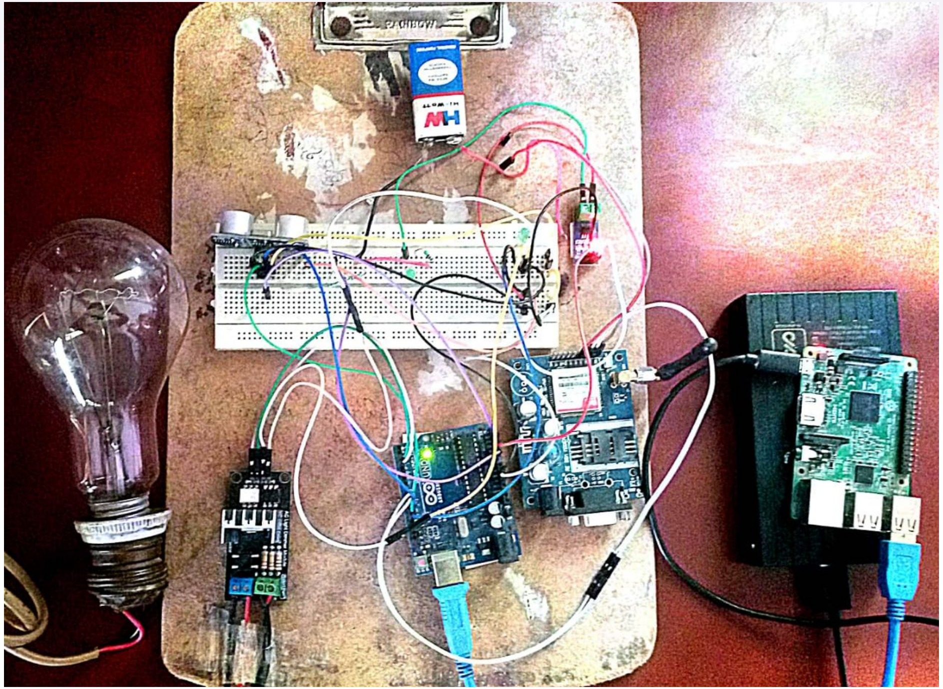
Device Control

GSM Messaging

Water level monitering

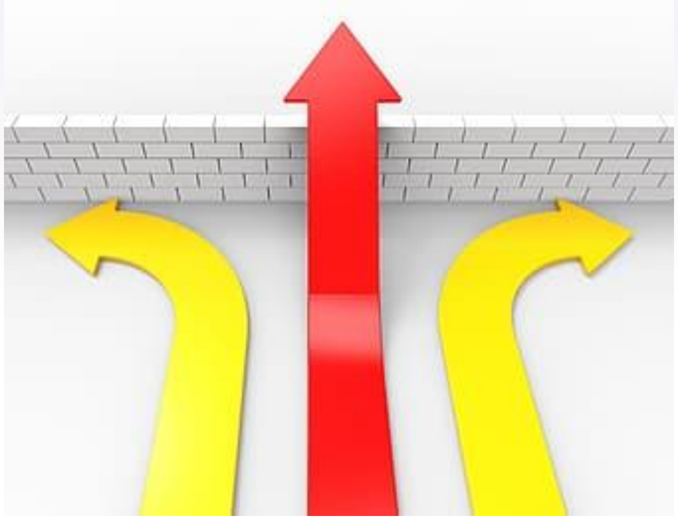
# Hardware components

1. Arduino uno
2. Raspberry pi
3. LM 35 (Temperature sensor)
4. ACS712 (Current sensor)
5. Voltage divider circuit
6. HC-SR04 (Ultrasonic sensor)
7. AC Light dimmer module
8. GSM module



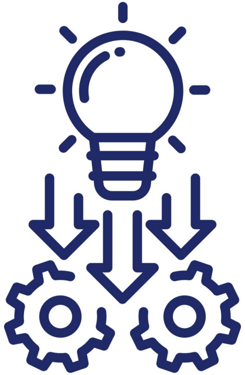
# Challenges

1. Sensor malfunctioning which might lead to device damage.
2. Limited number of slots in Microcontrollers.
3. Unavailability of safe Ac power supply in House to work on project.
4. Delay in action between website and actuator.
5. Debugging gets challenging when we integrate arduino and raspberry pi.



# Future scope

- Extension of Real life applications to AC, Water Pump etc.
- Using Paid web hosting service to buy domain name.
- Adding more security & other features in the website.
- Improved Quality of sensors for long maintenance & daily use.
- Integrating smart home features in to system.



# References

- How to Connect a Raspberry Pi to a Laptop Display | Headless Setup link
- How to Create a Windows 7 Bootable Windows SD Card or Flash Drive link
- 2-Way Communication Between Raspberry Pi and Arduino link
- The naivest Way to Send and Retrieve Data from Cloud link
- Udemy - Raspberry Pi For Beginners - 2020 Complete Course link

# Link to previous work

- Mid evaluation 1 presentation
- 6 Semester end evaluation presentation
- 6 Semester end evaluation Report
- Mid evaluation 2 presentation

# Thankyou.

Any Questions?

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