COMPONENT BASED OBJECT ORIENTED DESIGN IN POWER DISTRIBUTION SYSTEM

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Abstract - The component based methods are effectively carried out by the principles of object oriented analysis and design (OOAD). This approach focuses on the component based method using object oriented design in power distribution system. The component based method represents the advantage of object oriented concepts in terms of it reusability, maintainability and flexibility. The important contribution of this paper is to identify the amount of power that is distributed from the substation to the agriculture, residential and commercial regions for the first six hours' time interval. The java principles are used to carry out the object oriented concepts. The combined work of object oriented concepts with component based methods produce a better solution for the problem domain. The unified modelling language (UML) is used to represent the structural form of the power distribution system. The mat lab software is used to show the results obtained in the different regions for the first six hours' time interval.

Keywords: OOAD, Components, Power Distribution System, UML.

I.INTRODUCTION

The component based object oriented design in power distribution system is based on the principles of object oriented analysis and design (OOAD) [6]. The first part of OOAD is object oriented analysis and the second part is object oriented design. The requirements needed for the problem domain has been identified by the first part and designed it in the second part. The component based methods are used to perform the object oriented activities in an efficient form. By the principles of component based object oriented concepts, the problem domain can provide reusability, maintainability and flexibility. The component based method enable fast maintainable and reusable components. Components are highly reusable units of functionality. The design method provide excellent support for the successful distribution of power to the specified regions.

This paper focuses on the component based object oriented design for the concept of power distribution system. The power distribution system is classified into three categories: i) Residential, ii) Agricultural, iii) Commercial [5]. The important contribution of the paper is to evaluate the distribution of 3 phase power for first six hours' time interval.

## II. DESIGN CONCEPTS OF POWER DISTRIBUTION SYSTEM

The power that is distributed to the substation is identified in the analysis phase. The requirements needed to distribute the power from distribution system to the substation are analysed [4]. The Fig.1 shows the architecture of substation. The substation receives 33kV of power from the distribution system [1]. This 33kV is stepped down to 11kV and distribute to the base station computer. The stepped down activities is analyzed in the analysis phase [2]. From the base station computer the power is again stepped to 415 V to agriculture, commercial and residential regions.

Object oriented analysis requires domain knowledge and expertise in object oriented concepts. Hence, there is a need for both a domain expert and an object oriented analysis expert [3].

In the design phase, consider each substation divisions as an object. The 11kV power is again stepped down to 415 V and 240V in the base station and distribute to the three regions.

The 415V is taken as a 3 phase supply and 240V is taken as a single phase supply. Evaluate the power distributed for

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the three different regions by identifying the current and voltage. This method concentrates only on the distribution of power for 3 phase supply. The power distribution system itself can be represented as an object, since it is a composition of other physically existing objects. All the software object has primary attributes that represent the physical features of the object, data accessing and data processing methods that describe the interfaces of the object [6]. The substation and its regions are taken as the components.
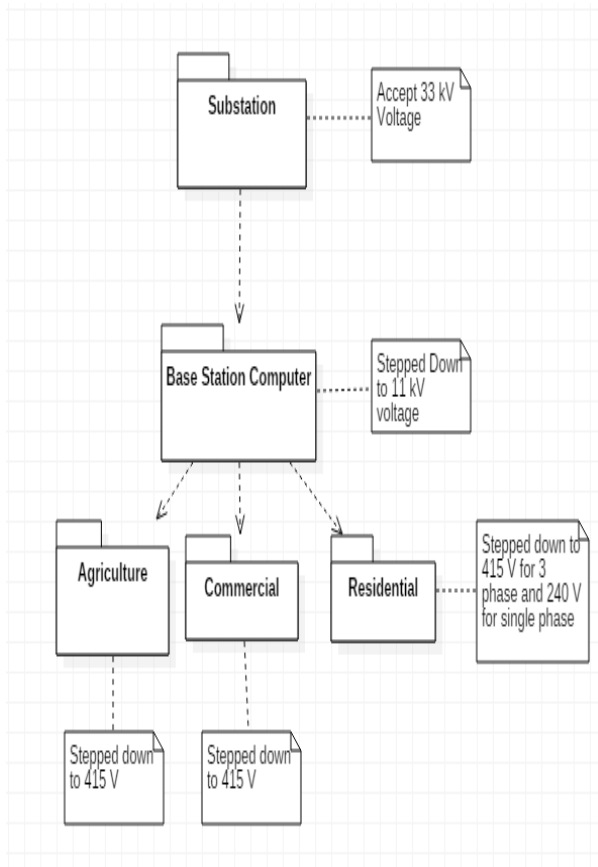
Fig.1. Architecture of Substation

Object oriented programming is the final phase of object oriented methodology in which implementation is carried out [6]. Classes have been developed for every designed objects using bottom up approach, which gives an ease implementation. The classes are used for the inheritance process and is used to implement the specialization relationship [6].

III.DISTRIBUTION OF POWER IN AGRICULTURE, RESIDENTIAL AND COMMERCIAL REGIONS

The power distributed in the agriculture, commercial and residential region for the first six hours of a single day is taken as consideration and shown the results. The Fig.2 show the distribution of power in agricultural region,Fig. 3 shows the distribution of power in commercial region and Fig. 4 shows the distribution of power in residential regions. The Fig. 2,3,4 shows that, when the voltage and current rate gets increased the distribution of power will also get increased. This power distribution is verified in the base station computer. By this, it shows the exact distribution of power for the first six hours intervals.

The object orientation are deployed in components as units of reusability. Object collaborations and interactions between objects are more important than objects individually. The combinations of three regions can be reused as a whole since it perform the object oriented concepts [5].

The load on a power distribution system, or on any unit of equipment within that power distribution system, represents the mass load of all the customers being served by that system or unit of equipment [8]. This load will vary from hour to hour, from day to day, and from season to season.

The results can be obtained by the object oriented method [7] for the purpose of reusability. The difference in power distribution for the three regions shows the unbalanced distribution of power. Because the power cannot be distributed in a balanced form in all the time intervals due to its transient stability conditions [6]. The occurrence of gradual flow of power in any of the region is taken into consideration for the calculation of power factor. The effectiveness of a power system can be represented as the total power required to get the real work that is carried out. The power factor is the calculation based on the ratio between real power and total power.

$$Power\ Factor = x\ 100\%$$

In this work, the real power denotes the power that is distributed for the first six hours interval in individual region and the total power denotes the amount of power distributed for the all the three regions for first six hours' time intervals.

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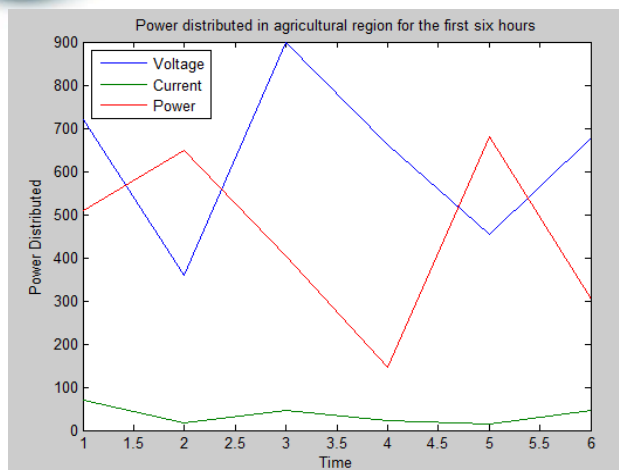
Fig.2. Power Distributed in agricultural region for the first six hours
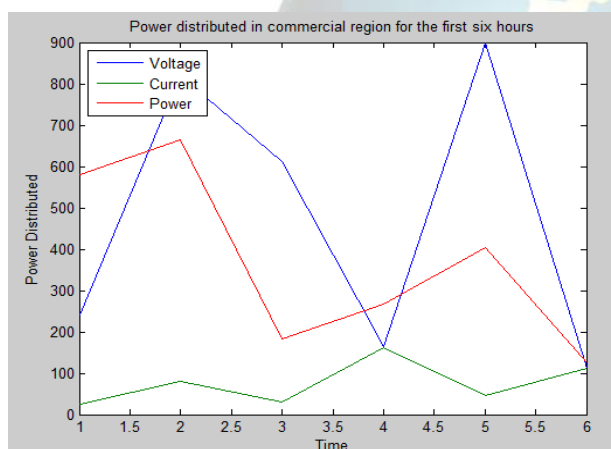
Fig. 3. Power distributed in commercial region for the first six hours
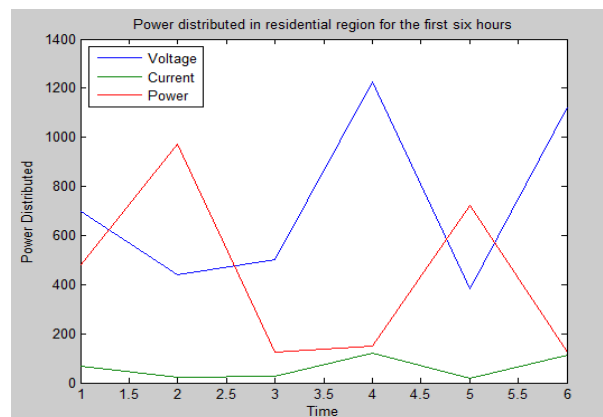
Fig. 4. Power distributed in residential region for the first six hours

The least value distributions are monitored and it can be transmitted to the particular area where the power is demanded on a condition basis [9]. The benefits of the object orientation method can be used to design and implement modular distributed system model that are reusable, and extendable [10].

The goal of object oriented design is to design the classes identified during the analysis phase and the user interface. During this phase, identify and define additional objects and classes that support implementation of the requirement. The object oriented design can be designed by the following ways: Reuse, rather than build a new class, design a large number of simple classes, rather than a small number of complex classes and design methods [1]. Component based method is the common issue as the components are supposed to be used as a building blocks of a software system [11]. Object oriented design involves the design of identified objects and the establishment of their relationship [6].

IV. CONCLUSION

This paper focuses on the power distribution system concepts by the principles of OOAD. The power distribution system is analysed first to identify the requirements needed for the problem domain. The object oriented design is used to carry out with various methods to estimate the distribution of power in various regions. The power that is distributed for the agriculture, residential and commercial regions for the first six hours is evaluated. This method produces better results that when voltage and current get raised the distribution of power also get raised without any fluctuations. This method can be extended to find the distribution of power in various intervals of time to find the exact distribution of voltage, current and power.

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