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TWO EXPERT ASSISTANTS FOR SOLVING FOSSIL ENERGY PROBLEMS  
DEVELOPED FROM PC-BASED EXPERT SYSTEM SHELLS

by

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ABSTRACT

Many potential users argue against using expert systems to solve problems because of the relatively high cost of specialized LISP machines and the large expert system shells written for them. This paper demonstrates how small, but useful, expert systems can be written with inexpensive shells and run on inexpensive personal computers (PCs). Two such shells are CLIPS and EXSHELL. CLIPS, developed by NASA, is a forward-chaining rule-based system, which is written in the C language, but the rules are entered in a LISP-like format. EXSHELL, developed by the computer science department at the University of New Mexico, is a back-chaining rule-based system written in PROLOG. Each of these shells was used to write two small expert systems for solving fossil energy problems. The first was an expert assistant to aid the design engineer in using the ASPEN (Advanced System for Process ENgineering) computer code. ASPEN is a large computer code used to design chemical plants and refineries. Among other things, ASPEN computes mass and energy balances for the plant design. Unfortunately, an expert, or several experts, are required to use ASPEN to its full potential. For example, choosing the proper thermodynamic package to represent a given process is important in developing the correct mass and energy balances. An ASPEN user may be an expert in plant design, yet may not be expert enough at thermodynamics to pick the proper package from the many offered by ASPEN. CLIPS and EXSHELL were used to develop a useful expert assistant to help process plant designers in picking the proper thermodynamic package to be used with particular operation conditions at various points in the ASPEN plant simulation. The second system was an expert assistant to help petroleum engineers screen possible enhanced oil recovery (EOR) candidate processes. Even though the final choice will be made based on an economic evaluation, an expert assistant can greatly reduce the work involved. Rather than exhaustively doing economic calculations for all possible processes, the work can be reduced to an economic comparison between two or three candidates. The PC-based expert system is easier to use than graphs or charts from a technical paper because the system interactively prompts the user for the needed information. It selects the shortest path to the solution and is easy to update when new data become available. This paper also demonstrates the utility and ease of use of these inexpensive shells and compares the approach used by each.