LOAD SHEDDING IN SMART GRID USING GENETIC ALGORITHM VIA IOT

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Abstract

Electric utilities resort to load shedding whenever there is imbalance between generation and load demand. It is the amount of load that can be instantly removed from the power grid to keep the remainder operational. It helps to reduce the power outages by distributing the shortage of supply. The algorithm is developed on a smart grid environment under the assumption that the loads can be individually controlled from the utility side. The algorithm utilizes forecasting, shedding, and controlling of the devices through webpage. It also uses the Internet of Things and stream analytics to provide real-time load control, and generates a daily schedule for customers equipped with Electronic Devices, based on their demand sand the forecasted load model. The Genetic algorithm techniques are utilized for real time load control and optimization.

Keywords: Raspberry pi, Relays, loads, Wi-Fi technology, Genetic Algorithm.

1. Introduction.

By considering the peak load demand faced by the power plants which causes lots of nonrenewable energy resource utilization, the distributed generation (dispersed generation) comes into existence. This minimizes the non-renewable energy utilization to keep it reserve for our future generations (sustainable development) which helps to reduce the cost of electricity generation to a great extent. Thus, reducing the environmental pollution. For achieving this all electrical parameters need to be controlled in a smarter way through internet by using Raspberry pi-3. Advanced fast monitoring, controlling and protective devices with inbuilt fast fault clearing capability in a smarter way to develop an overall smart grid can be implemented.

The purpose of this paper is to monitor and control Power grid devices (Analog and Digital) remotely using Genetic algorithm and IOT. The loads are controlled through webpage and data is sent to thingspeak using Wi-Fi connection.

This paper contributes an efficient and fairly fall detection system. System once installed has less maintenance cost and is easy to use.

2. LITERATURE SURVEY

Every type of load has its 'peak hours', and loads can be shed by exploiting this concept. That is, time-based load shedding is an alternative to grade-based. Feeder data from eight substations in Karnataka were considered for the analysis made [1]. A consumer suffers from revenue loss as well as discomfort when he is neglected power during this period. At the same time distribution companies also incur revenue loss when consumers paying higher tariffs are shed. Since we cannot control the loads individually during the load shedding there is a probability that power is supplied to non-critical loads rather than the important ones. Therefore, the present load shedding scheme does not provide effective power distribution of available power[2].The present load shedding strategy suffers from many shortcomings. Since an entire feeder is disconnected it becomes impossible to shed the required amount of load. Another serious drawback is that load shedding is carried out without giving any consideration to the importance of load. Loads such as data centers, hospitals, cold storages should be exempted from load shedding to the maximum extent possible. Loads generally fall under categories such as commercial, industrial, residential etc. Each of them has a particular priority time of usage [3].The smart grid provides backup power supply via Renewable-Energy Sources (RES) and also intelligent means of utilization via automation, demand response (DR) and smart energy usage [4]. The ALS enables the end user to provide demand response and shave loads with little or no dissatisfaction to their conveniences. ALS schemes utilize intelligent systems such as a microprocessor, microcontroller, DSP, and FPGA embedded systems to provide a real-time solution to the bottleneck of the latter schemes [5], [6].

3. Proposed system:

The Figure 1 shows the AV (i.e. audio and video) receiver of Robot.

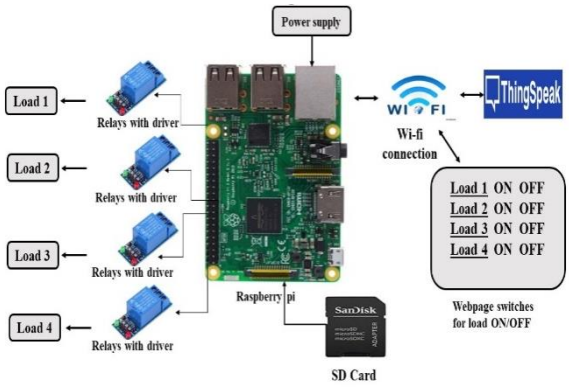

Figure 1: Block Diagram of Load Shedding in Smart Grid Using Genetic Algorithm via IOT

The Figure shows the main block diagram of the proposed model where to Raspberry pi all components are connected.

Working:

The controlling device of the whole system is a Microcontroller. In this project we designed a system where we can ON/OFF devices or loads from the web page. Here, in webpage we have ON/OFF switches for four different loads, where we can control the devices according to our requirement. If load 1 to be ON we have to click load 1 ON button in the webpage then load 1 is ON through relay by taking instructions from Raspberry pi and data is sent to thingspeak. If load 1 to be OFF we have to click load 1 OFF button in the webpage then load 1 is OFF through relay by taking instructions from Raspberry pi and data is sent to thingspeak. The same process continues for loads 2, 3 and 4. Genetic algorithm is used along with python language with Linux OS in Raspberry pi. The output data of loads is sent to thingspeak through Wi-Fi

Raspberry pi-3:

Figure 2: Raspberry pi-3

The **Raspberry Pi** is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. Raspberry Pi 3 Featuring the ARM1176JZF-S Running at 1.2 GHz, with 1 GB of RAM

The RASPBERRY Pi 3 is a credit card sized computer that plugs into your TV and a keyboard, it's like a little PC which can be used for many of the things that your desktop PC does, like spreadsheets, word processing and games. It also plays high definition video. The design is based around a Broadcom BCM2837 SoC, which includes an ARM1176JZF-S 1.2 GHz processor, Video Core IV GPU and 1 GB of RAM.

Relay:

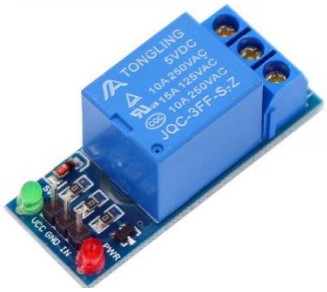

Figure 3: Relay

Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones.

Wi-Fi:

In Raspberry pi-3 we have built-in Ethernet, where we connect wi-fi through hotspot from mobile phone and send data.

Wi-Fi or WLAN as it is commonly known is fast becoming the preferred mode of connecting to the internet. Many people are not aware of the descriptions and explanations related to it. Wi-Fi gets its name from a certification called Wireless Fidelity given to networks operating under 802.11 standards. Wi-Fi allows computers, PDAs and other devices to connect to a broadband connection in a wireless mode. The 802.11 standard defines the wireless communication operating via electromagnetic waves.

Genetic Algorithm:

Genetic Algorithms(GAs) are adaptive heuristic search algorithms that belong to the larger part of evolutionary algorithms. Genetic algorithms are based on the ideas of natural selection and genetics. These are intelligent exploitation of random search provided with historical data to direct the search into the region of better performance in solution space. They are commonly used to generate high-quality solutions for optimization problems and search problems.

Genetic algorithms simulate the process of natural selection which means those species who can adapt to changes in their environment are able to survive and reproduce and go to next generation. In simple words, they simulate "survival of the fittest" among individual of consecutive generation for solving a problem. Each generation consist of a population of individuals and each individual represents a point in search space and possible solution. Each individual is represented as a string of character/integer/float/bits. This string is analogous to the Chromosome.

Thingspeak:

Figure 4: Thingspeak

"ThingSpeak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates.

5. RESULTS:

Load shedding in smart grid using genetic algorithm via IOT project out put

Fig 5: project out put

We can ON/OFF devices or loads from the web page.

Fig 6: For buttons in web page.

The output of four different devices in thingspeak.

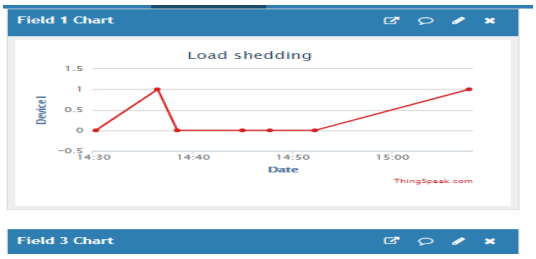

Fig 7: Device (1) Output

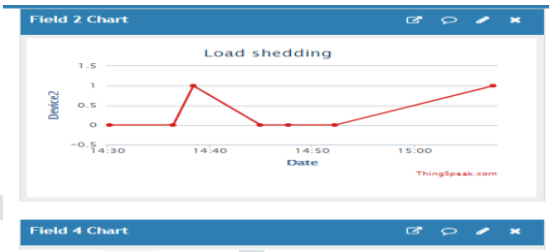

Fig 8: Device (2) Output

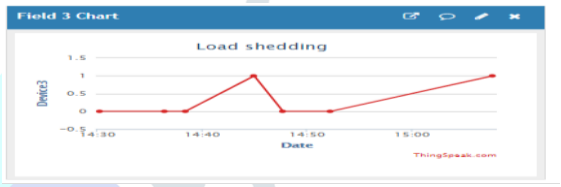

Fig 9: Device (3) Output

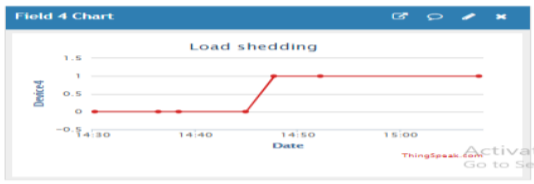

Fig 10: Device (4) Output

6. CONCLUSION

The existing model presents an Integrating feature of all the hardware components. The presence of each and every module has been reasoned out and placed very carefully. Hence the contributing to the best working unit for "**Load Shedding in Smart Grid Using Genetic Algorithm via IOT**" has been designed perfectly. Thus, the project has been successfully designed and tested.

7. ACKNOWLEDGEMENT

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