



Presented By:
Majd Jabr
Dalia Batyeh

Supervised By:
Dr. Raed Al-Qadi

Outline

- Overview
- Motivation
- What is Check It Project
- Components
- Methodology
- Future work
- Demo

Overview

There are two types of electro meter in Palestine.



Old Type



Modern Type

Motivation

Current system used in Palestine have the following disadvantages:

- ▶ People in high buildings can't know when the money is almost consumed.
- ▶ Can't keep updated of their consumption.

What is Check It project ?

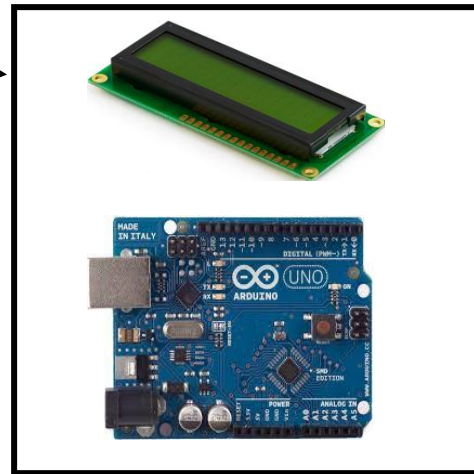
- ▶ It is an electro meter with some features added and a mobile application



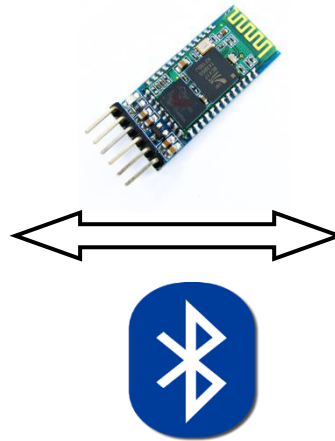
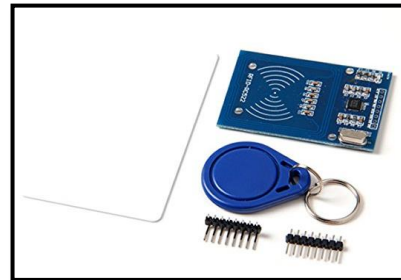
Components



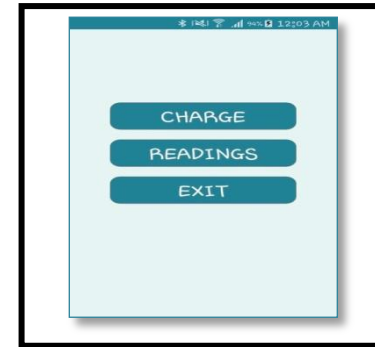
Electro Meter



Fill money
by the card



Mobile App



**Provider
of service**

Methodology

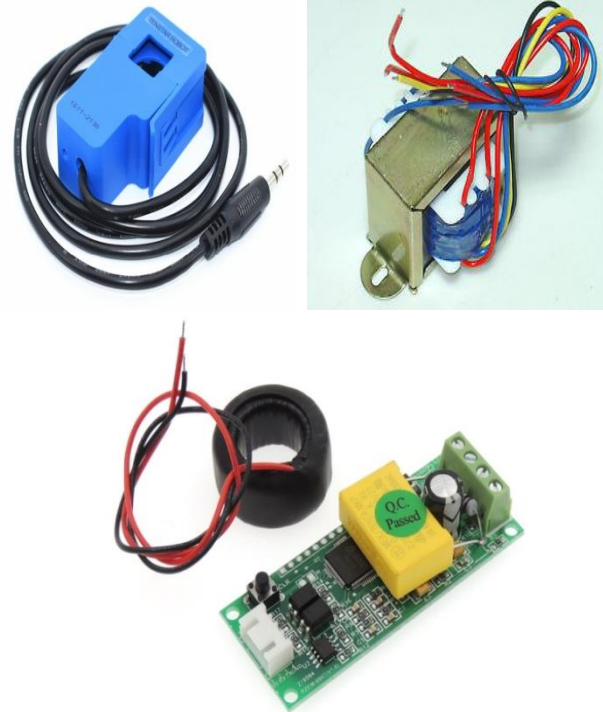
- ▶ Measuring Energy
- ▶ Electricity Payment Ways
- ▶ Extra Features



Check It

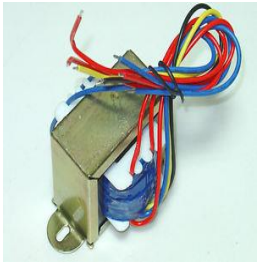
Measuring Energy

- ▶ By Designing & Sampling
- ▶ By PZEM Module

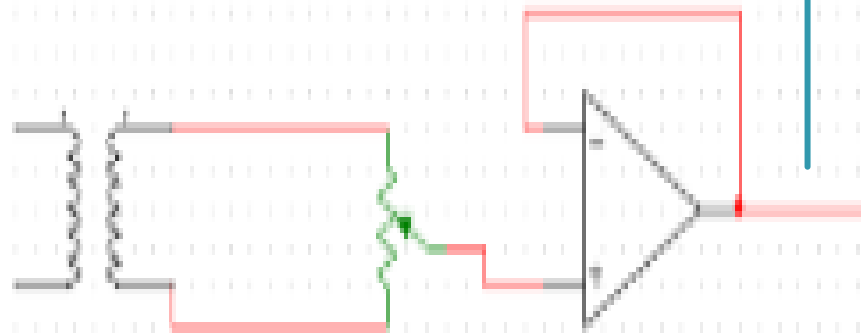


Measuring Energy

- Designing the circuits



220V Input for VT
Or Current for CT



From
-2.5 - 2.5

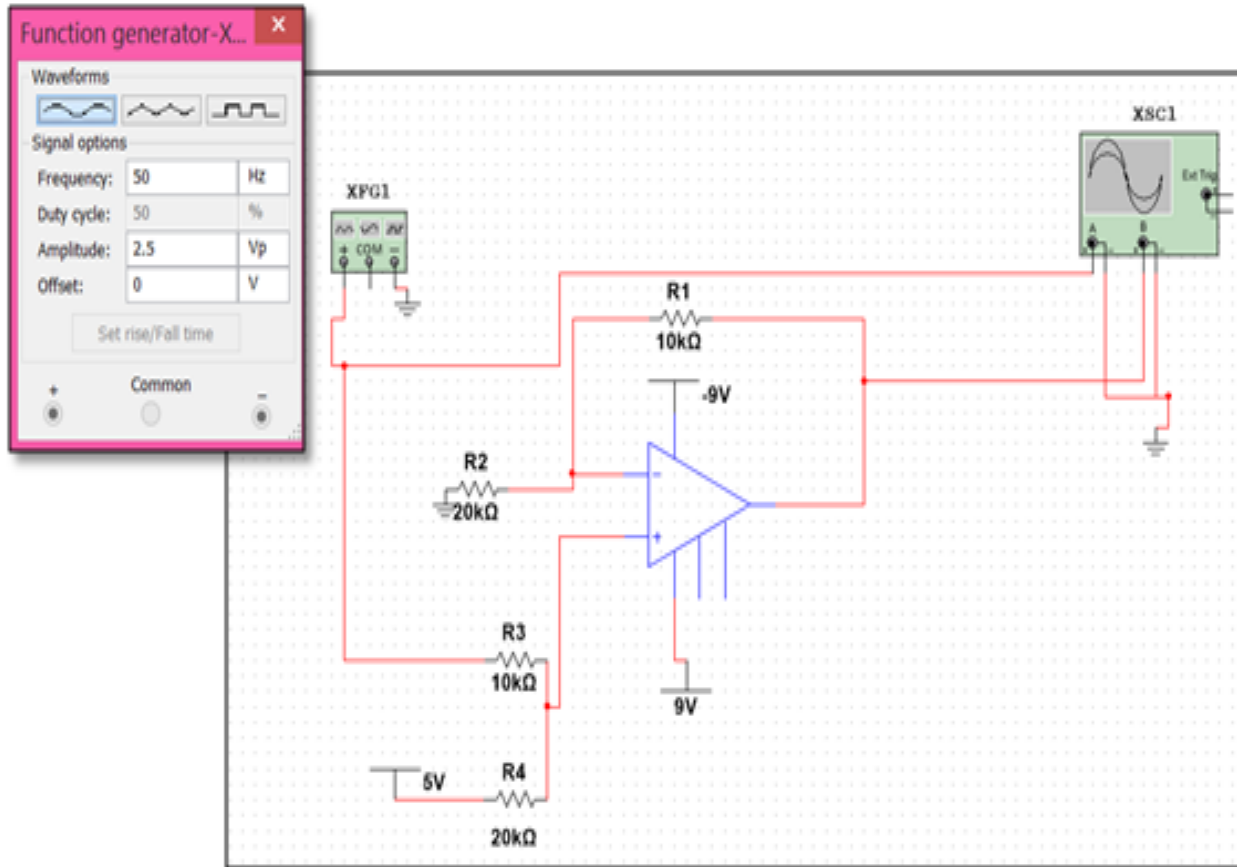
Offset Circuit

From
0 - 5

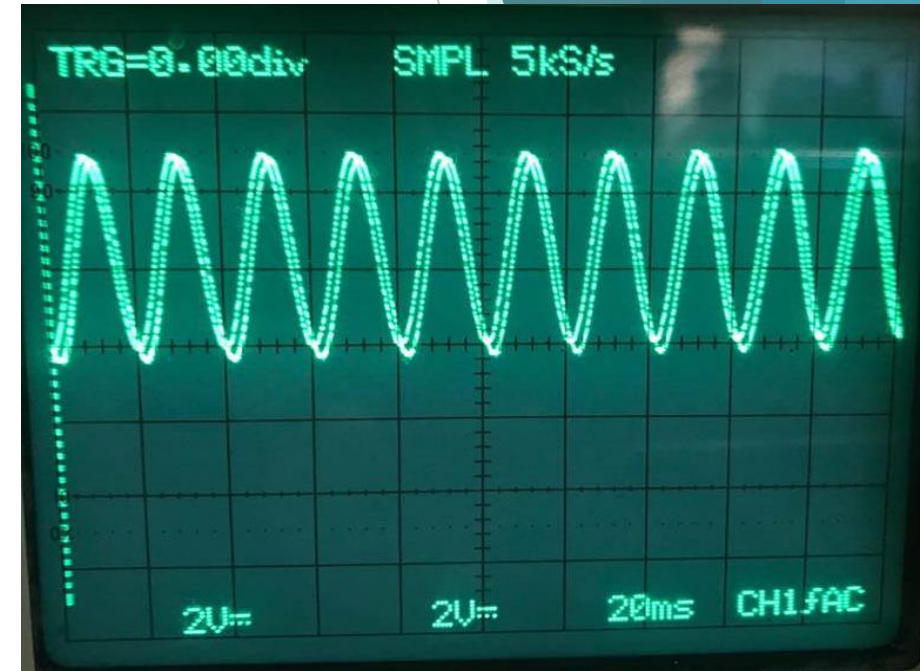
To Arduino Input



Offset Circuit



Output



Then we enter this two waves to the analog pins A3 and A4 of Arduino.

Arduino Sampling

- ▶ Return the actual voltage and current after reading ADC.
- ▶ Use interrupt to make a sample each 1ms -> 40 samples each cycle.
- ▶ Each 40 sample calculate :
 - ▶ Power, rms voltage and rms current

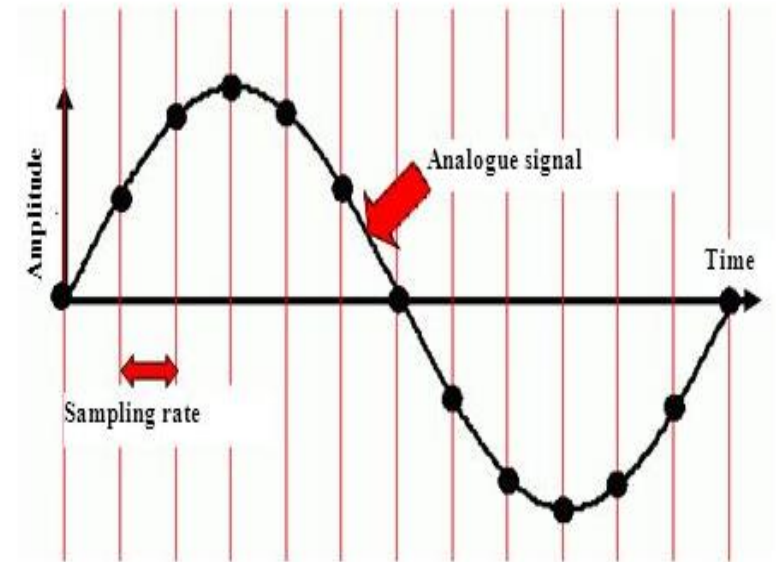
$$X_{rms} = \sqrt{\frac{1}{n} (x_1^2 + x_2^2 + \dots + x_n^2)}$$

- ▶ For power:

$$p \text{ (in W)} = \frac{1}{n} (v_1.i_1 + v_2.i_2 + \dots + v_n.i_n)$$

- ▶ For Energy:

$$Energy = \sum P.\Delta t$$



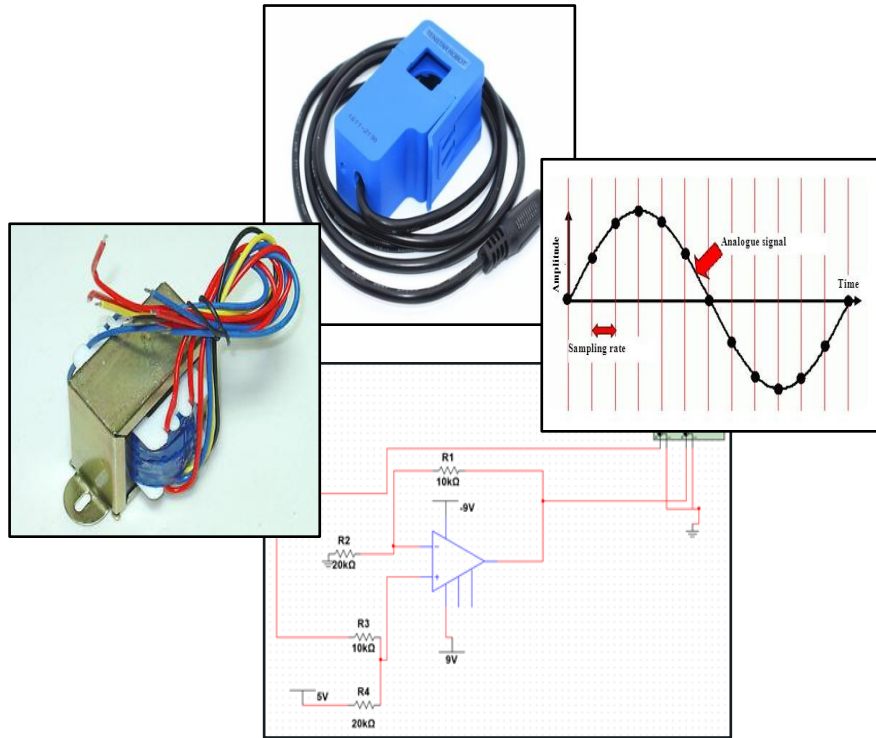
Measuring Energy

2. By PZEM Module

- It is an alternative way for measuring energy.
- Instead of using current and voltage transformer, or designing an offset circuit and doing the sampling in Arduino.



Sampling VS PZEM Module

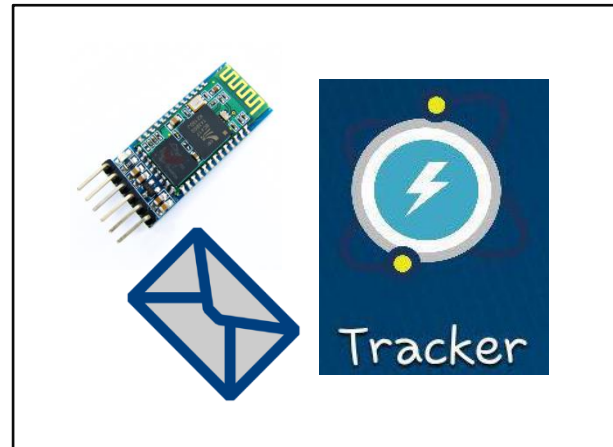


VS



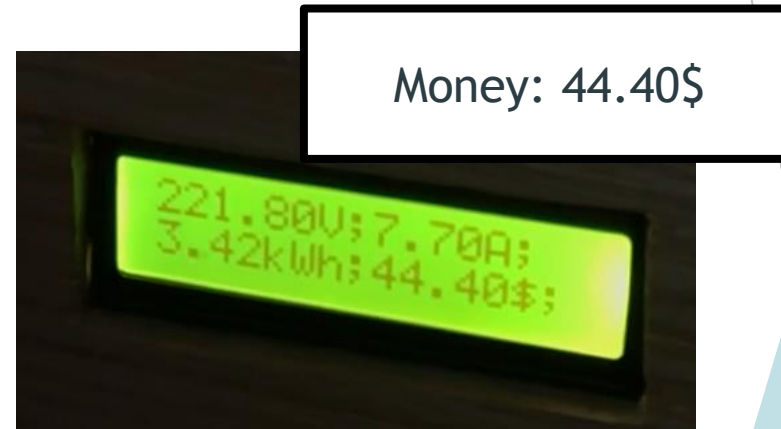
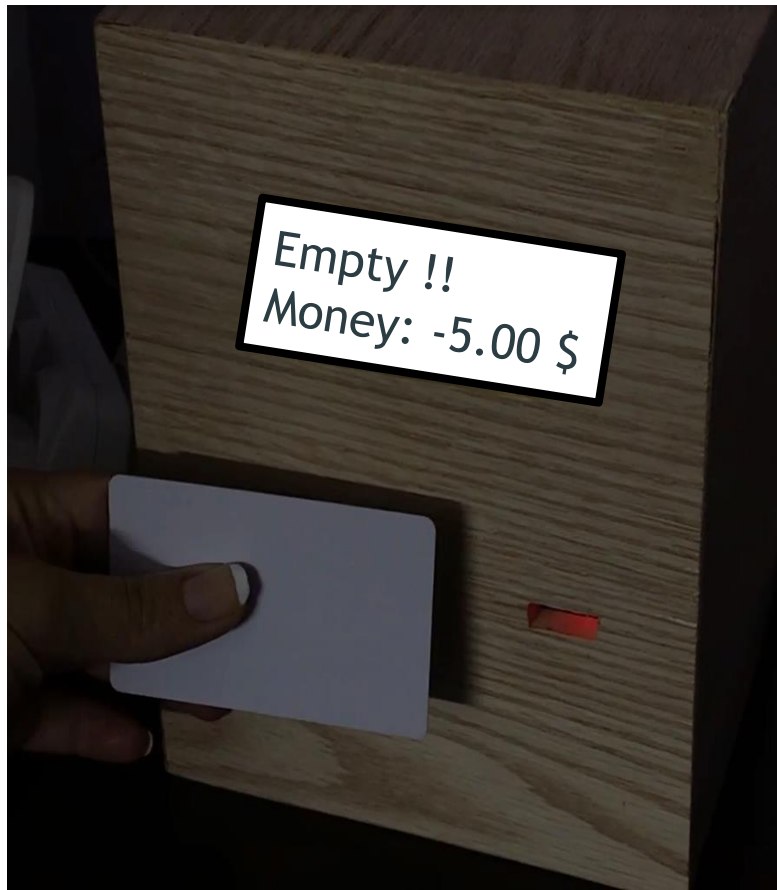
Electricity Payment Ways

- ▶ By RFID Card
- ▶ By Bluetooth



Electricity Payment Ways

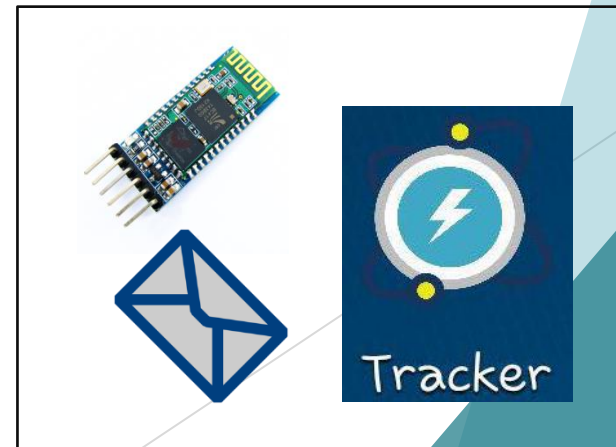
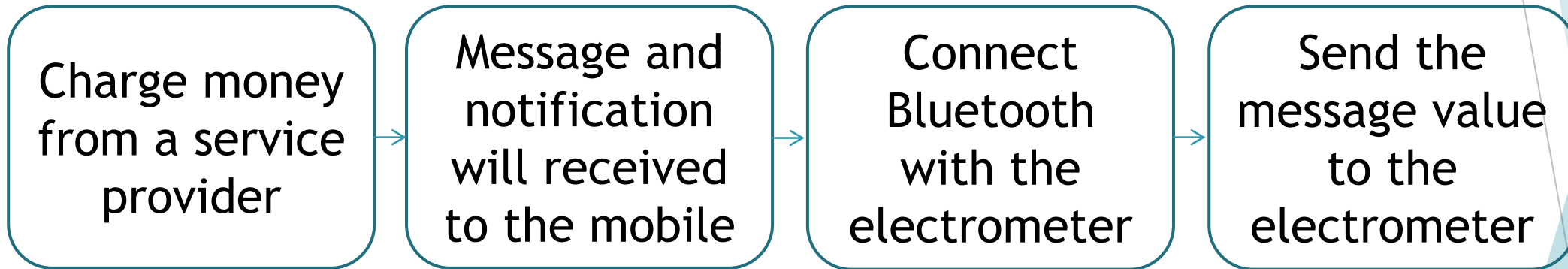
1. By RFID Card



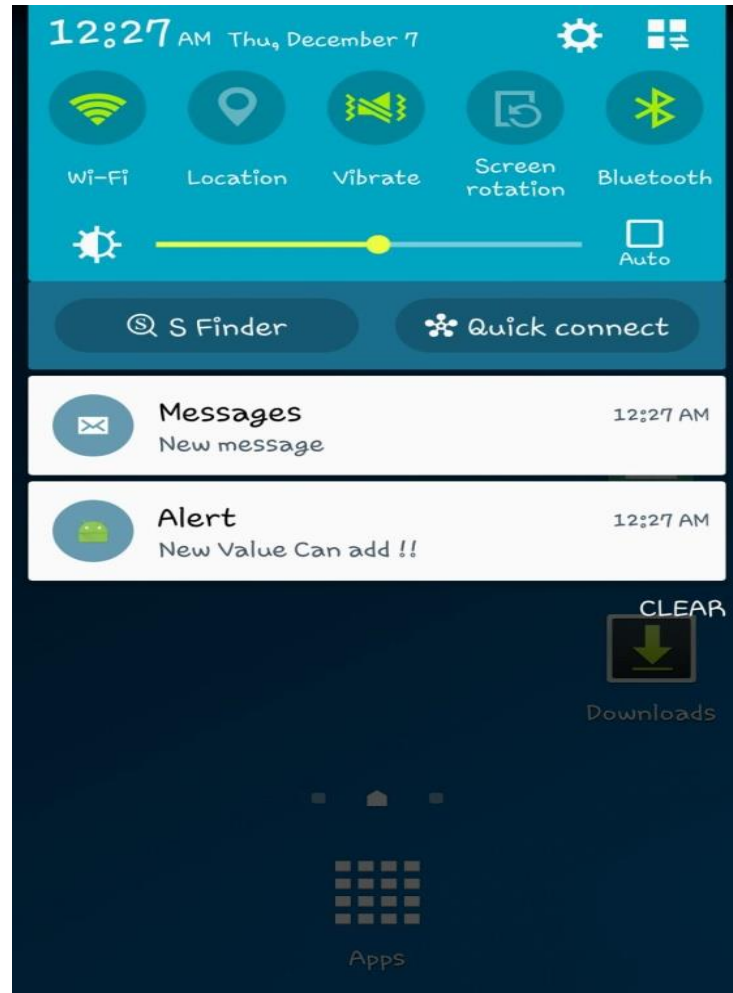
Card now is empty and the electro meter is charged

Electricity Payment Ways

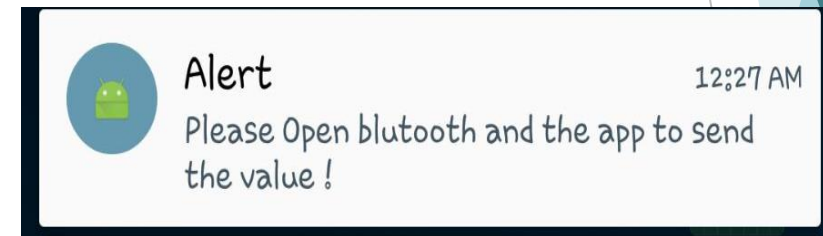
2. By Bluetooth (Mobile App)



Charging By Message & Bluetooth

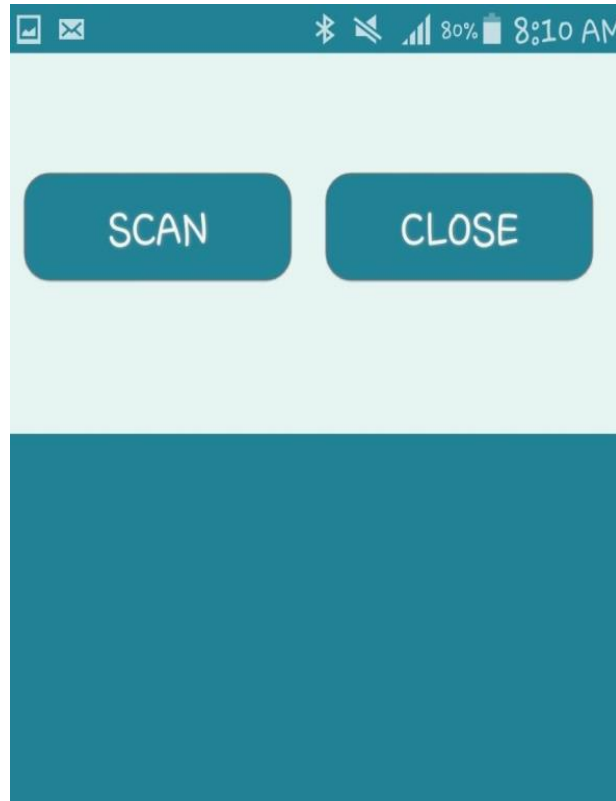


If User
expand
it

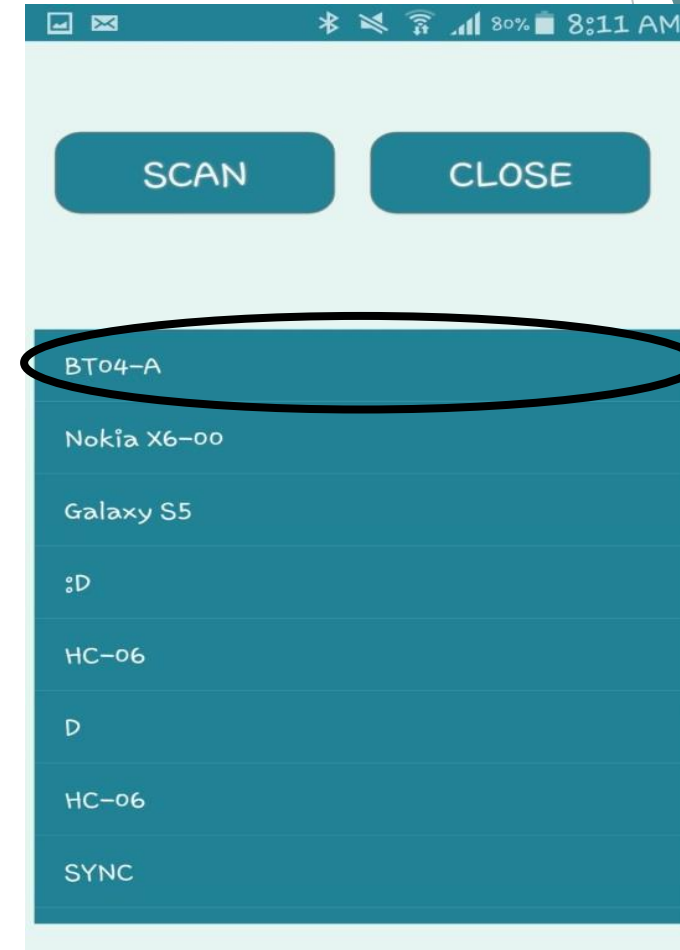


Notification Received after send a message from
a service provider

Charging By Message & Bluetooth

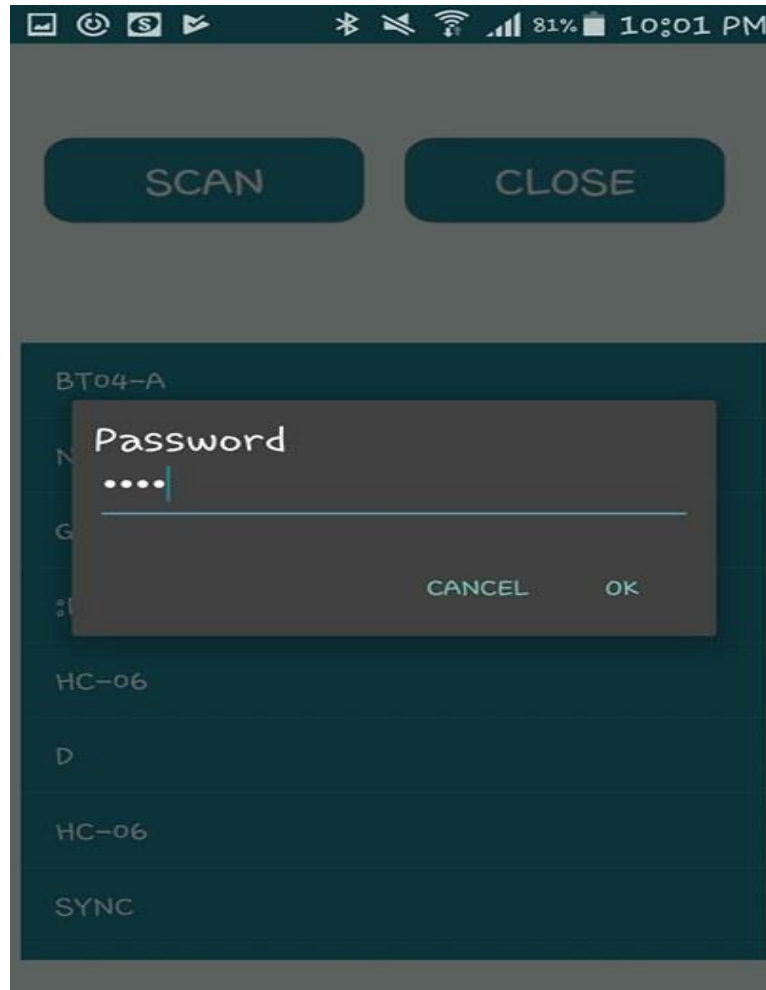


If User presses
scan →



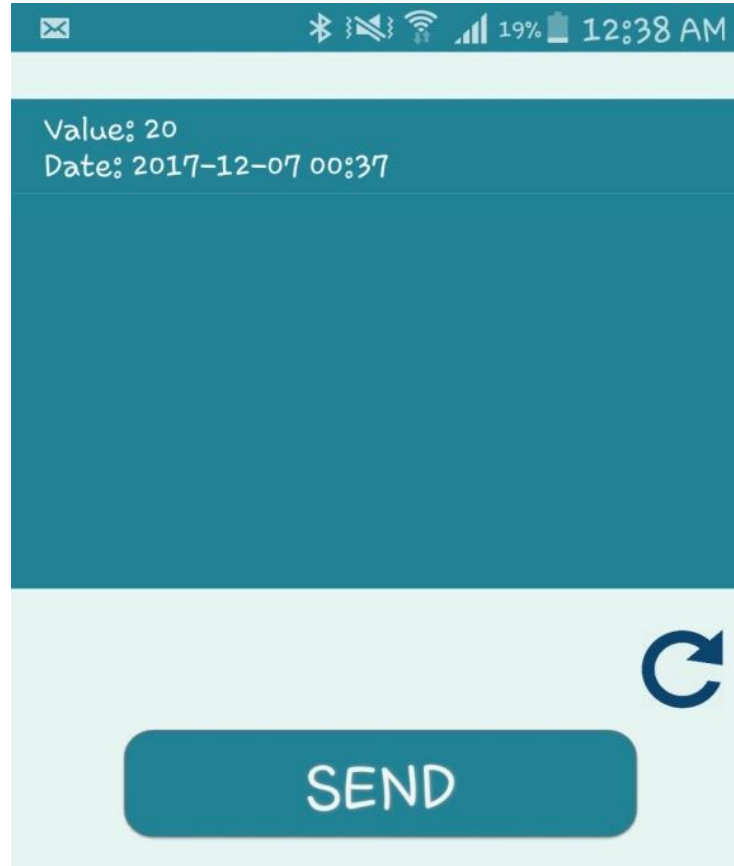
Connect Bluetooth with the electro
meter

Charging By Message & Bluetooth



Enter Bluetooth password for security

Charging By Message & Bluetooth



The screenshot shows a mobile application interface. At the top, there is a status bar with icons for email, Bluetooth, signal strength, and battery level (19%), along with the time 12:38 AM. Below the status bar, the app has a teal header. The main content area is a light blue box containing the text "Value: 20" and "Date: 2017-12-07 00:37". At the bottom of this box is a large teal button labeled "SEND". To the right of the "SEND" button is a circular refresh icon.

Now Send the message to the electrometer and the value will be added to the money

Extra Features

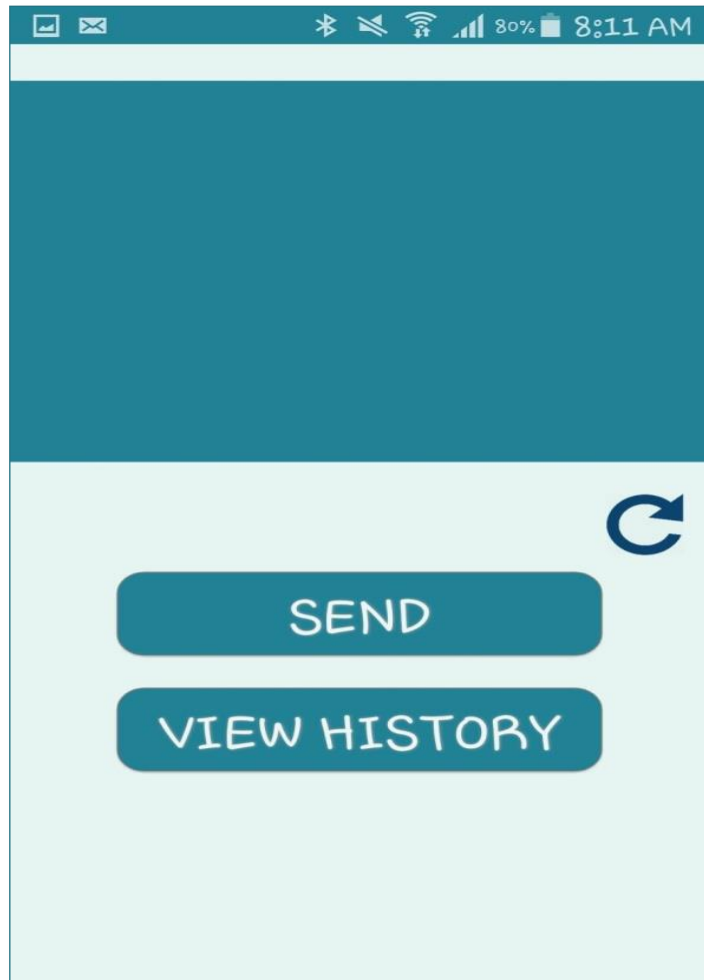
- ▶ History for charging
- ▶ History for energy consumption
- ▶ Getting Values
- ▶ Warning Notification



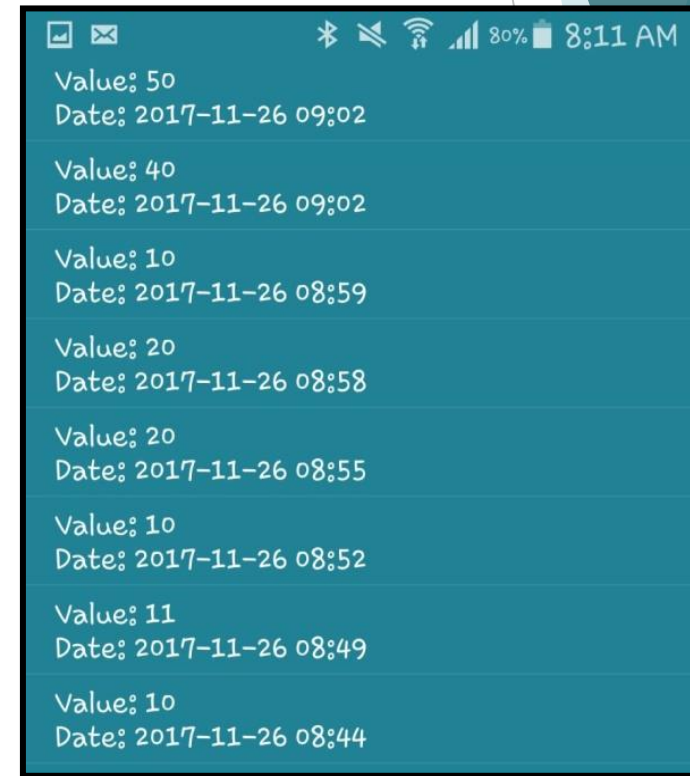
Check It

Extra Features

1. History for charging

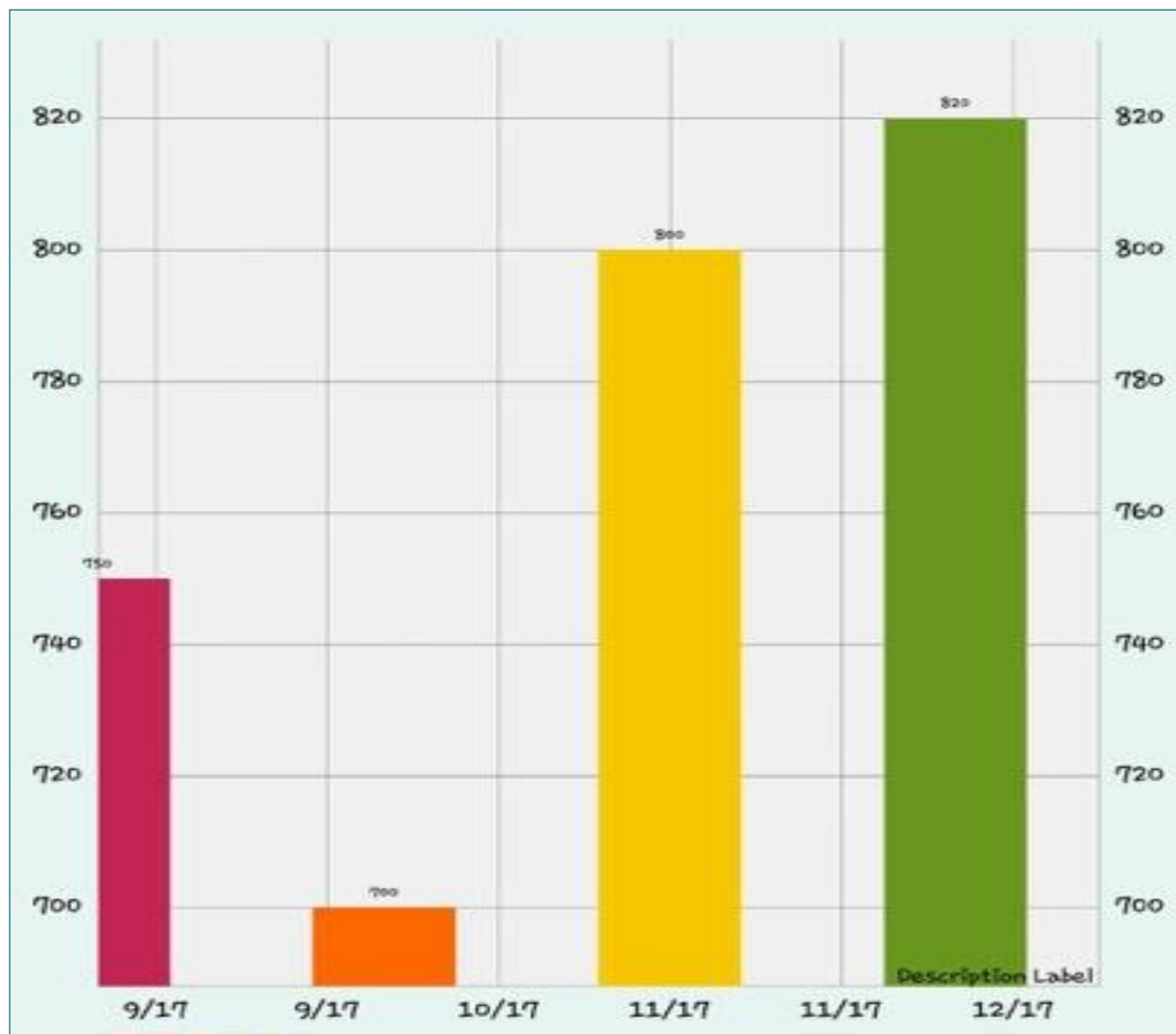


View history
button



Extra Features

2. History for energy consumption



Extra Features

3. Get Values

Bluetooth 96% 11:02 PM

Voltage		V
Current		A
Energy		KWh
Money		nis

GET DATA

Through
Bluetooth
connection

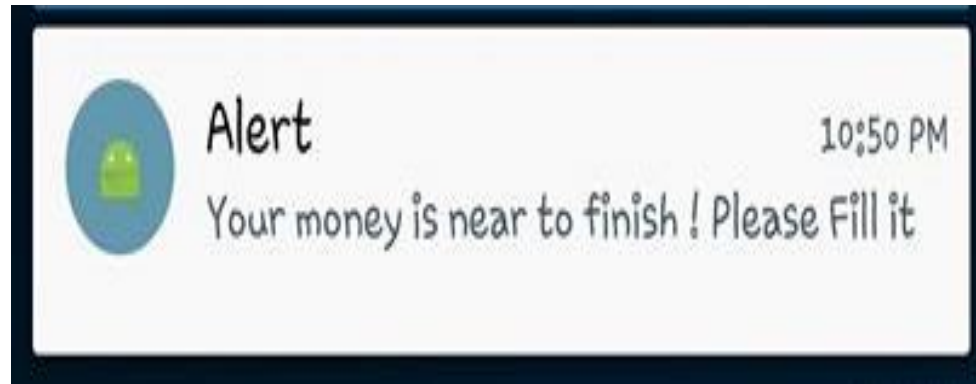
Bluetooth 93% 12:11 AM

Voltage	226.20	V
Current	5.79	A
Energy	2.74	KWh
Money	10.00	nis

GET DATA

Extra Features

4. Notification Warning



Future Work

- ▶ Adding GSM Module to the project, so user will be notified when money is almost consumed even if he didn't connect to Bluetooth.
- ▶ Enhance Check It to integrated with the existing electrometer that used in the houses, so people don't need to buy a new electrometer.
- ▶ Making the mobile application smarter; by adding the ability to learn and make it knows which home devices are in use any time and calculate the money consumed by each device each month.

Demo