

A SET OF APL FUNCTIONS TO PLAY NEW ELEUSU

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T THE GAME

New Eleusls is a game, invented by Robert Abbott, which has been used to simulate hypothetico-deductive reasoning. [3]

Players of New Eleusls attempt to find the "secret rule" which governs the play of cards. This rule, which is made up by a player referred to as "God," may be anything at all so long as it depends only on attributes of the cards themselves. The scoring of the game punishes a God who makes up rules which are too difficult for any of the players to discover. Players experiment by playing cards which are then either accepted or rejected by God.

II THE ORGANIZATION OF INFORMATION

One of APL's greatest strengths is its ability to deal with rectangular arrays as easily as scalars. With the introduction of nested arrays, this power is enhanced by the ability to enclose or "scalarize" any APL array so that it may itself be an element of a larger array. The Eleusls workspace uses these new nested arrays to great advantage.

One example is the prediction matrix. This matrix contains a row for each rule under consideration, and a column for each position on the mainline including 20 or 30 columns representing positions at which no cards have yet been played. Each element of the array is an enclosed vector of all cards which would be permissible at that position according to a particular rule. Any card in the intersection of a column of the matrix is allowed by all the rules. When the rule list has reached its final state, these are the cards which the program acting as prophet would approve. By comparing rows and columns of the prediction matrix with the vectors representing the cards accepted and rejected at a position, the program can determine whether an individual rule is consistent with the results of past experiments.

The rules themselves are numerically encoded. A translation program renders these rules into grammatical English for communication with the human players.

III THE METHODOLOGY

The Eleusls workspace contains 50 or 60 APL functions. Each of these is a single purpose module which can be fitted together with other modules to build a complex system.

The program works by applying a collection of "screen functions" each of which is blind to all but one aspect of the cards, and then looking for patterns in the results. The part of the problem requiring the most intelligence is recognizing which rules are not likely to be correct because they do not correspond to human styles of thinking. This is done by employing a number of functions which weight the rules by "common sense." For instance, it was pointed out by Dietterich [2] that most rules invented by human Gods have symmetry. Once the program has a set of possible rules it tests them by playing cards which seem likely to eliminate the largest number of unlikely rules. When all the remaining rules meet the "reasonability" criteria and even long strings of cards can be played successfully by following them, the program declares itself to be a prophet. The program can play against itself, or against one or more other players.

Complete program listings are available from the author.

- [1] Abbott, Robert
The New Eleusls
Box 1175, GPO, New York, NY 10001
1977
- [2] Dietterich, Thomas G.
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Inducing Descriptions of Sequentially Ordered
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University of Illinois Thesis
#UIUCDCS-R-80-1-24 1980
- [3] Gorman, Michael E.
How Communication and Confirmatory Strategies
Affect the "Search for Truth."
Doctoral Dissertation,
University of New Hampshire 1981