THE DAUGHTER OF CELIA,
THE FRENCH FLAG
AND
THE FIRING SQUAD

by

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In earlier work (1, 2) we have reported on a program, called CELIA, for simulating the behavior of linear iterative arrays of cells. The action of a cell is influenced by both its neighbors. Our main application area was biology, where the program can be used to test hypotheses about the developmental rules for organisms.

More recently we have been applying our program to test proposed solutions to some fairly complicated biologically based problems. We have investigated (3) whether one can achieve regulative global polarity in organisms without polarity in individual cells, by solving the French flag problem of Wolpert (4) using only symmetric elements. In our attempted simulation of pigmentation patterns on the shells of sea-snails, we have found it necessary to find a solution to a generalized version of the firing squad synchronization problem (3), in which the firing squad is growing while it is trying to synchronize itself.

We found that our original program CELIA was somewhat awkward for simulating such complicated situations. A new program has been devised where the state of the individual cells is described by an array of attributes, such that each attribute itself may be a list structure.

The present paper reports on these changes and explains how they turn out to be useful in the applications mentioned above.

REFERENCES

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(3) HERMAN, G.T., Models for cellular interaction in development without polarity of individual cells, International Journal of Systems Sciences 3 (1972), 149-175.

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"AN APPLICATION OF SIMULATION TO DEBUGGING AND MAINTAINING A COMPUTER NETWORK SYSTEM"*

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The Computing Division of the Los Alamos Scientific Laboratory is implementing a system which will link the Laboratory's large general purpose computers (3 - CDC 6600's and 2 - CDC 7600's) to a common data base (10^{12} bits on-line), and to a network of keyboa.d and computer based terminals. This paper discusses the use of simulation in designing, implementing, testing and maintaining the system software for the Front End Machine which is the center of this system.