

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: February 27, 1978

Project Title: Relative Complexity of Programming Systems

Project No: G-36-626

Project Director: Dr. Nancy A. Lynch

Sponsor: National Science Foundation, Washington, D.C. 20550

Agreement Period: From 1/1/78 Until 6/30/80*
*Includes 6 mos. flexibility period

• Type Agreement: Grant No. MCS77-15628

Amount: \$46,300 NSF Funds (G-36-626)
20,573 GIT Contribution (G-36-327)
\$66,873 Total

Reports Required: Annual Summary Reports; Final Technical Report

Sponsor Contact Person (s):

Technical Matters

W. Richards Adrion
Theoretical Computer Science Program
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Phone (202) 632-5745

Contractual Matters

(thru OCA)
Ms. Mary Frances O'Connell
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National Science Foundation
1800 G Street, N.W.
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Phone (202) 632-2858

Defense Priority Rating: n/a

Assigned to: Information & Computer Science (School/Laboratory)

COPIES TO:

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Project File (OCA)
Project Code (GTRI)
Other _____

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT TERMINATION

Date: 12/17/80

Project Title: Relative Complexity of Programming Systems

Project No: G-36-626

Project Director: Dr. Nancy Lynch

Sponsor: National Science Foundation

Effective Termination Date: 6/30/80

Clearance of Accounting Charges: 6/30/80

Grant/Contract Closeout Actions Remaining:

- Final Invoice and Closing Documents
- Final Fiscal Report via FCTR
- Final Report of Inventions
- Govt. Property Inventory & Related Certificate
- Classified Material Certificate
- Other _____

Assigned to: Information & Computer Sciences (School/~~XXXXXXXXXX~~)

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Project Code (GTRI)
Other C. E. Smith

(L-78-1-5272-1)

PLEASE READ INSTRUCTIONS ON REVERSE BEFORE COMPLETING

PART I-PROJECT IDENTIFICATION INFORMATION

1. Institution and Address School of Info. & Comput. Sci. Georgia Institute of Technology Atlanta, Georgia 30332	2. NSF Program Theoretical Comput. Sc	3. NSF Award Number MCS-77-15628
	4. Award Period From 1/78 To 6/80	5. Cumulative Award Amount \$46,300

6. Project Title
Relative Complexity of Programming Systems

PART II-SUMMARY OF COMPLETED PROJECT (FOR PUBLIC USE)

Formal models are developed for measuring the complexity of any algebra (i.e. data type and associated operations) relative to any other algebra. Particular focus is on algebras of interest in computing, such as those used for numerical computation, or for string manipulation. Efficient codings of various high-level algebras relative to other, more basic, algebras are described, and in many cases the optimality of these codings is demonstrated. Results are obtained describing how the relative complexity of certain algebras depends on the choice of an underlying class of programs.

These basic results are extended in two directions. First, the approach leads naturally to consideration of questions about tradeoffs between the complexity of various operations on the same algebra. Two interesting results are obtained, one demonstrating such a tradeoff for insertion and searching in a data base, and one for the time and space required for sorting. Second, the approach is extended to models for asynchronous parallel computation. Appropriate formal models are developed for this situation, and then several parallel algorithms are described via decomposition into levels, with complexity analysis of each entire algorithm composed from relative complexity analyses performed at the different levels. Some of these algorithms are so difficult that a presentation without such a decomposition seems infeasible.

PART III-TECHNICAL SUBMITTALS (FOR PROGRAM MANAGER USE)

1. ITEM (Check appropriate boxes)	NO.	ATTACHED	COMPLETLY SUBMITTED	TO BE RETURNED SEPARATELY TO PROGRAM	
				Check (✓)	Approx. Date
a. Abstracts of Theses				✓	12/1/78
b. Publication Citations				✓	
c. Data on Scientific Collaborators				✓	
d. Information on Inventors				✓	
e. Technical Description of Project and Results				✓	1/1/78
f. Other (specify)					
2. Principal Investigator/Project Director Name (Typed) Nancy A. Lynch		3. Principal Investigator/Project Director Signature			4. Date 12/1/78

9-36-626
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	4. Award Period From 1/78 To 6/80	5. Cumulative Award Amount \$46,300
6. Project Title Relative Complexity of Programming Systems		

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PART III-TECHNICAL INFORMATION (FOR PROGRAM MANAGER USE ONLY)

1. TITLE OF PROJECT	2. DATE	3. APPROVED	4. FUNDING	5. TO BE FURNISHED	
				6. PARALLEL PROGRAM	7. SPECIAL DES.
a. Abstracts of Theses				<input checked="" type="checkbox"/>	
b. Publication Citations				<input checked="" type="checkbox"/>	
c. Data on Scientific Collaborators				<input checked="" type="checkbox"/>	
d. Information on Inventions				<input checked="" type="checkbox"/>	
e. Technical Description of Project and Results				<input checked="" type="checkbox"/>	
f. Other (specify)					
8. Principal Investigator/Project Director Name (Typed) Nancy A. Lynch	9. Principal Investigator/Project Director Signature			10. Date	