A GENERATIVE AUTHORING SYSTEM BASED ON
COGNITIVE PROCEDURES FOR DIAGNOSIS
AND INSTRUCTION

Alice Scandura of Intelligent Micro Systems, Inc. (IMS) has received an award
to establish the feasibility of developing a generative authoring system for
computer-based instruction. The system, which is being developed in collaboration
with Joseph Scandura of the University of Pennsylvania, is designed to over-
come one of the principal limitations of most conventional systems: the require-
ment that the author specify in advance all instructional material to be pre-
ented to a learner, all likely answers to any questions or instructional sequences
requiring a response, and all feedback that is to occur as a result of a learner’s
response. With funding from the Small Business Innovation Research program of
the U.S. Department of Education, Scandura is designing a “RuleTutor Author-
ing System” that will be capable of generating content dynamically, as instruc-
tion proceeds. The work capitalizes on recent advances in cognitive science and
instructional systems design that make a sharp distinction between the content
represented in the knowledge base of a system, and the system’s more general
functions, in this case, diagnostic and instructional functions.

This separation is being implemented in Scandura’s work as an author/driver
system. The author part of such a system allows a subject matter specialist to
prepare course material without being able to program, using the system some-
what like the author of ordinary text uses a word processor. The driver portion
of the system treats the entered course material as data, presenting it in a se-
quence determined both by the organization of the material and by the nature
of a student’s responses. The author subsystem will be based on modifications of
a computer program, PRODOC. PRODOC allows a user to generate code by
creating and modifying flow diagrams directly on a computer screen using ele-
mentary rules available in a library of atomic rules. A content expert or educator
would use this flow charting to specify the underlying structure of the material
to be taught. Much of the Phase I work involves extending the library of
PRODOC rules to facilitate authoring in a variety of content domains that are
representative of school subject matter.

Other Phase I work is aimed at developing a generalized driver component
for the system by building on another IMS product, Tutorial Arithmetic.
Tutorial Arithmetic is an intelligent tutoring program that consists of several
routines corresponding to the content—whole number arithmetic—and a driver
program, a set of routines for diagnostic testing and instruction. At the time of
the award, the driver program had been used only with code corresponding to
whole number arithmetic. The project team presently is attempting to build and
test a content-independent “RuleTutor” for the system. The modifications will
make it possible to use the system for other tasks such as geometry construction,
algebraic proof, and critical reading, where problems can be solved using cogni-
tive procedures that can be formulated as rules. Scandura and her colleagues also
are in the process of identifying teachers, and other authors of instructional
materials to participate in Phase II trials of the system, which are contingent
upon additional funding. More information on the project can be obtained by
contacting Alice Scandura at Intelligent Micro Systems, Inc., 1249 Greentree
Lane, Narberth, PA 19072.