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THE GRAPHICS-BASED HUMAN INTERFACE TO THE DISYS DIAGNOSTIC/CONTROL GUIDANCE SYSTEM AT EBR-II

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ABSTRACT

An initial graphics based interface to the real-time DISYS diagnostic system has been developed using the multi-tasking capabilities of the UNIX operating system and X-Windows 11 Xlib graphics library. This system is interfaced to live plant data at the Experimental Breeder Reactor (EBR-II) for the Argon Cooling System of fuel handling operations and the steam plant. The interface includes an intelligent process schematic which highlights problematic components and sensors based on the results of the diagnostic computations. If further explanation of a faulted component is required, the user can call up a display of the diagnostic computations presented in a tree-like diagram. Numerical data on the process schematic and optional diagnostic tree are updated as new real-time data becomes available. The initial X-Windows 11 based interface will be further enhanced using VI Corporation DATAVIEWS graphical data base software.

INTRODUCTION

The initial development of the DISYS diagnostic and control guidance expert system was conducted by Westinghouse for the U.S. Department of Energy (DOE) during the period of 1982 to 1986[1]. Although perceived as an approach to meeting real-time power plant diagnostic requirements in general, application of DISYS has focused on liquid metal reactor systems because of its origin in the DOE Breeder Reactor Technology program. The DISYS system uses a nodal network knowledge representation scheme arranged in a hierarchical manner to match an operator's mental model of the plant and diagnostic procedures. Sensor measurements, at the bottom of the hierarchy, connect to validation calculations which in turn are mapped to a measure-of-presence of a fault symptom. The measures of fault symptom presence are processed, based on Baye's rule of conditional probability, to determine the degree to which a faulted component or system exists. The diagnostic system also utilizes Fuzzy Logic in determining subsystem and overall system operational status.

In 1988, the DOE University Liquid metal program funded a Penn State project to convert the DISYS system from Pascal to C language operation in SUN workstations[2]. The project included simulation testing of a diagnostic data base for the EBR-II Argon Cooling System (ACS) for fuel handling operations using the B&W Modular Modeling System and IBM Advanced Control System at Penn State. Modularization of the UNIX C version of DISYS was also initiated by externalizing access to plant data using the UNIX shared memory feature and multitasking capabilities. On a UNIX based workstation, plant data is maintained in a shared memory segment updated with real-time plant data or recorded data from disk files during simulation testing. At the end of the C language conversion project the human interface to the

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