e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Issue:05/May-2020 www.irjmets.com

IOT BASED GREEN RADIO TECHNOLOGY

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ABSTRACT

Now a days the mobile users and the use of telecommunication systems are increasing speedily and due to this large amount of energy usage and carbon dioxide emission is increased. By the Life-cycle assessment of various network operations, it is seen that energy consumption in the radio access network is very important factor which impact on the environmental conditions. The CO2 emission is increasing in telecommunication system, along with increase in mobile users.

Currently available radio access networks are not energy efficient, mainly the base stations. Due to the rapid growth in mobile subscribers we have to use higher data rate mobile broadband system. The requirement for reconstructing of existing network architecture, we require to control the systems in every base station. This paper gives the idea about current energy consumption and CO2 emission in base station devices. This is the inventive and auspicious technology for increasing the energy efficiency in wireless networks. This method provides the solutions that will helpful to reduce costs and harmful effects on the environment.

KEYWORDS: CO2 emission, Energy efficient wireless network, Green Radio Technology (GRT), Base stations, Internet of Things (IoT), Information technology (IT)

I. INTRODUCTION

GRT is the more hopeful innovative solutions not only in reducing the power consumption but also the CO2 emissions of base stations. For the increasing worldwide growth in mobile subscribers, and increasing contribution of IT to the complete power consumption of the world, there is a need of system which can control power consumption and reduce harmful effect on environment due to emission of CO2. The Green Radio technology help us to achieve a huge reduction in use of power in current designs for wireless communication networks. It is observed that mobile handset consumes very less energy than the base station. This is for one tower only. We can imagine the effect due to million towers constructed in a country. We will control the system which will be at each base station, for ON or OFF switching of the base station. To keep control over base station we will use microcontroller-based system. In the current system all towers in area is turned on without considering user frequency. Due to this the huge amount of fuel is waste.

In India millions of towers are present and every tower consumes 28 liters of diesel in one day. One tower emits 85 kg of CO2 per day. In night time only 10% of the total users communicates, still all the towers remain in the working state. A critical mobile network consumes 4050MW approximately, a diesel generator used for supplying power for communication purpose which produces lot of carbon die oxide.

This technology will help to minimize the power consumption, to decrease CO2 emission and prevents fossil fuel. In this project we are using IoT to analyze some parameter those are temperature, power, user's frequency and light at the base station. By using IoT we can store the information and can see at any time.

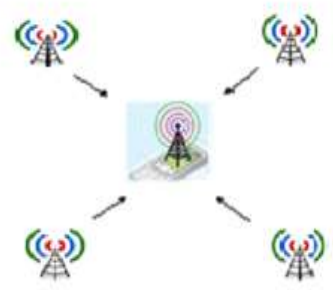

Figure:1 Current system

Figure:2 Proposed System

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The above figure shows that all towers in one region are in idle state and only one tower is in on state, handling predefined number of users.

If number of users will increase then next tower will be on. Along with implementing model, we monitor certain parameters which can help in reducing energy consumption. Those parameters are Cooling-Fan, Air Conditioner, and Light Indicator. Every tower has a Light Indicator. This light glow whole day which is not required. Same as, there is Cooling-Fan and Air Conditioner running round the clock. Hence, a tower consumes power to run all these devices, apart from power used for transmitting signal. This method proposes a new method to implement a corrective measure, which will ensure optimum utilization of energy resources.

II. PROBLEM STATEMENT

In last few years, the mobile network is developed. This large growth is because of large number of mobile subscribers. Due to this rapid growth the use of fossil fuel is increased and the CO2 emission is increased. Along with CO2 emission power consumption is very high at every base station. These are the major problems. These problems can be reduce using Green radio technology.

III. OBJECTIVE AND SCOPE OF PROJECT

1. Reduce power consumption.
2. Reduction in carbon dioxide.

As the users are increased the requirement of mobile base station is increase, each base station consumes separate power for its operation. Hence the power consumption is very high, besides it unnecessarily all the base stations are in ON state for example in night when users using mobile are very less as compare to day so, there is wastage of power from base station. As the main source for operating each mobile base station is generator, they require large amount of fuel and emit high amount of carbon dioxide in the environment. The GRT describes the solution which reduces the power consumption and carbon dioxide emission.

IV. PROPOSED METHODOLOGY

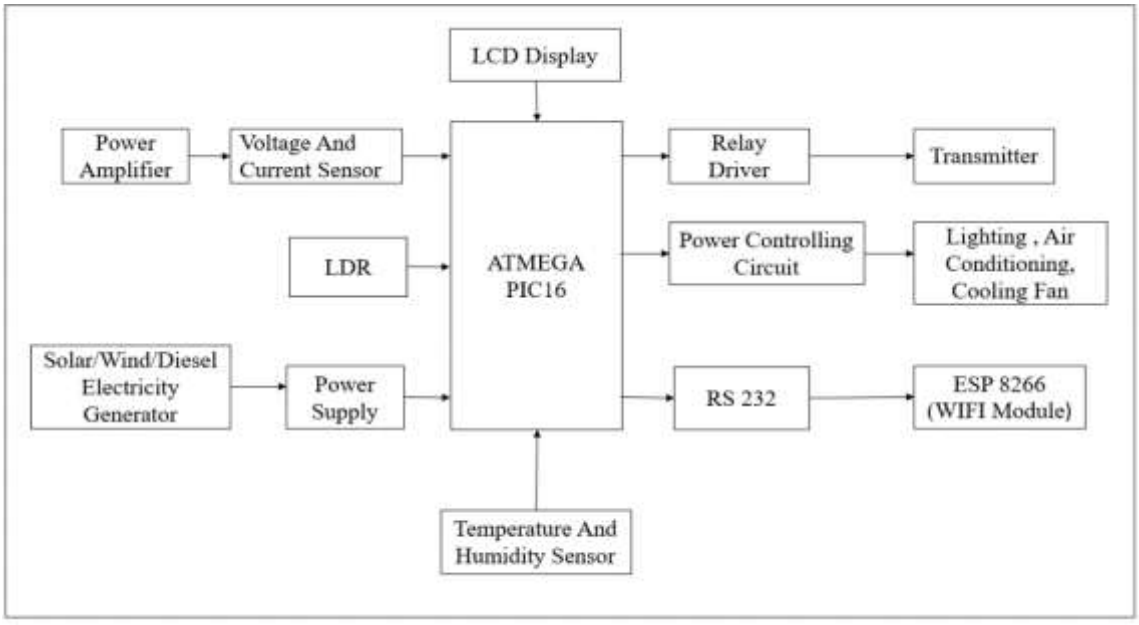

Figure:3 Block Diagram

A) Basic operation:

Here we are calculating the number of users on the basis of wattage of bulb. In this project we are switching the number of users to other base station for that we are using the strategy of bulb wattage. Initially there will be one threshold value of the power, If the power increases above this threshold then the users will switch to next base station. To control the power, we are using the potentiometer and to measure the power we are using voltage and current sensors. when user increase then next tower will be turned on.

Apart from implementing this configuration, we are going to monitor certain parameters such as Cooling fans, Air conditioners and Light indicators which can help in reducing energy consumption. At every base station has light indicator. This light glows throughout the day, which is not necessary. Similarly, it also has cooling system (fans,

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air conditioners) running round the clock. We will control the cooling and lighting system at the base stations. It can reduce the power consumptions up to 30%.

To control these parameters automatically, we used micro-controller based embedded system. We use LDR to monitor the light intensity at the base station and the temperature humidity sensors used to measure the temperature at the base station. There are threshold values define for all these parameters. When the parameter values deviate from the threshold values the switching action will take place. In this project, we are using four relays to monitor temperature, light intensity and power. For example, light intensity beyond 125 lumens is considered as day time, if not, it's night. Hence the light indicator will turn on automatically during night. Similarly, based on temperature and humidity of the generator room cooling system (Air Conditioners and Cooling fans) will operate respectively. Here we are using IoT to represent the result with the help of Thing Speak. With the help of IoT we can analyze information at any time instant. By using Thing Speak software the tower switching action is showed.

V. TESTING AND TROUBLESHOOTING

Solar Panel and LDR testing: -

Figure:4 Solar panel testing

Figure:5 LDR testing

Above figure 5 shows the values of voltage and current of solar panel. We tested the voltage and current and displayed on LCD. It gives voltage 12.2 volt and current 4.8mA
Above figure 6 shows the intensity of light on the LCD when the light is fall on LDR then the displayed light intensity is high. when there is no light fall on LDR then darkness is detected and then minimum value of light intensity is displayed on LCD

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VI. RESULTS

Schematic Result

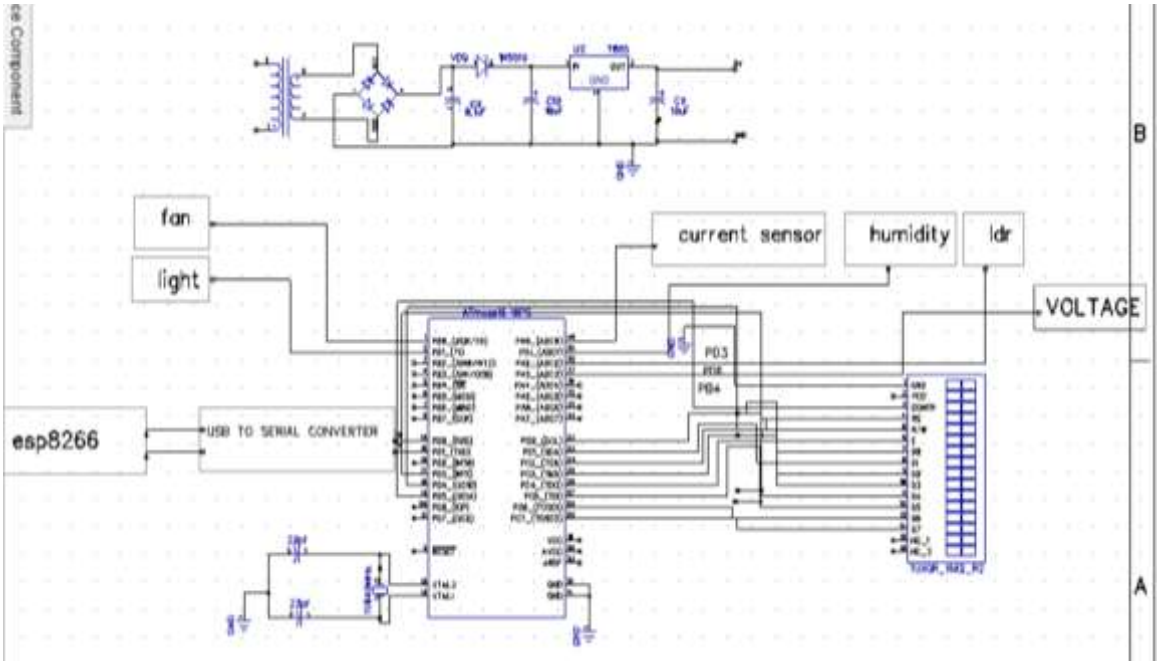

Figure:6 DIPTRACE Software Schematic Result

Software Results

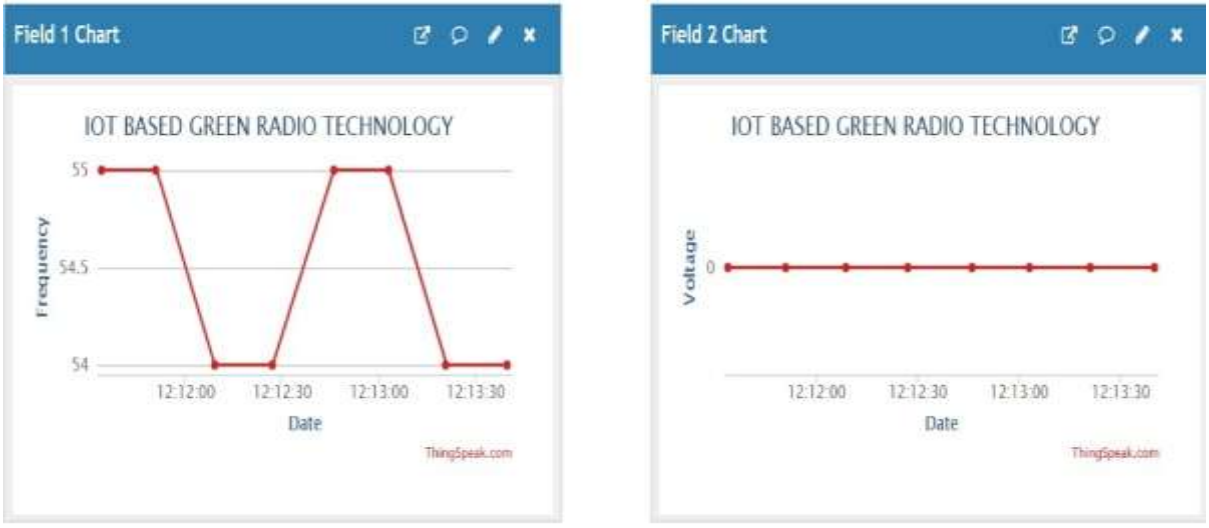

Figure:7 Effect of users Frequency and Voltage on the system.

1) **Effect of user frequency and voltage on system:** The above figure shows user frequency which is varying according to the wattage of bulb. The increase in wattage of bulb indicate the increase in number of mobile users. From the figure we can understand the state of tower which is going to cross the user limit. We can see that the user frequency changes date by date, when the user frequency varies above the limit then the next idle base station is going to come in ON state.

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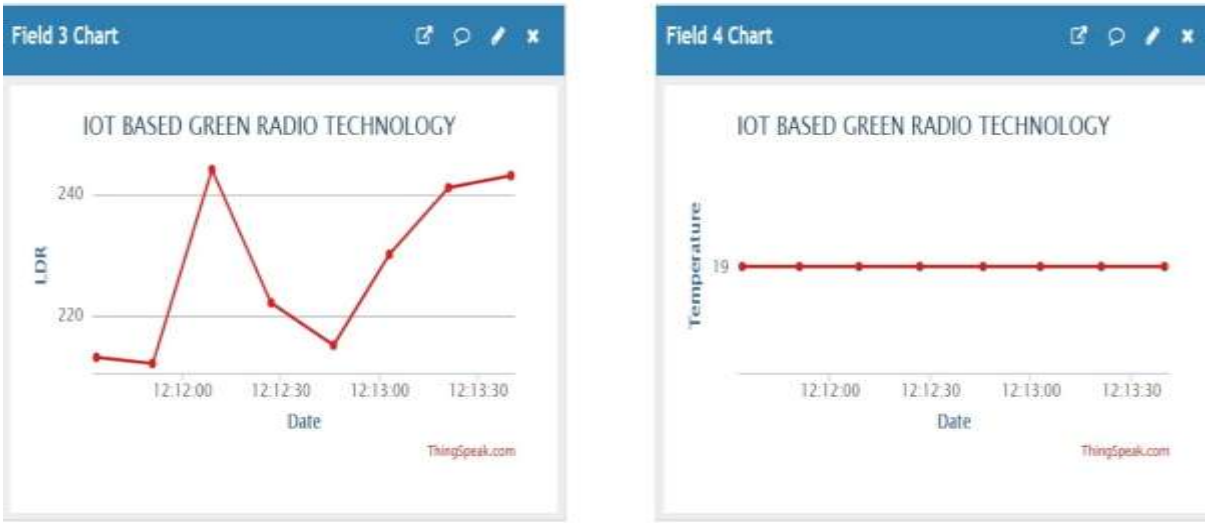

Figure:8 Effect of Light and Temperature on the system.

2) **Effect of Light and Temperature on system:** Above figures shows the state of LDR and temperature around the system. There are fixed values assigned to the LDR and temperature sensor, whenever these two parameters crosses the threshold values the lightning and cooling system is going to comes in existence. The LDR and temperature values changes date by date. From the graph strategies we can do analysis of whole system, the date by date change in graph shows there is change in the light intensity and according to this the LED will glow.

Hardware Results

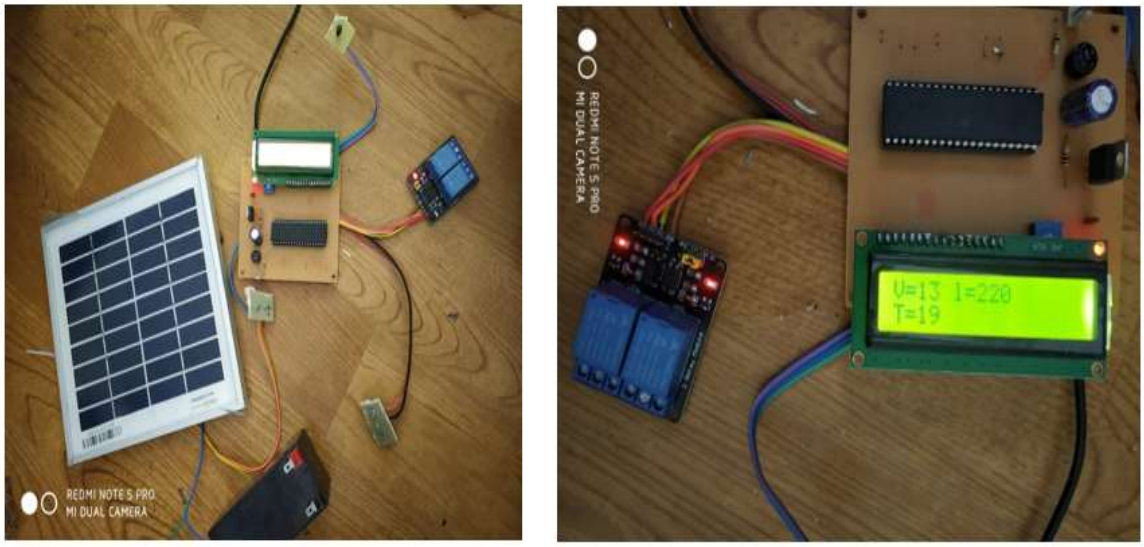

Figure:9 Interfacing of LDR and temperature sensor with the controller

VII. ADVANTAGES

- It reduces power consumption in the base stations and make the wireless network more efficient.
- Help to Reduce the emission of greenhouse gases (Carbon dioxide).
- It help to reduce fossil fuel (diesel) which is required to run the generators.
- Data storage can be possible, so that power consumption survey can be done.

VIII. APPLICATION

- Base Station
- Space Antennas
- Army Networking Sites

IX. CONCLUSION

The aim of the project is to design a microcontroller-based energy saving to reduce the power consumption in the existing base stations. Since cooling unit are major parts to consume energy in the BTS, its power consumption should be minimized, this is done in our project by controlling various parameters and by using a relay to control the unit. This can be done by considering some parameters such as the operation of Air Conditioner, Cooling fan, Light indicator and power amplifier. This project aimed to minimized the power consumption by considering these parameters. Power amplifier is use to amplify the signal. When the power is less then tower is kept in power saving mode. This is visually brought in front end using IOT CLOUD THINGSPEAK software. As per the objective the power consumption will reduce as much as possible and hence emission of CO2 will also get reduce.

ACKNOWLEDGEMENTS

We respect and thank Dr. N. B. Chopade, Principal, PCCOE & Dr. M. T. Kolte, Head of Department, PCCOE for providing me an opportunity to do the project work in Pimpri Chinchwad College of Engineering , Pune of and giving us all support and guidance which made me complete the project duly. We owe our deep gratitude to our project guide Prof. K. B. Kotangale, who took interest on our project work and guided us all along, till the completion of our project work by providing all the necessary information for developing a good system.
We thank to all these staff to guide and encourage us.

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