ILLIAC IV

Illinois University

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FINAL REPORT

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13. ABSTRACT

This document describes GLYPNIR updates, the status of the Parallel Assembler (Pandora), and provides a summary of administrative activities to date. It is submitted as the Final Report in lieu of the last quarterly technical report.

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SUMMARY

During this quarter the GLYPNIR compiler continued to be enhanced and improved, and its documentation revised.

The parallel assembler has been consolidated, and provisions have been made for it to compile programs of up to 256,000 source cards in length.

The documents, tapes, and programs have been finalized for delivery of the software to the sponsor, as this is the t he Final Report.

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1. Software

1.1 GLYPNIR

Last quarter's efforts to improve the GLYPNIR compiler continued through this quarter. The main areas of activity were:

1.1.1 Implementation of the Word Function

Very often, the programmer needs to reference one word of a PE variable. Earlier, programmers used the GRABONE Function which has the disadvantage that it can only take a value from a word of a PE variable; i.e., it cannot place a value in a PE variable. The word function however, can be used on either side of an assignment to either take from or place a single word value in a PE variable.

1.1.2 Compile Time Variables and Functions

The ability to declare and use compile time variables and to interrogate the state of the compiler symbol tables and the state of the source code being compiled were added to the already extensive define capabilities of GLYPNIR. This addition will allow a considerable amount of GLYPNIR language extension without the attendant costs of compiler development, and will allow the user to develop language extensions that allow him to match his problem to ILLIAC IV in a more concise, efficient and elegant manner than before.

1.1.3 Continued Optimization of Emitted Code

The process of improving the code emitted by the GLYPNIR compiler continued this quarter. This work has lowered the average measured number of assembler statements issued per GLYPNIR statement from about 10 to 6.

The consequent improvement in GLYPNIR compile speed (including the time to assemble the consequent assembler code) has improved by about 30%.

1.1.4 Attempt to Improve Exponentiation

Some time was spent investigating the accuracy of the exponentiation operator (**) and attempting to improve it. It was found that although its minimum accuracy of 36 mantissa bits was sufficient for most purposes, the task of extending this accuracy to about 46 mantissa bits required the use of extended precision arithmetic at considerable cost in execution speed. As the development of such a routine would be relatively costly in terms of the small practical gain likely, the activity was deferred indefinitely.

1.1.5 Documentation

The GLYPNIR reference manual has been extended and revised, and a descriptive article about the basic problems associated with writing compilers for ILLIAC IV has been drafted for later publication.

1.2 Parallel Assembler

The emphasis of effort during this final quarter was directed towards making the parallel assembler more user and "production" oriented as opposed to its previous "development" oriented status.

1.2.1 Consolidation of Pass II

The entire object code mechanism was consolidated and optimized with a resultant clarification of logic and a speed up of about 20%.

1.2.2 Unification of Constituent Modules

In order to conserve testing time, the assembler previously existed as a series of independant ILLIAC IV modules connected by simulator disk files controlled by a special purpose monitor. These segments were unified with consequent simplifications to the monitor, and better utilization of ILLIAC IV array memory.

1.2.1.3 Provisions for Non-Core-Contained Source Code

The size of the array memory and the need for input-output buffers restricted the maximum number of source cards the parallel assembler could handle to 4000. The parallel assembler has been extended to handle up to 256,000 source cards. This is done by processing large code in segments of 4000 cards and then joining the semi-assembled segments together to provide the appropriate continuous object code.

However, because the ILLIAC IV simulator is slow compared to ILLIAC IV itself, the cost of fully testing this facility for large codes is prohibitive. However, the algorithm is explicity stated and described, preliminary testing indicates that it will be sucessfull and it will not signficantly degrade the performance of the parallel assembler.

1.2.4 Documentation

The parallel assembler reference manual has been extended and revised, the maintainence manual brought up to date and a descriptive article about the basic features and methods of parallel assembly has been drafted for later publication.

2. Administration

2.1 Financial

Total expenditures through September 30, 1972:

Burroughs Subcontract:	$30,099,709
U. of I./Burroughs-Disc Purchase:	930,000
University of Illinois:	8,815,967

Expenditures and obligations for October, November and December, 1972:

	October	November	December
Burroughs	$152,783	$128,452	N.A.
University	48,002	21,892	10,899
Disc. Purchase	-0-	-0-	-0-
B6700 Rental/Ames	93,933	93,933	46,967

Estimated expenditures and obligations through December 31, 1972:

Burroughs Subcontract:	$30,380,944
U. of I./Burroughs-Disc Purchase:	930,000
U. of I./Burroughs B6700 Rental/Ames:	234,833
University of Illinois:	8,896,760

2.2 Final Financial Report

Although this is the final report, in lieu of the last quarterly technical report from the University of Illinois at Urbana-Champaign, there will be continued effort through June 30, 1973, primarly for the publication of final documents by the University of Illinois and Burroughs.

In addition, there will be same C-U Board rework by Burroughs; therefore, we will publish and distribute the final administrative and financial report in June.