VisPower: An Interactive System for Power Generation Planning

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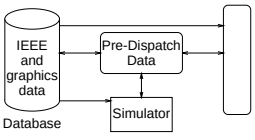
Abstract. This work aims to explore several computer graphics tools to assist the power engineers and operators for planning the power generation on the basis of the estimated load forecasting.

A systematic growth on the demand of electric power, mainly in the large urban areas and in the predominantly industrial regions, leads to a complex power network and increasing number of power transfers. As a consequence, the power systems may be operated closer to their limits and require more careful generation and transmission planning for avoiding overloadings. Often, the power system engineers and operators should handle the huge amount of data, traditionally in the format of a tabular list of violated transmission lines, for performing this task. There is a need for efficient and effective interaction with these data to allow the operators to forecast the system state and to find a good, if not optimal, solution.

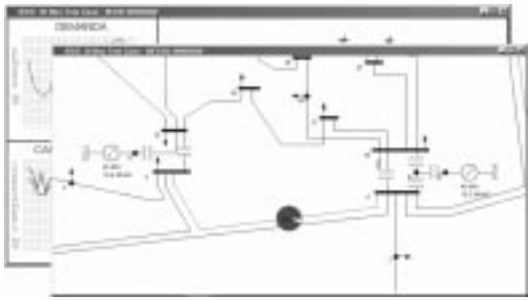
This project proposes to explore some graphics resources for visualizing the power generation and its transmission to supply dispersed load centers on the basis of the forecasting loads. Our interface is aimed at helping the operators to detect the possible overloadings in the transmission lines for a specific generation configuration and to interactively experiment alternative generation scenarios, until a satisfactoy power generation at each power station is achieved. To our best knowledge, such an interactive system is still under investigation [1, 2].

Due to the large amount of data, data organization and categorization play a vital role in its manegement. For generation planning, we distinguish three classes of data: (1) the persistent data, which are included in the *IEEE Common Data Format* [3], (2) the pre-dispatch data, and (3) the geographic/graphics information for displaying a 2D one-line diagram to which the power system operators are used to. On the basis of these three classes of data, we propose the VisPower system comprising of three modules, as shown in the following figure



Through the Interface the operator visualizes the state of the system (2D one-line diagram) and interacts with the Simulator by providing different generation scenarios. The generation plans for each power station is shared with the other applications via the Database.

Our prototype consists of three data files for separating the three classes oo data. The interface is composed by one main window with three subwindows. The objective of the main window is to provide a glance of the state of a power system. From this window, the operator can quickly identify the critical points (overloading power station or transmission lines). Colors are used to distinguish these points. On the user's request, another window may be opened to display detailed information at the critical points.



The prototype is being developed using C language and the OpenGL graphics interface. Appropriate feedback from the power system specialists within reasonable time ensures that the real-world conventions are always followed.

References

[1] T. Overbye and D. Wiegmann and A. Rich and Y. Sun, *Human Factors Analysis of Power System Visualizations*, Proc. 34th Hawaii International Conference on System Sciences(Maui, Hawaii, 2001).

[2] T. Overbye and D. Wiegmann and A. Rich and Y. Sun, *Human Factors Aspects of Power System Voltage Visualizations*, Proc. 35th Hawaii International Conference on System Sciences (Big Island, Hawaii, 2002).

[3] *Power Systems Test Case Archive*, Electrical Engineering Department, University of Washington, http://www.ee.washington.edu/research/pstca/.