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A DENOTATIONAL SEMANTICS IMPLEMENTATION SYSTEM

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PREFACE

The research described in this report, "A Denotational Semantics Implementation System," by Roberto da Silva Bigonha, was carried out as part of the research grant "Reliability of Computing", sponsored by the National Science Foundation, Grant no. MCS-78-18918, under the direction of A. Avizienis, J.A. Goguen, and D.F. Martin, Principal Investigators on the project, in the Computer Science Department, School of Engineering and Applied Science, University of California, Los Angeles.

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ABSTRACT OF THE DISSERTATION

A Denotational Semantics Implementation System

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A system for formulating, testing and implementing denotational semantic definitions is designed and formally defined. Mosses' Semantics Implementation System (SIS) has been taken as a starting-point. SIS has been modified and extended in order to increase its expressive power and to enhance reliability and readability of denotational definitions.

The main work is toward the definition and specification of a machine-processable Denotational Semantic Language (SDL) for conveying modular denotational semantic definitions. In addition to the usual notation of semantic equations, SDL contains specially designed constructs to facilitate modularization and data abstraction. Moreover, SDL embodies some convenient notations such as the ellipsis (...) and "updating" functions.

A polymorphic type discipline has been adopted to give SDL the advantages of strongly typed languages such as Algol 68 while benefiting from the flexibility of defining functions that accept parameters of

various types.

Both the formal definition of the SDL type system and of the semantics of SDL are written in SDL itself.

In addition to SDL, our system incorporates two other languages: SSL for syntax specifications and LAMB, the semantic base language borrowed from Mosses' SIS.

Finally, a data-abstraction-based methodology for formulating structured denotational definitions is proposed and illustrated.