Priority Scheduler for Real Time Power Allocation System

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Abstract: In spite of tremendous advances in technology and computing one area is found lacking in the use of technology for making efficient use of available resources is the electricity usage in India. Electricity being an essential part of human life today needs better management and allocation techniques than the existing systems. Better management and sharing of electricity can ensure maximum utilization of the available electricity at the same time also ensure almost no power cuts. This paper proposes a hybrid model for allocation of power to home and typical urban area with a combination of home and commercial establishments on the same power line. Right now a very inefficient and inconvenient model of power cuts is used by electricity board, where in irrespective of the priority of the place or significant of the time of the day power cuts are done in certain area. For implementing this process each consumer at home or commercial is fitted with a special device that has embedded controller in it and also capable of receiving real time instruction from the EB at any point in the time, using wireless link. The device has power cut off feature and also a display and alarm build into it, this device can even replace the existing EB meters.

Keywords: Technology, Hybrid, Wireless, Power, Wireless Link.

I. INTRODUCTION

This paper discusses conceptual frameworks for actively involving highly distributed loads in power system control actions. The context for load control is established by providing an overview of system control objectives, including economic dispatch, automatic generation control, and spinning reserve. The paper then reviews existing initiatives that seek to develop load control programs for the provision of power system services. We then discuss some of the challenges to achieving a load control scheme that balances device-level objectives with power system-level objectives. One of the central premises of the paper is that, in order to achieve full responsiveness, direct load control (as opposed to price response) is required to enable fast time scale, predictable control opportunities, especially for the provision of ancillary services such as regulation and contingency reserves. Centralized, hierarchical, and distributed control architectures are discussed along with benefits and disadvantages, especially in relation to integration with the legacy power system control architecture. Implications for the supporting communications infrastructure are also considered. Fully responsive load control is illustrated in the context of thermostatically controlled loads and plug-in electric vehicles.

II. OVERVIEW

The purpose of this paper is to explore the conceptual requirements and opportunities to develop load control schemes that are competitive with conventional generation based approaches to providing power system control services. In principle, practically any measure that can be taken by generating units (i.e., the supply side) to ensure that electricity generation and load are equal has an equivalent countermeasure that can be taken by loads (the demand side). The primary characteristic of load control that distinguishes it from conventional generation-based approaches is that it must deliver a reliable resource to the power system while simultaneously maintaining a level of service commensurate with customer expectations. These two objectives are often in competition, and one of the greatest technical challenges to the competitiveness of engaging loads in power system services is to develop approaches that balance these objectives.

Existing System

With growing population electric power is the one resource that is not available in sufficient supply. Power cuts causes lot of inconvenience to consumers. These days' power cuts have become a part of life both in cities and elsewhere. Power cuts happen because of uncontrolled and uneven distribution of electricity.

Proposed System

In order to overcome this power cut problem, power should be controlled and distributed eventually to the residential and industrial areas. Consumers of the electricity are provided with priority depending on the nature of customer. So the customer will never cut off totally during the hours when priority is given to them.

III. DESCRIPTION

The design of system hardware includes power supply section, Microcontroller, GSM, RS232, Current Sensor, Relays, Alarm, and LCD. It is an embedded device.
The input voltage 230v is given from input line of EB office to respective home side embedded device. Initially Relay drive pass this power to the current sensor which measure the amount of current consumed by the respective home customer. So the current sensor is connected with consumer appliance. With the help of step down transformer and signal conditioner current sensor is connected with microcontroller. Microcontroller is programmed with predefined input value provided by EB office. LCD is used to display the real time usage power and allocated power by EB office. Once the customer exceeds the allocated power level means alarm gives the warning sound, so that the cut off relay cut the power totally. GSM is act as communicating device between EB office and customer.

The below mentioned fig 1 describes the connection diagram of various sensors, Controller and the PC.

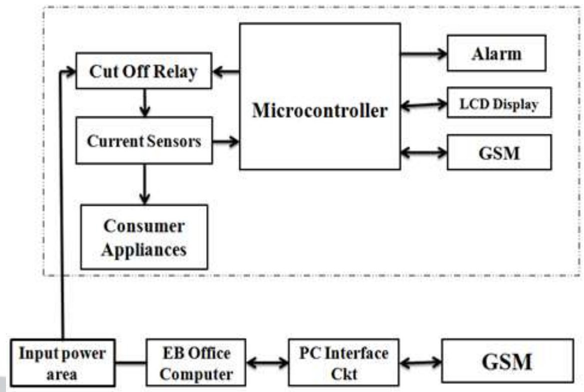
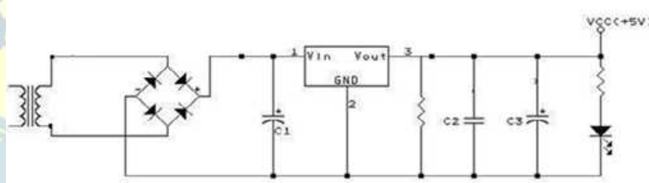


Fig.1 Block diagram of Priority scheduler for real time power allocation

Regulator



The AC voltage, typically 220V rms, is connected to transformer, which steps that ac voltage down to the level of the desired DC output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variations.
A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes.

Transformer

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC. Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in UK) to a safer low voltage.
The input coil is called the **primary** and the output coil is called the **secondary**. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core. Transformers waste very little power so the power out is (almost) equal to the power in.

Note that as voltage is stepped down current is stepped up. The ratio of the number of turns on each coil, called the **turn's ratio**, determines the ratio of the voltages. A step-down transformer has a large number of turns on its primary (input) coil which is connected to the high voltage mains supply, and a small number of turns on its secondary (output) coil to give a low output voltage.

There are several ways of connecting diodes to make a rectifier to convert AC to DC. The bridge rectifier is the most important and it produces **full-wave** varying DC. A full-wave rectifier can also be made from just two diodes if a centre-tap transformer is used, but this method is rarely used now that diodes are cheaper. A single diode can be used as a rectifier but it only uses the positive (+) parts of the AC wave to produce **half-wave** varying DC.

Smoothing

Smoothing is performed by a large value electrolytic capacitor connected across the DC supply to act as a reservoir, supplying current to the output when the varying DC voltage from the Rectifier is falling. The diagram shows the unsmoothed varying DC (dotted line) and the smoothed DC (solid line). The capacitor charges quickly near the peak of the varying DC, and then discharges as it supplies current to the output.

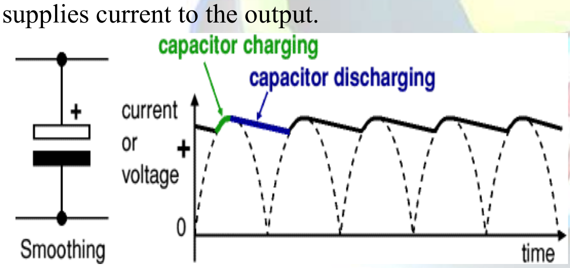


Fig. 2 Smoothing

Note that smoothing significantly increases the average DC voltage to almost the peak value (1.4 × RMS value). For example 6V RMS AC is rectified to full wave DC of about 4.6V RMS (1.4V is lost in the bridge rectifier), with smoothing this increases to almost the peak value giving 1.4 × 4.6 = 6.4V smooth DC.

Smoothing is not perfect due to the capacitor voltage falling a little as it discharges, giving a small **ripple voltage**. For many circuits a ripple which is 10% of the supply voltage is satisfactory and the equation below gives the required value for the smoothing capacitor. A larger capacitor will give fewer ripples. The capacitor value must be doubled when smoothing half-wave DC.

$$\text{Smoothing capacitor for 10\% ripple, } C = \frac{5 x I_o}{V_s \times f}$$

C = smoothing capacitance in farads (F)

I_o = output current from the supply in amps (A)

V_s = supply voltage in volts (V), this is the peak value of the unsmoothed DC

f = frequency of the AC supply in hertz (Hz), 50Hz in the UK.

LCD display units

Here we use 2 X 16 LCD modules to display the setting data and to view change in setting data.

Buzzer circuit

A **buzzer** is an audio signalling device, which may be mechanical, electromechanical or piezoelectric. Typical uses of buzzers and beepers include alarms.

Global System for Mobile Communication (GSM)

GSM, which stands for Global System for Mobile communications, reigns (important) as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. It is estimated that many countries outside of Europe will join the GSM partnership.

Modulation

Modulation is a form of change process where we change the input information into a suitable format for the transmission medium. We also changed the information by demodulating the signal at the receiving end. The GSM uses Gaussian Minimum Shift Keying (GMSK) modulation method.

Access Methods

Because radio spectrum is a limited resource shared by all users, a method must be devised to divide up the bandwidth among as many users as possible.GSM chose a combination of TDMA/FDMA as its method. The FDMA part involves the division by frequency of the total 25 MHz bandwidth into 124 carrier frequencies of 200 kHz bandwidth. One or more carrier frequencies are then assigned to each BS. Each of these carrier frequencies is then divided in time, using a TDMA scheme, into eight time slots. One time slot is used for transmission by the mobile and one for reception. They are separated in time so that the mobile unit does not receive and transmit at the same time.

Transmission Rate

The total symbol rate for GSM at 1 bit per symbol in GMSK produces 270.833 K symbols/second. The gross transmission rate of the time slot is 22.8 Kbps.GSM is a digital system with an over-the-air bit rate of 270 kbps.

Frequency Band

The uplink frequency range specified for GSM is 933 -960 MHz basic 900 MHz band only). The downlink frequency band 890 - 915 MHz (basic 900 MHz band only).

Channel Spacing

This indicates separation between adjacent carrier frequencies. In GSM, this is 200 kHz.

Speech Coding

GSM uses linear predictive coding (LPC). The purpose of LPC is to reduce the bit rate. The LPC provides parameters for a filter that mimics the vocal tract. The signal passes through this filter, leaving behind a residual signal. Speech is encoded at 13 kbps.

Duplex Distance

The duplex distance is 80 MHz. Duplex distance is the distance between the uplink and downlink frequencies. A channel has two frequencies, 80 MHz apart.

Mobile Station Authentication

The GSM network authenticates the identity of the subscriber through the use of a challenge-response mechanism. A 128-bit random number (RAND) is sent to the MS. The MS computes the 32-bit signed response (SRES) based on the encryption of the random number (RAND) with the authentication algorithm (A3) using the individual subscriber authentication key (Ki). Upon receiving the signed response (SRES) from the subscriber, the GSM network repeats the calculation to verify the identity of the subscriber.

Signalling and Data Confidentiality

The SIM contains the ciphering key generating algorithm (A8) which is used to produce the 64-bit ciphering key (Kc). The ciphering key is computed by applying the same random number (RAND) used in the authentication process to the ciphering key generating algorithm (A8) with the individual subscriber authentication key (Ki).

An additional level of security is provided by having the means to change the ciphering key, making the system more resistant to eavesdropping. The ciphering key may be changed at regular intervals as required by network design and security considerations. In a similar manner to the authentication process, the computation of the ciphering key (Kc) takes place internally within the SIM. Therefore sensitive information such as the individual subscriber authentication key (Ki) is never revealed by the SIM.

Subscriber Identity Confidentiality

To ensure subscriber identity confidentiality, the Temporary Mobile Subscriber Identity (TMSI) is used. The TMSI is sent to the mobile station after the authentication and encryption procedures have taken place. The mobile station responds by confirming reception of the TMSI. The TMSI is valid in the location area in which it was issued. For communications outside the location area, the Location Area Identification (LAI) is necessary in addition to the TMSI.

IV. CONCLUSION

This paper was designed such that the devices can be monitored and also controlled from anywhere using GSM modem connected to mobile phone. So this project avoids the overconsumption of power by the customer of the Electricity. Also avoid the power theft. Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC"s with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

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BIOGRAPHY

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