

HOPE COLLEGE
APPROVAL FORM OF APPLICATION FOR A GRANT

1. Project director Herbert L. Dershem Department Computer Science
Proposal to be submitted New Program Renewal
2. Project title An Object-Oriented Execution Visualization Env. for Intro
3. Purpose of Objective Design & implement environment and use in course
4. Proposed period from 05/01/01 to 04/30/03
5. Effect on faculty, staff and students:
 - a. The following faculty members, other than project director, will participate (on more than a token basis)

<u>NAME</u>	<u>NATURE OF PARTICIPATION</u>
<u>Ryan McFall</u>	<u>Co-Principal Investigator</u>
 - b. Number of students to participate 4
 - c. Name any additional personnel for the project (secretarial, technical, post-doctoral, etc.) who are not presently employed by Hope College.
6. a. Are space and necessary facilities available? YES ☒ NO ☐
If yes, Building Van Zoeren Room B24
If no, comment on your requirement for new space and facilities.
If the program is off campus, please indicate location: _____
- b. Will acquisition of major equipment require eventual cost to Hope College (e.g., installation, accessories, maintenance, repair, expendable supplies for instruments)?
YES _____ NO ☒ Explain _____
- c. Will computer services or computer assistance be required? No
If yes, the grant must cover costs for computer time either as a direct cost of the grant or as matching funds if required.
- d. List any additional office equipment or computer equipment required for this project, not included in the grant. none
7. a. Summary of proposed budget:

	<u>TOTAL</u>		<u>TOTAL</u>
Salaries and Wages..	\$47,500	*Computer Charges	
*Employee Benefits...	8,621	Computer Time.....	
Supplies.....		Computer Personnel.....	
Equipment.....		Computer Equipment.....	
		Travel.....	\$1,500
		*Indirect Costs.....	\$24,937 <u>\$15,675</u>
		Other (Itemized under notes)	\$1,000
		TOTAL.....	\$74,937 <u>\$74,296</u>
- b. Will the Hope College Business Office administer these funds? yes
- c. Indicate any costs which are to be paid by Hope College. Name the specific source of these funds and the corresponding Hope College account number. none
8. Notes
*Explanation of methods or source used in calculating indirect costs, employee benefits and computer charges. 52.5% of salaries 10.5% retirement 7.65% FICA + M&FE
9. Signatures for approval (must be obtained in advance of submission):

<u>Herbert L. Dershem</u> 5/30/00 Requested by: Project Director (date)	<u>James M. [Signature]</u> 5/30/00 Approved by: Divisional Dean (date)
<u>Herbert L. Dershem</u> 5/30/00 Endorsed by: Chairman of Dept. (date)	<u>[Signature]</u> 5/31/00 Approved by: Jacob Nyenhuis, Provost (date)
<u>[Signature]</u> 7/10/00 Approved by: Director, Computing and Information Technology (date)	<u>[Signature]</u> 6-7-00 Approved by: William K. Anderson, V.P. (date)

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION					FOR NSF USE ONLY						
PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE (if not in response to a program announcement/solicitation enter NSF 00-2)					NSF PROPOSAL NUMBER						
NSF 00-63 06/06/00											
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)											
DATE RECEIVED		NUMBER OF COPIES		DIVISION ASSIGNED		FUND CODE		DUNS# (Data Universal Numbering System)		FILE LOCATION	
								050947084			
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)				SHOW PREVIOUS AWARD NO. IF THIS IS <input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL				IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYMS(S)			
381381271											
NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE				ADDRESS OF Awardee ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE							
Hope College				Hope College P.O. Box 9000 Holland, MI. 494229000							
AWARDEE ORGANIZATION CODE (IF KNOWN)											
0022731000											
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE				ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE							
PERFORMING ORGANIZATION CODE (IF KNOWN)											
IS Awardee ORGANIZATION (Check All That Apply) (See GPG II.D.1 For Definitions) <input type="checkbox"/> FOR-PROFIT ORGANIZATION <input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS											
TITLE OF PROPOSED PROJECT: An Object-Oriented Execution Visualization Environment for Learning Introductory Computer Science											
REQUESTED AMOUNT			PROPOSED DURATION (1-60 MONTHS)			REQUESTED STARTING DATE			SHOW RELATED PREPROPOSAL NO., IF APPLICABLE		
\$ 74,296			24 months			05/01/01					
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW											
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG 1.A.3) <input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.12) IACUC App. Date _____											
<input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.D.1) <input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.12)											
Exemption Subsection _____ or IRB App. Date _____											
<input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG II.D.10) <input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES _____											
<input type="checkbox"/> NATIONAL ENVIRONMENTAL POLICY ACT (GPG II.D.10) <input type="checkbox"/> FACILITATION FOR SCIENTISTS/ENGINEERS WITH DISABILITIES (GPG V.G.)											
<input type="checkbox"/> HISTORIC PLACES (GPG II.D.10) <input type="checkbox"/> RESEARCH OPPORTUNITY AWARD (GPG V.H)											
<input type="checkbox"/> SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.12)											
PI/PD DEPARTMENT				PI/PD POSTAL ADDRESS							
Department of Computer Science				27 Graves Place Hope College Holland, MI 494229000 United States							
PI/PD FAX NUMBER											
616-395-7123											
NAMES (TYPED)		High Degree		Yr of Degree		Telephone Number		Electronic Mail Address			
PI/PD NAME		Ph.D.		1969		616-385-7508		dershem@cs.hope.edu.			
CO-PI/PD		Ph.D		2000		616-392-5111		Mcfallry@cs.hope.edu			
CO-PI/PD											
CO-PI/PD											
CO-PI/PD											

CERTIFICATION PAGE

Certification for Principal Investigators and Co-Principal Investigators:

I certify to the best of my knowledge that:

- (1) the statements herein (excluding scientific hypotheses and scientific opinions) are true and complete, and
- (2) the text and graphics herein as well as any accompanying publications or other documents, unless otherwise indicated, are the original work of the signatories or individuals working under their supervision. I agree to accept responsibility for the scientific conduct of the project and to provide the required progress reports if an award is made as a result of this proposal.

I understand that the willful provision of false information or concealing a material fact in this proposal or any other communication submitted to NSF is a criminal offense (U.S.Code, Title 18, Section 1001).

Name (Typed)	Signature	Social Security No.*	Date
PI/PD Herbert L Dershem		SSNs are confidential and are not displayed *ON FASTLANE SUBMISSIONS*	
Co-PI/PD Ryan McFall			
Co-PI/PD			
Co-PI/PD			
Co-PI/PD			

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding Federal debt status, debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 00-2. Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflict which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Debt and Debarment Certifications

(If answer "yes" to either, please provide explanation.)

Is the organization delinquent on any Federal debt?

Yes ☐

No ☒

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes ☐

No ☒

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME/TITLE (TYPED) James M. Gentile, Dean Natural Science		Bad_Date
TELEPHONE NUMBER 616-395-7190	ELECTRONIC MAIL ADDRESS gentile@hope.edu	FAX NUMBER 616-395-7923

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

Project Summary

This project will build an environment for visualizing program execution that supports student learning. It will also produce materials that make use of this environment in an Object-Oriented, Java-based introductory Computer Science course. The environment will be built from components that have already been constructed by the Principal Investigator and his students during three summers of prior research.

The course material will integrate the visualization environment into the introductory course through the development of lecture demonstrations with follow up activities, in class laboratory activities, and outside-of-class homework exercises. These will be refined and improved through class testing.

The impact of the environment on learning will be evaluated through student surveys, logging student usage to measure the nature and impact of use of the environment, and by the critical reviews of outside experts. The materials will all be web-based and will be distributed through its availability on the web and through workshops presented at regional and national conferences. A community of users will be created and maintained on the web where upgrades and additional course materials will be made available.

TABLE OF CONTENTS

For font size and page formatting specifications, see GPG section II.C.

Section	Total No. of Pages in Section	Page No.* (Optional)*
Cover Sheet (NSF Form 1207) (Submit Page 2 with original proposal only)		
A Project Summary (not to exceed 1 page)	1	_____
B Table of Contents (NSF Form 1359)	1	_____
C Project Description (plus Results from Prior NSF Support) (not to exceed 15 pages) (Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	16	_____
D References Cited	1	_____
E Biographical Sketches (Not to exceed 2 pages each)	4	_____
F Budget (NSF Form 1030, plus up to 3 pages of budget justification)	6	_____
G Current and Pending Support (NSF Form 1239)	1	_____
H Facilities, Equipment and Other Resources (NSF Form 1363)	0	_____
I Special Information/Supplementary Documentation	0	_____
J Appendix (List below.) (Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	_____	_____
Appendix Items:		

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

An Object-Oriented Execution Visualization Environment for Learning Introductory Computer Science

Project Description

1 Results from Prior NSF Support

The Principal Investigator has received three NSF grants related to undergraduate education over the past six years. These grants are listed in abbreviated form below and referenced later in the proposal:

- REU: An Undergraduate Research Participation Program in Computer Science
Grant Number CDA-9423943
Amount of Award \$114,393
Support Period March 1, 1995 until February 28, 1998
- An Integrated Classroom/Laboratory for Introducing Students to Object-Oriented Concepts
Co-PIs Michael J. Jipping and Gordon A. Stegink
Grant Number DUE-9650129
Amount of Award \$46,356
Support Period June 15, 1996 until May 31, 1999
- REU: An Undergraduate Research Participation Program in Computer Science
Grant Number EIA-9732339
Amount of Award \$146,700
Support Period February 15, 1998 until January 31, 2001

The two REU grants are the latest of three grants supporting a Hope College REU site program over the past nine years. The PI has supervised undergraduate research projects every summer from 1992-1999. The Co-PI supervised undergraduate research under this project in 1996. Four of the projects supervised by the PI are directly related to the project presented in this proposal. The DUE grant was an ILI project that supported the establishment of a combination classroom and laboratory environment that provides a seamless integration of large group (classroom) and small group (laboratory) learning. The equipment purchased with this grant is presently being used in all Hope College Computer Science classes and this facility along with successors of the original equipment will provide the classroom environment for the present project.

2 Project Overview

The proposed project will build an environment for visualizing program execution that supports student learning and will develop materials that make use of this environment in an Object-Oriented, Java-based introductory Computer Science course. This environment will be built from components that have already been constructed by the PI and his students and will be developed under the leadership of the co-PI.

The course material will integrate the visualization environment into the course through the development of lecture demonstrations, laboratory activities, and outside-of-class homework exercises. These will be refined and improved through class testing.

The impact of this environment on learning will be evaluated through student surveys, logging student usage to measure nature and impact of use of the environment, and by the critical reviews of outside experts.

3 Goals and Objectives

This project has four goals, as listed below along with their corresponding objectives.

Goal 1: We will develop an integrated, web-based execution visualization environment to enhance introductory Computer Science learning.

Objective 1a. We will integrate previously developed components for Java program development, visualizing class/method protocol, recursion, and event-driven computing.

Objective 1b. We will add a facility to this environment that will permit code generation and playback of visual user/machine interactions.

Goal 2: We will develop course modules that use the visualization environment.

Objective 2a. We will develop lecture presentation modules including follow-up web-based review materials that utilize the visualization environment.

Objective 2b. We will develop laboratory exercises using the visualization environment.

Objective 2c. We will develop out-of-class homework exercises requiring use of the visualization environment.

Goal 3: We will evaluate the materials and modify them based on the evaluation.

Objective 3a. We will use these materials locally in the Computer Science 225 course.

Objective 3b. We will evaluate effectiveness by collecting data from students.

Objective 3c. We will distribute our materials to a panel of experts for critical review.

Objective 3d. We will modify and improve the materials based on these.

Goal 4: We will share the materials developed with other Computer Science educators.

Objective 4a. We will communicate our results through professional publication, web publication, and workshops at national and regional conferences.

Objective 4b. We will establish a community of users for the continued evaluation, development, and maintenance of these materials.

4 Problem Addressed

In the past ten years, we have seen a major change in both the content and methods used in introductory Computer Science instruction. Three of those changes are addressed in this project.

The paradigm of problem solving introduced in this course has changed from predominantly imperative to predominantly object-oriented. This has been evident in the textbooks published and in the programming languages used.

In addition, the mode of classroom teaching in this course has moved from lecture-based presentation to interactive, cooperative learning. The Computing as a Discipline report [4] gave impetus to this movement and it has continued to grow as more emphasis has been placed on

collaborative learning in all of higher education in general and in Computer Science education in particular [3] [18].

Finally, the use of the World Wide Web to enhance learning has been a phenomenon of the last five years, and is becoming an integrated part of course presentation in Computer Science [1] [2].

The proposed project is intended to address some particular instructional problems that are present in object-oriented introductory Computer Science learning by applying the new web-based technology in a manner that will encourage active, cooperative learning.

The three instructional topics addressed by this project are (1) the class/method protocol of object-oriented problem solving; (2) recursion; and (3) event-driven computing.

As the object-oriented paradigm has become the approach to problem solving in introductory Computer Science courses, a fundamental instructional challenge has become establishing early student understanding of the class/method protocol. This has been noted by others including Kölling [9][10] who has developed the Blue environment [11] and its successor, the BlueJ environment [12] that has similar goals to that of the present project in working on this problem.

A second problem that has long existed in Computer Science instruction at all levels is developing an understanding of procedural recursion [13][20]. Visualization has frequently been used as a tool to address this problem [8].

A third instructional challenge addressed by this project is developing student understanding of event-driven computing. This is a more recent issue [19], without a long history of visualization approaches.

5 Prior Work

In the last three years, the PI has addressed each of the three instructional problems described in Section 4 through the use of visualization techniques. This work was done with support from the NSF REU program during the summers of 1997-1999. See Section 1 for a description of this support. The results of this prior work will form the basis for the present project.

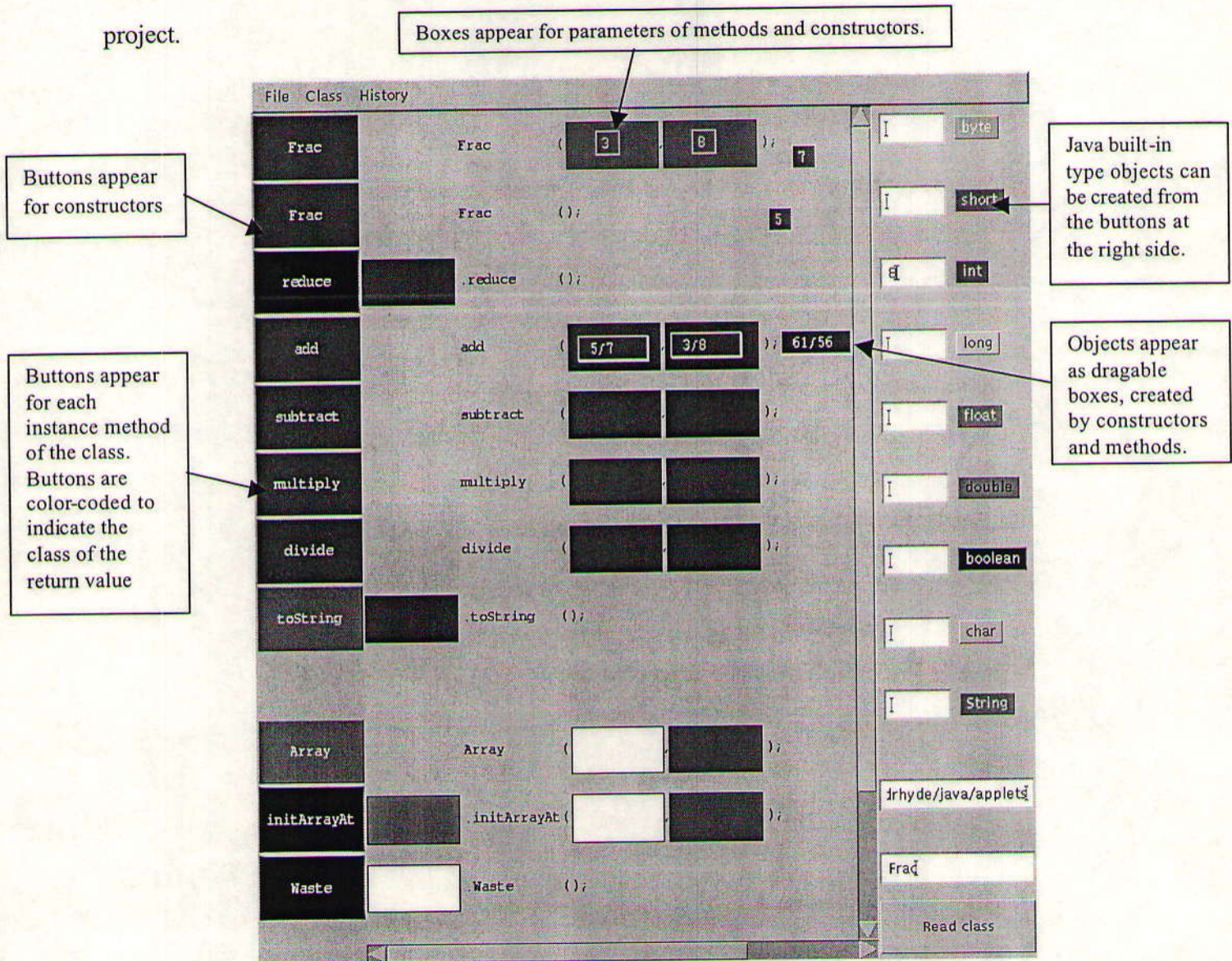


Figure 1 Sample screen from ObViz for visualizing a Fraction class

5.1 Object Visualization

The first project, developed by James Vanderhyde and the PI [5], addressed the visualization of the class/method protocol by providing the ability to view any Java class' method protocol

and activating any of its methods by dragging and dropping objects into its parameter positions and clicking on the method box. After the click, the action of the method is performed and any returned object appears in the window next to the method. A sample interaction in progress is shown in Figure 1 to illustrate the capabilities and format of ObViz, the Java software that provides this facility. ObViz needs only the Java Virtual Machine code of a class to visualize that class. This software has many capabilities that cannot be described here due to space limitations and has been used in many different course environments at Hope College and elsewhere.

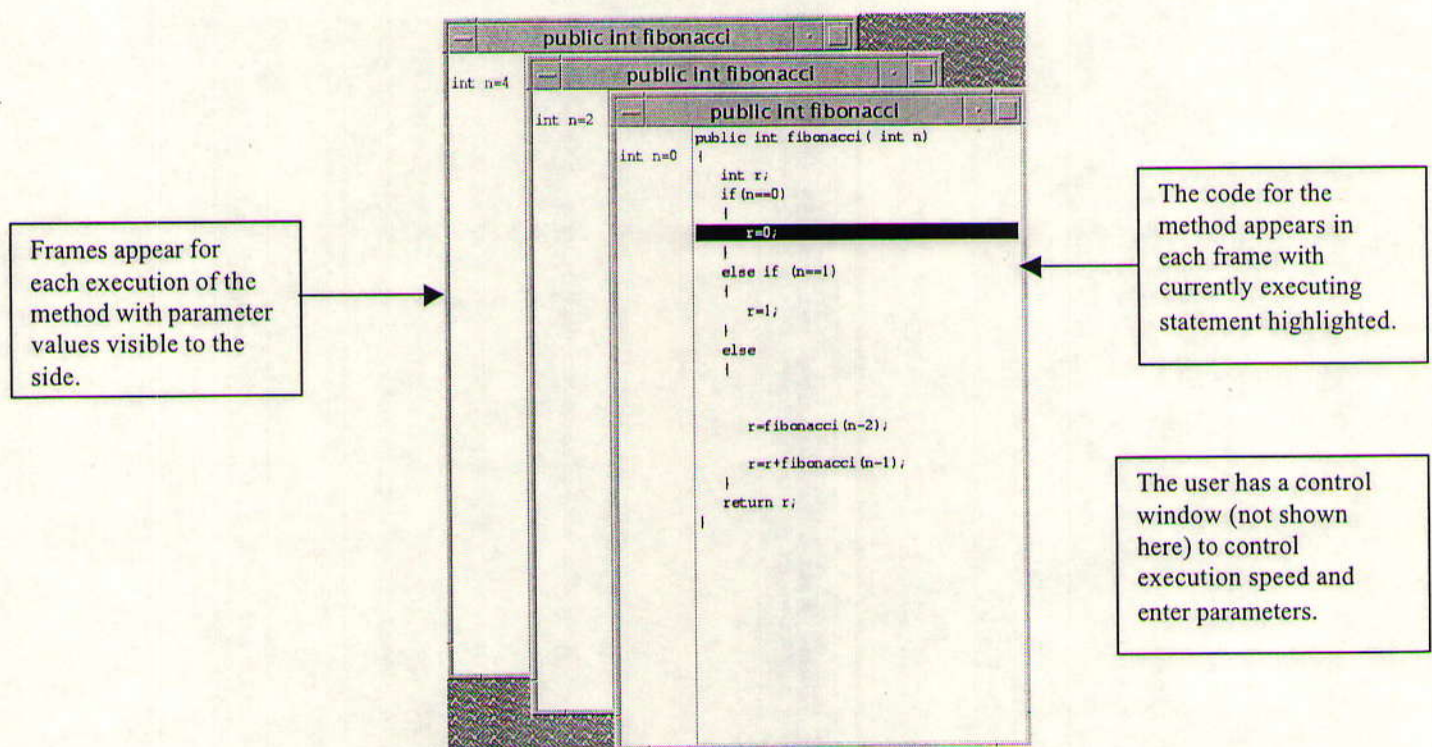


Figure 2 Function Visualizer with three recursive calls to fibonacci function

5.2 Recursion Visualization

Visualization of recursion is provided by a package called VizFun [6] developed by the PI along with undergraduates Erin Parker and Rebecca Weinhold. This package accepts as input source code for Java methods and produces a visualization for the execution of those methods. The visualization produces a frame for each method call, including recursive calls or calls on

other methods. Each method call frame contains the source code for that method with the currently executing Java statement highlighted. All active methods are visible in a stack as shown in Figure 2.

5.3 Visualization of Event-Driven Computing

A third development project resulted in AWTViz, a product that produces visualizations of Java event-driven method calls [7]. AWTViz was developed by Josiah Dykstra and Keith Suppes working with the PI. In this case, the window of AWTViz, shown in Figure 3, contains the source code of the currently executing method with an execution trace, a call stack for methods, and a history of method calls, all arranged so that the student can follow in detail the execution of methods that are called by events produced by user interaction.

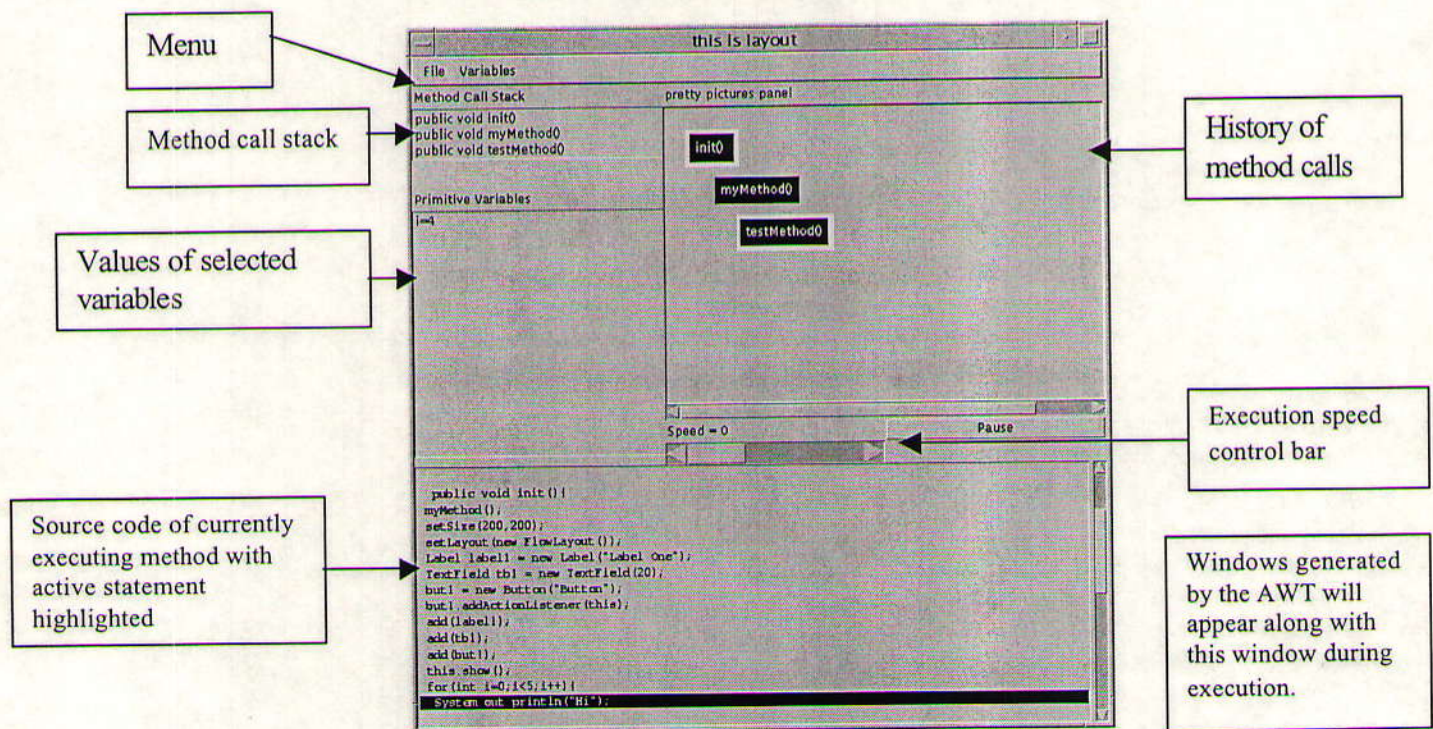


Figure 3 AWTViz visualization of Event-Driven Java

5.4 A Java Development Environment

Another software product developed under the Hope College REU program is JaDE, a Java Development Environment that permits web-hosted Java source code entry, editing, and

execution of the resulting applet. This was developed by Professor Gordon Stegink with assistance from students Jon Pater and Daron Vroon [16]. Figure 4 shows a snapshot of the JaDE environment.

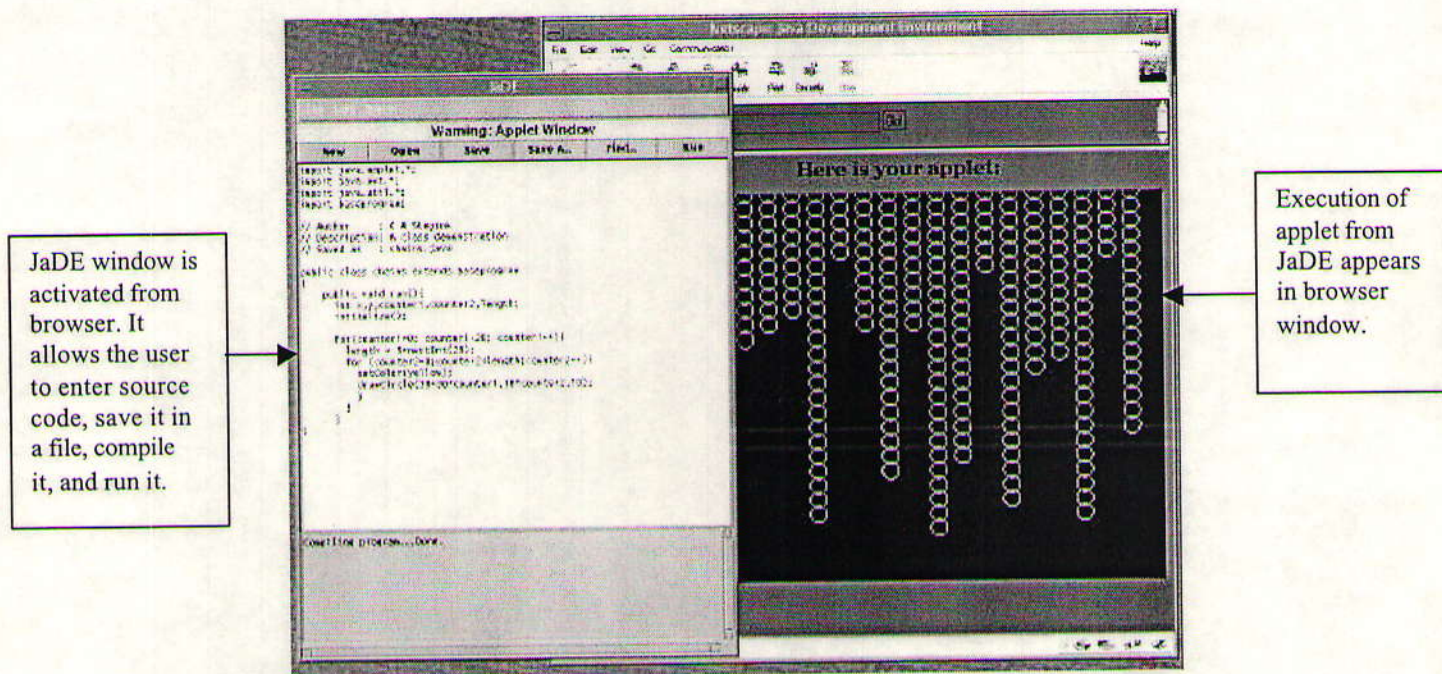


Figure 4 JaDE: a browser-based Java program development environment

5.5 Integrated Classroom and Laboratory

The setting for the classroom activities related to this project will occur in the classroom constructed with support from the NSF ILI grant described in Section 1. This classroom contains 12 Sun workstations in an arrangement that supports easy transition from lecture to discussion to laboratory activities for up to 24 students. In addition, this classroom contains projection facilities to enable the instructor to communicate effectively with students by means of the instructor's station at the front of the room. This classroom is used for all Computer Science classes at Hope College, including the one that will be the host for the study described in this proposal. Figure 5 illustrates the configuration of this classroom.

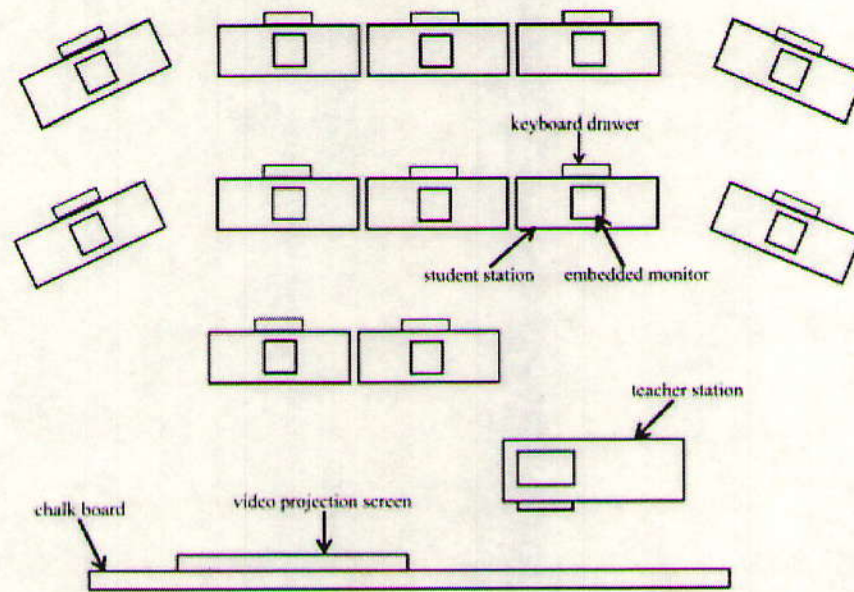


Figure 5 Computer classroom/laboratory for 24 students containing 12 student stations

6 Project Activities

The project timeline is given below:

Summer, 2001	Software implementation Course material preparation
Academic Year, 2001-2	Class testing Software and course material refinement
Summer, 2002	Preparation for dissemination Workshop design

6.1 Background – Course and Facilities

The course that will host the materials developed by this project is CSCI 225, Software Design and Implementation. It is the first Computer Science course in the Hope College curriculum, though it has as a prerequisite that the students have some prior programming experience. It is an introduction to Computer Science using the Java programming language with an objects-first approach. It also includes extensive treatment of event-driven computing through

the introduction of the Java Abstract Windows Toolkit (AWT) library classes. The course outline for CSCI 225 is given in Appendix A.

This class meets in the classroom described in Section 5.5 and meets for five fifty-minute periods per week, with that time flexibly divided into lecture, demonstration, and laboratory activities, distributed at the instructor's discretion. An estimate is that the time is divided into 30% lecture, 30% demonstration, and 40% laboratory.

6.2 Software Development

The software development process will take place during the summer of 2001. This effort will be headed by co-PI Ryan McFall, assisted by two undergraduates who will be funded by NSF REU funds or by Hope College funds. This activity will address Goal 1 in Section 3. The activities to meet the specific objects are given below:

1. Integrate previously completed software components.

The proposed activities here are

- Use ObViz as the main user interface.
- Facilitate student code-generation for visualization through the use of JaDE.
- Include optional method execution trace and visualization using VizFun when a method is activated through ObViz.
- Allow optional activation of AWTViz through ObViz
- Make all components accessible via a web browser.
- Provide a general interface that will enable the integration of future visualization components beyond those included in this project.

2. Provide a capability for logging student usage of individual components. This will generate data that will be helpful in the evaluation process by monitoring individual student activity within the software.
3. Provide an optional code-generation and playback facility for ObViz. This will record all method invocations activated by ObViz and record them as Java code that can then be “played back” at a later time by an ObViz playback component.

6.3 Course Material Preparation

Course material will be developed during the summer of 2001. This process will be directed by PI Herbert Dershem with the assistance of two students who will be funded by NSF REU funds or Hope College undergraduate research funds. This activity will address Goal 2 in Section

3. The PI has already used the previously developed components in a similar format within the CSCI 225 course. This activity will make use of the integrated software and result in materials that will eventually be suitable for dissemination. The material developed will take three forms:

1. Lecture illustrations with follow-up

This is best illustrated by an example. When introducing the concept of classes and their method protocol, a number of suitable example classes will be developed for classroom illustration within the ObViz component. The concurrent examination of Java code and its modification within JaDE will also be used in this setting. Follow-up activities will include student playback of lecture illustrations both before and after making directed modification to the code.

2. In-class laboratory exercises

These will be activities designed to be completed by pairs of students within an instructor-supervised environment. Each laboratory exercise will be presented by a web page

that will describe the activities and provide opportunity for student interaction. In addition, each laboratory exercise will make use of one or more of the visualization components.

Some laboratory exercises will be lecture illustration follow-ups and activities to familiarize students with the visualization tools. A further example of a laboratory exercise that would enhance the learning of recursion would provide the students with a faulty recursive method and lead them through discovery of the error by using VizFun. The exercise would then direct the students through making corrections within JaDE and verifying its correctness. This process could be repeated for a number of different recursive methods.

3. Out-of-class Activities

A final type of learning activity is that designed to be completed by the student outside of the classroom setting. Such activities would be similar to in-class laboratory exercises, and in fact, in-class labs are frequently completed as out-of-class homework. But additional activities will be designed especially for out-of-class learning reinforcement. These activities could be either optional or required. An example of such an activity is an assignment to create a class including its user interface. In addition to directing the students to use AWTViz in the construction of the interface, the students would be asked to test their class with ObViz, recording the test and submitting the generated source code to the instructor. Another out-of-class activity is to have students exchange student-written classes for black box testing within ObViz.

6.4 Class Testing and Material Refinement

During the Fall Semester of 2001, the PI will teach a section of CSCI 225 using the materials developed during the preceding summer. He will refine and improve both the course

materials and the software with assistance from the Co-PI. The PI will have one-fourth release time during this semester, provided as an institutional contribution, to work on this project. Data for evaluating the materials will also be collected during the semester.

The co-PI will teach a section of CSCI 225 during the Spring, 2002 semester, again refining and improving the course materials and software. The co-PI will have one-fourth release time for working on this project, provided as an institutional contribution, and will be assisted by the PI. Evaluation data will also be collected during the spring semester offering.

6.5 Preparation for Dissemination

The PI and Co-PI will put all of the software and course materials in final form during the summer of 2002. This will include preparation of all of the products mentioned in the Evaluation Plan (Section 9) and the design and preparation of materials for the workshop described in the same section.

7 Facilities and Resources

All resources needed to complete this project are presently available in the Hope College Computer Science Department. These facilities include 26 Sun workstations and 3 PCs. These machines are organized in three areas: the classroom described in Section 5.5 and two laboratories that provide both a general computing facility supporting all class activities and an area tailored for the experimentation needs of upper level classes. Because of a wide range of uses, each area is equipped with a rich set of software development environments and machine configurations that support our curricular offerings.

8 Experience and Capabilities of the Principal Investigators

The Principal Investigator, Herbert Dershem, is a Professor of Computer Science and chair of the Department at Hope College. He has been a faculty member at Hope for 31 years. Dr.

Dershem has been active in course development and the use of visualization in teaching Computer Science, receiving grants and publishing papers in these areas. He is the primary instructor for the course that is targeted by this proposal.

The Co-Principal Investigator, Ryan McFall, has been involved in curriculum and course development at both Michigan State University and Hope College. At Michigan State he was part of a team that designed the course CPS 100, "Computing Concepts and Competencies," a large enrollment, non-major course that combines lab-based problem solving instruction with modified mastery-learning [17]. In addition, Professor McFall was a co-designer of a web-based lab-intensive introduction to Computer Science for general education students at Hope College using Java and graphics [15]. As an undergraduate, he worked on an instructional visualization project under the direction of the PI [14].

McFall will also bring expertise in web development technologies to the project. His doctoral dissertation works on automatic detection and repair of broken links in distributed information systems such as the World Wide Web.

9 Evaluation and Assessment

Data will be collected from students in two ways to assess the materials developed for this project. Student survey data will be collected immediately after each activity and students will be given a survey to determine their overall assessment of the materials at the end of the course. These survey instruments will be kept brief and will be completed on-line as a part of the student assignments. They will be designed and analyzed with advice from the Hope College Frost Center for Social Science Research.

In addition, data will be collected through the logging features of the software. This data will measure the amount of usage of the various components by each student. Again, we will consult

with the Frost Center to assist in the design of the data collection instruments and in their analysis.

Finally, we will employ a panel of outside reviewers to evaluate the materials at the end of the summer of 2001. This panel will include Professors Alyce Brady from Kalamazoo College, Myles McNally from Alma College, Gary Lewandowski from Xavier University in Ohio, and Dave Berque from DePauw University.

10 Dissemination of Results

This project will result in two products that will be disseminated: software and course materials. The software along with illustrative documentation will be made available for downloading on the internet, as will all course materials.

We expect to publish a paper on the results of this project that will detail the methods and results. This paper will be submitted to the ACM SIGCSE Technical Symposium. We will also provide a complete introduction to the materials and our results on the World Wide Web. This web presence will also serve as a gateway to downloading the materials. Also included here will be the capability for users of the material to submit materials of their own as well as suggestions and criticisms. We expect that this will include materials that use the software in other course settings. This web presence will be used to communicate future upgrades and improvements to the software and course material.

We will also prepare a workshop for introducing Computer Science faculty to the software and its use in their classes. This will be a four-hour workshop and will result in the participants designing activities for their own classes using the software. This workshop will be proposed for presentation at the SIGCSE Symposium and at the regional conferences of the Consortium for Computing in Small Colleges.

Appendix A

Course Outline for CSCI 225—Software Design and Implementation

1. Background (1 week)
 - Evolution of Programming
 - Internet and World Wide Web
 - Java – an Overview
2. Applets (1 week)
 - The Applet Class
 - Java Methods
 - Graphical Programming
3. Graphical User Interfaces (1 week)
 - Components
 - Textual Widgets
 - Active Widgets
4. Visual Design (1 week)
 - Containers
 - Layouts
 - High-level containers
5. Java Language (2 weeks)
 - Types
 - Identifiers
 - Operators
 - Statements
 - Conditionals
 - Events and Event Handling
6. Object-Oriented Problem Solving (1 week)
 - Design
 - Class determination
 - Method determination
7. Collections (2 weeks)
 - Loops
 - Arrays
 - Sorting
 - Strings
8. Exceptions and Input/Output (2 weeks)
 - Exception Conditions
 - Exception Handlers
 - Streams
 - Files
9. Threads (1 week)
 - Threaded Execution
 - Synchronizing Threads
 - Applets in Cyberspace
10. Applets for the web (1 week)
 - Images and Sounds
 - Animations

References Cited

- [1] Boroni, C.M., et al, "A Paradigm Shift! The Internet, the Web, Browsers, Java, and the Future of Computer Science Education," *SIGCSE Bulletin*, 20,1 (Mar 1998), 145-152.
- [2] Carlson, D., et al, "WWW Interactive Learning Environments for Computer Science Education," *SIGCSE Bulletin*, 28,1 (Mar 1996), 290-294.
- [3] Daigle, R.J., et al, "Integrating Collaborative Problem Solving Throughout the Curriculum," *SIGCSE Bulletin*, 28,1 (Mar 1996), 237-241.
- [4] Denning, P.J., et al, "Computing as a Discipline," *Communications of the ACM*, 32, 1 (Jan 1989), 9-23.
- [5] Dershem, H.L. and J. Vanderhyde, "Java Class Visualization for Teaching Object-Oriented Concepts," *SIGCSE Bulletin*, 30,1 (Mar 1998), 53-57.
- [6] Dershem, H.L., Parker, D.E., and R. Weinhold, "A Java Function Visualizer," *Journal of Computing in Small Colleges*, 15,1 (Oct 1999), 222-230.
- [7] Dykstra, J., Suppes, K., and H.L. Dershem, "An Abstract Window Toolkit Visualizer for Computer Science Instruction," *Proceedings of the 33rd Midwest Instruction and Computing Symposium, (CD-ROM)*, Apr 14-15, 2000, Minneapolis, MN.
- [8] George, C.E., "EROSI – Visualising Recursion and Discovering New Errors," *SIGCSE Bulletin*, 32,1 (Mar 2000), 305-309.
- [9] Kölling, M., "The Problem of Teaching Object-Oriented Programming: Part I: Languages," *Journal of Object-Oriented Programming*, 11,8 (Jan 1999), 8-15.
- [10] Kölling, M., "The Problem of Teaching Object-Oriented Programming: Part II: Environments," *Journal of Object-Oriented Programming*, 11,9 (Feb 1999), 6-12.
- [11] Kölling, M., "Teaching Object Orientation with the Blue Environment," *Journal of Object-Oriented Programming*, 12,2 (May 1999), 14-23.
- [12] Kölling, M. and J. Rosenberg, "Objects First with Java and BlueJ," *SIGCSE Bulletin*, 32,1 (Mar 2000), 429.
- [13] Leron, U., "What Makes Recursion Hard," *Proceedings of the Sixth International Congress on Mathematics Education*, Budapest, Hungary (1988).
- [14] McFall, R. and H.L. Dershem, "Finite State Machine Simulation in an Introductory Lab," *SIGCSE Bulletin*, 26,1 (Mar 1994), 126-130.
- [15] McFall, R. and G.A. Stegink, "Introductory Computer Science for General Education Laboratories, Textbooks, and the Internet," *SIGCSE Bulletin*, 29,1 (Mar 1997), 96-100.
- [16] Stegink, G.A., Pater, J., and D. Vroon, "Computer Science and General Education: Java, Graphics, and the Web," *SIGCSE Bulletin*, 31,1 (Mar 1999), 146-149.
- [17] Urban-Lurain, M. and D.J. Weinshank, "I Do and I Understand: Mastery Model Learning for a Large Non-Major Course," *SIGCSE Bulletin*, 31,1 (Mar 1999), 150-154.
- [18] Walker, H.M., "Collaborative Learning: A Case Study for CS1 at Grinnell College and UT-Austin," *SIGCSE Bulletin*, 29,1 (Mar 1997), 207-213.
- [19] Woodworth, P. and W. Darm, "Integrating Console and Event-Driven Models in CS1," *SIGCSE Bulletin*, 29,1 (Mar 1999), 132-135.
- [20] Wu, C., Dale, N.B., and L.J. Bethel, "Conceptual Models in Cognitive Learning Styles in Teaching Recursion," *SIGCSE Bulletin*, 28,1 (Mar 1998), 292-295.

BIOGRAPHICAL SKETCH

No Bio Data Provided

Biographical Sketches

Principal Investigator: Herbert L. Dershem

Education:

B.S. University of Dayton, 1965
M.S. (Computer Science) Purdue University, 1967
Ph.D. (Computer Science) Purdue University, 1969

Professional Experience:

Hope College, Assistant Professor, 1969-1974, Associate Professor, 1974-1981,
Professor, 1981-present, chair of Computer Science Department, 1975-present.
Oak Ridge National Laboratories, Visiting Research Scientist, 1977-1978.
Boston University Overseas Program, Visiting Professor, 1982-1983.
United States Air Force Academy, Distinguished Visiting Professor, 1993-1994.

Publications (last six years):

Dykstra, J., Dershem, H.L., and K. Suppes, "An Abstract Window Toolkit Visualizer for
Computer Science Instruction," *Proceedings of the 33rd Midwest Instruction and Computing
Symposium (CD-ROM)*, April 14-15, 2000, Minneapolis, MN.
Dershem, H.L., Parker, D.E., and R. Weinhold, "A Java Function Visualizer," *Journal of
Computing in Small Colleges*, 15,1(Oct 1999), 221-230.
Dershem, H.L. and J. Vanderhyde, "Java Class Visualization for Teaching Object-Oriented
Concepts," *SIGCSE Bulletin*, 30,1(Mar 1998), 53-57.
Dershem, H.L. and P. Brummund, "Tools for Web-Based Sorting Animation," *SIGCSE Bulletin*,
30,1(Mar 1998), ??
Dershem, H.L., Barth, W., Bowsher, C., and D. Brown, "Data Structures with Ada Packages,
Laboratories, and Animations," *Proceedings of the First Australasian Conference on
Computer Science Education*, July, 1996, 32-38.
Dershem, H.L. and M.J. Jipping, *Programming Languages: Models and Structures: Second
Edition*, PWS Publishing Co., 1995.
McFall, R. and Dershem, "Finite State Machine Simulation in an Introductory Lab," *SIGCSE
Bulletin*, 26,1(Mar 1994), 126-140.

Research Grant Awards:

Co-director, "Introduction of the Computer in the Statistics Curriculum," NSF Office of
Computing Activities, 1971-1973, \$45,800.
Director, "A Modular Approach to the Introductory Course in Computer Science," NSF Local
Course Improvement Program, 1978-1980, \$14,200.
Co_Director, "A Microcomputer Laboratory for use in Teaching Statistics," NSF Instructional
Scientific Equipment Program, 1979-1980, \$10,315.
Director, "CSNET Membership in Support of Computer Science Research," NSF RUI Program,
1987-1990, \$9,375.
Director, "Computer Science Undergraduate Research Program," NSF REU Program, 1992-
1994, \$86,550; 1995-1997, \$114,393; 1998-2000, \$146,700.

Director, "Use of Ada, Laboratories, and Visualization in the Teaching of Data Structures and Discrete Mathematics," DARPA Curriculum Development Grant, 1993-1994, \$23,010.

Director, "Curriculum and Textbook Development Using Ada 9X for the Teaching of Object-Oriented Concepts," US Air Force Contract, 1995-1996, \$34,464.

Co-Director, "An Integrated Classroom/Laboratory for Introducing Students to Object-Oriented Concepts," NSF ILI Program, 1996-1998, \$46,356.

Collaboration:

A list of collaborators over the last 48 months includes: Michael Jipping, Gordon Stegink, Ryan McFall

Biographical Sketches

Co-Principal Investigator: Ryan L. McFall

Education:

B.S. Hope College, 1993

M.S. (Computer Science) Michigan State University, 1995

Ph.D. (Computer Science) Michigan State University, 2000 (expected)

Professional Experience:

Hope College, Visiting Instructor, 1995-1996, Assistant Professor, starting Fall 2000.

Publications (last six years):

McFall, R. and G. Stegink, "Introductory Computer Science for General Education:

Laboratories, Textbooks, and the Internet," *SIGCSE Bulletin*, 29,1(Mar 1997), 96-100.

McFall, R. and Dershem, "Finite State Machine Simulation in an Introductory Lab," *SIGCSE Bulletin*, 26,1(Mar 1994), 126-140.

Collaboration:

A list of collaborators over the last 48 months includes: Herbert Dershem, Matt Mutka, and Gordon Stegink.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Hope College				FOR NSF USE ONLY	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Herbert L Dershem				PROPOSAL NO.	DURATION (months)
				AWARD NO.	
				NSF Funded Person-mos.	Funds Requested By proposer
				CAL	ACAD
				SUMR	Funds granted by NSF (if different)
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)					
1. Herbert L Dershem - PI				0.00	0.00
2. Ryan McFall - none				0.00	0.00
3.					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES				0.00	0.00
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (0) OTHER					
TOTAL SALARIES AND WAGES (A + B)					20,900
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					3,793
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					24,693
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)					
TOTAL EQUIPMENT					0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0
2. FOREIGN					0
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS \$ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0
3. CONSULTANT SERVICES					1,000
4. COMPUTER SERVICES					0
5. SUBAWARDS					0
6. OTHER					0
TOTAL OTHER DIRECT COSTS					1,000
H. TOTAL DIRECT COSTS (A THROUGH G)					25,693
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) % of MTDC (Rate: 33.0000, Base: 20900)					
TOTAL INDIRECT COSTS (F&A)					6,897
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					32,590
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)					0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 32,590 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$	
PI / PD TYPED NAME & SIGNATURE*				DATE	
Herbert L Dershem					
ORG. REP. TYPED NAME & SIGNATURE*				DATE	
				FOR NSF USE ONLY	
				INDIRECT COST RATE VERIFICATION	
				Date Checked	Initials - ORG
				Date Of Rate Sheet	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** C- Fringe Benefits**

Fringes are computed as 10.5% salaries for retirement benefits

8.65% of salaries for FICA and Medicare

**** I- Indirect Costs**

Indirect costs are based on 33% of MTDC.

Hope College negotiated rate is 52.5%.

19.5% is college contribution

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Hope College				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Herbert L Dershem				PROPOSAL NO.		DURATION (months)	
				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-mos.		Funds Requested By proposer	
	CAL	ACAD	SUMR			Funds granted by NSF (if different)	
1. Herbert L Dershem - PI	0.00	0.00	2.00	\$ 17,000			
2. Ryan McFail - none	0.00	0.00	2.00	9,600			
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0			
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	4.00	26,600			
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0			
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0			
3. (0) GRADUATE STUDENTS				0			
4. (0) UNDERGRADUATE STUDENTS				0			
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0			
6. (0) OTHER				0			
TOTAL SALARIES AND WAGES (A + B)				26,600			
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				4,828			
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT				0			
E. TRAVEL	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)			1,500			
	2. FOREIGN			0			
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$	0						
2. TRAVEL	0						
3. SUBSISTENCE	0						
4. OTHER	0						
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS		0	
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES				0			
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0			
3. CONSULTANT SERVICES				0			
4. COMPUTER SERVICES				0			
5. SUBAWARDS				0			
6. OTHER				0			
TOTAL OTHER DIRECT COSTS				0			
H. TOTAL DIRECT COSTS (A THROUGH G)				32,928			
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) % of MTDC (Rate: 33.0000, Base: 26600)							
TOTAL INDIRECT COSTS (F&A)				8,778			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				41,706			
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)				0			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$ 41,706		\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI / PD TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY	
Herbert L Dershem						INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE*				DATE		Date Checked	Date Of Rate Sheet
						Initials - ORG	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

**** E- Travel**

Travel to present workshops

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION Hope College				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Herbert L Dershem				AWARD NO.	Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-mos.	Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR
1. Herbert L Dershem - PI				0.00	0.00	4.00 \$ 33,300 \$
2. Ryan McFall - none				0.00	0.00	3.00 14,200
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00 0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	7.00 47,500
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES				0.00	0.00	0.00 0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00 0
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						47,500
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						8,621
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						56,121
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						1,500
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ 0						0
2. TRAVEL 0						0
3. SUBSISTENCE 0						0
4. OTHER 0						0
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						1,000
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						1,000
H. TOTAL DIRECT COSTS (A THROUGH G)						58,621
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						15,675
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						74,296
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.i.)						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 74,296 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI / PD TYPED NAME & SIGNATURE*				DATE	FOR NSF USE ONLY	
Herbert L Dershem					INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE*				DATE	Date Checked	Initials - ORG

Budget Justification

A1. Salary for Senior Personnel

Each summer, the PI and the Co-PI will be funded for two months. The budget reflects 2/9 of their annual salary with the salary for 2001-2 based on a 4% estimated increase over their 2000-1 salaries. One month of the Co-Pi's salary for the summer of 2001 will be paid by Hope College as a contribution to this project. In addition, the college will contribute the 1/4 release time each semester. See the summary of college contributions below.

B. Fringe Benefits

Calculated at 10.5% contribution to retirement and 8.65% contribution to FICA and MQFE.

E. Travel

\$1,500 has been budgeted for the PI and Co-PI to travel to a conference to present their work on this project.

G3. Consultant Services

Four consulting faculty will be paid stipends of \$250 each for their assistance with the evaluation part of this project.

Hope College Contributions

One month salary for Co-PI, summer 2001	\$4,600
Release time for PI, Fall 2001 semester	
1/8 of academic year salary	\$9,500
Release time for Co-PI, Spring 2002 semester	
1/8 of academic year salary	\$5,400
Student assistants, Summer 2001	
4 @ \$3,000	\$12,000
Travel for PI and Co-PI provided by Hope College	\$1,500
19.5% of Hope College negotiated indirect cost not charged (52.5% is negotiated rate.	\$9,263
Total Hope College Contribution	\$42,263

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Herbert Dershem	Other agencies (including NSF) to which this proposal has been/will be submitted.
--------------------------------------	---

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **REU: Computer Science Research Experience for Undergraduates**

Source of Support: **NSF-REU**

Total Award Amount: \$ **146,700** Total Award Period Covered: **02/15/98 - 01/31/01**

Location of Project: **Hope College, Holland, MI**

Person-Months Per Year Committed to the Project. Cal: Acad: **1.00** Sumr: **1.00**

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **An Object-Oriented Execution Visualization Environment for Learning Introductory Computer Science**

Source of Support: **NSF-CCLI**

Total Award Amount: \$ **74,937** Total Award Period Covered: **05/01/01 - 04/30/03**

Location of Project: **Hope College, Holland, MI**

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: **2.00**

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: \$ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: \$ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: \$ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

User: dershem
Host: beorn
Class: beorn
Job: /tmp/Acro_Daygc

**INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and
co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS**

Submit only ONE copy of this form for each PI/PD and co-PI/PD identified on the proposal. The form(s) should be attached to the original proposal as specified in GPG Section II.B. Submission of this information is voluntary and is not a precondition of award. This information will not be disclosed to external peer reviewers. **DO NOT INCLUDE THIS FORM WITH ANY OF THE OTHER COPIES OF YOUR PROPOSAL AS THIS MAY COMPROMISE THE CONFIDENTIALITY OF THE INFORMATION.**

PI/PD Name: Herbert L Dershem

Gender:

☒ Male ☐ Female

Ethnicity: (Choose one response)

☐ Hispanic or Latino ☐ Not Hispanic or Latino

Race:

(Select one or more)

☐ American Indian or Alaska Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian or Other Pacific Islander
☒ White

Disability Status:

(Select one or more)

☐ Hearing Impairment
☐ Visual Impairment
☐ Mobility/Orthopedic Impairment
☐ Other
☒ None

Citizenship: (Choose one)

☒ U.S. Citizen ☐ Permanent Resident ☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☒

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☒

Ethnicity Definition:

Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.

Race Definitions:

American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.

Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Black or African American. A person having origins in any of the black racial groups of Africa.

Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

WHY THIS INFORMATION IS BEING REQUESTED:

The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity, or disability of its proposed PIs/PDs. To gather information needed for this important task, the proposer should submit a single copy of this form for each identified PI/PD with each proposal. Submission of the requested information is voluntary and will not affect the organization's eligibility for an award. However, information not submitted will seriously undermine the statistical validity, and therefore the usefulness, of information received from others. Any individual not wishing to submit some or all the information should check the box provided for this purpose. (The exceptions are the PI/PD name and the information about prior Federal support, the last question above.)

Collection of this information is authorized by the NSF Act of 1950, as amended, 42 U.S.C. 1861, et seq. Demographic data allows NSF to gauge whether our programs and other opportunities in science and technology are fairly reaching and benefiting everyone regardless of demographic category; to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational opportunities; and to assess involvement of international investigators in work supported by NSF. The information may be disclosed to government contractors, experts, volunteers and researchers to complete assigned work; and to other government agencies in order to coordinate and assess programs. The information may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records", 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records", 63 Federal Register 268 (January 5, 1998).

**INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and
co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS**

Submit only ONE copy of this form for each PI/PD and co-PI/PD identified on the proposal. The form(s) should be attached to the original proposal as specified in GPG Section II.B. Submission of this information is voluntary and is not a precondition of award. This information will not be disclosed to external peer reviewers. **DO NOT INCLUDE THIS FORM WITH ANY OF THE OTHER COPIES OF YOUR PROPOSAL AS THIS MAY COMPROMISE THE CONFIDENTIALITY OF THE INFORMATION.**

PI/PD Name: Ryan McFall

Gender:

☐ Male ☐ Female

Ethnicity: (Choose one response)

☐ Hispanic or Latino ☐ Not Hispanic or Latino

Race:

(Select one or more)

☐ American Indian or Alaska Native

☐ Asian

☐ Black or African American

☐ Native Hawaiian or Other Pacific Islander

☐ White

Disability Status:

(Select one or more)

☐ Hearing Impairment

☐ Visual Impairment

☐ Mobility/Orthopedic Impairment

☐ Other

☐ None

Citizenship: (Choose one)

☐ U.S. Citizen

☐ Permanent Resident

☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☒

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☐

Ethnicity Definition:

Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.

Race Definitions:

American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.

Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Black or African American. A person having origins in any of the black racial groups of Africa.

Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

WHY THIS INFORMATION IS BEING REQUESTED:

The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity, or disability of its proposed PIs/PDs. To gather information needed for this important task, the proposer should submit a single copy of this form for each identified PI/PD with each proposal. Submission of the requested information is voluntary and will not affect the organization's eligibility for an award. However, information not submitted will seriously undermine the statistical validity, and therefore the usefulness, of information received from others. Any individual not wishing to submit some or all the information should check the box provided for this purpose. (The exceptions are the PI/PD name and the information about prior Federal support, the last question above.)

Collection of this information is authorized by the NSF Act of 1950, as amended, 42 U.S.C. 1861, et seq. Demographic data allows NSF to gauge whether our programs and other opportunities in science and technology are fairly reaching and benefiting everyone regardless of demographic category; to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational opportunities; and to assess involvement of international investigators in work supported by NSF. The information may be disclosed to government contractors, experts, volunteers and researchers to complete assigned work; and to other government agencies in order to coordinate and assess programs. The information may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records", 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records", 63 Federal Register 268 (January 5, 1998).

NATIONAL SCIENCE FOUNDATION

4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

**DIRECTORATE FOR EDUCATION
AND HUMAN RESOURCES**

Division of Undergraduate Education (DUE)

OCT 18 2000

Dr. Herbert L. Dershem
Department of Computer Science
Hope College
27 Graves Place
Holland, MI 49422-9000

Re: DUE - 0088407

Dear Dr. Dershem :

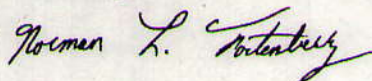
We have considered carefully the proposal that you submitted to the National Science Foundation's Course, Curriculum and Laboratory Improvement (CCLI) Program. I regret to inform you that we are not able to provide support for your proposed project.

The Foundation's decisions regarding project support are based primarily on the perceived scientific and educational merit of the proposals. The advice we solicit and receive from the reviewers enters heavily into our decisions.

Verbatim (but anonymous) copies of the reviews received for your proposal are enclosed. The comments of the reviewers and staff judgment serve as the basis for our decision. Please understand that individual reviewer comments do not necessarily reflect the Foundation's policy or position.

We are grateful for your interest in improving undergraduate education and appreciate your effort in preparing and submitting a proposal. I hope the enclosed information and the reviews explain the reasons for the Foundation's actions, but, if not, please contact the Program Officer who managed the review of your proposal at (703) 292-8666.

Sincerely,



Norman L. Fortenberry
Division Director

Enclosures

Copy to: Business Officer or President
Hope College
P.O. Box 9000
Holland, MI 49422--900

NATIONAL SCIENCE FOUNDATION

4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

DIRECTORATE FOR EDUCATION
AND HUMAN RESOURCES

Division of Undergraduate Education (DUE)

Dr. Herbert L. Dershem
Department of Computer Science
Hope College
27 Graves Place
Holland, MI 49422-9000

Re: DUE - 0088407

Dear Dr. Dershem :

As indicated in Dr. Fortenberry's letter, enclosed are the reviews of your Course, Curriculum and Laboratory Improvement (CCLI) proposal. These reviews were written by faculty and other professionals from the scientific community interested in the improvement of undergraduate education, and they were a major factor in determining that your proposal could not be funded within the budget for CCLI. A written summary of the discussion by the panel also is enclosed.

Firstly, congratulations on a well-written proposal. The reviewers and I very much appreciate the quality of your writing. However, the reviewers found two areas of major concern with this proposal with which I concur: all major components of the project already exist, having been developed with NSF REU support, and no substantive evaluation of these components has taken place in the context of enhanced student learning. The proposal does not address why your approach is superior to several other similar efforts. In order to make this case, you must evaluate your current software products in terms of student learning. I suggest that your appropriate next step should be to evaluate the materials that you have already developed, in terms of student learning not simple utility, and then, if the evaluation is positive, to develop an EMD-Full proposal for review in a future CCLI round.

We appreciate your efforts on behalf of undergraduate education.

Sincerely,



Andrew P Bernat
Program Director
Division of Undergraduate Education

NATIONAL SCIENCE FOUNDATION
Arlington, VA 22230

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES

Division of Undergraduate Education

Course, Curriculum, and Laboratory Improvement (CCLI)

General Information for Applicants, FY 2001

The CCLI program received 1041 proposals requesting \$170 million by the deadline of June 6, 2000. It is anticipated that \$40 million will be available for these projects and that these funds will permit approximately 300 proposals to be supported in the CCLI program. More specifically, 427 proposals were submitted to the Educational Materials Development (EMD) track, 592 to Adaptation and Implementation (A&I), and 22 to National Dissemination (ND). The program expects to make about 100 EMD awards, 200 A&I awards, and 5 ND awards.

Each proposal was considered by a panel of reviewers, each of whom received a copy of all proposals to be reviewed by that panel. Each panel member read and wrote reviews of the proposals and then the panel convened as a group to discuss the proposals under consideration. Following these discussions, reviewers completed their individual written reviews of each proposal. The written remarks are addressed to the NSF and reflect the views of individual reviewers. In most cases, one member of the panel prepared a summary of the discussion.

Decisions about particular proposals are often very difficult, and factors other than reviewer comments and ratings enter into the decision. Comments by a reviewer must sometimes be considered in the context of other reviews by the same person. Maintaining appropriate balance among disciplines, the availability of other funding, the total amount of funds available to the program for proposals, and general foundation policies are also important decision factors.

Additional information about the decision on your proposal is provided separately. Please feel free to contact the program director if more information would be helpful. To see the awards that are made as a result of this competition, you are encouraged to consult the Division of Undergraduate Education's (DUE) Web-based *Project Information Resource System* (PIRS) at <http://www.ehr.nsf.gov/PIRWeb/Search>. This resource is intended to provide access to current information about projects funded by the NSF through the programs in DUE.

The CCLI program will operate again in FY02. A revised program solicitation and the application deadline will be available early in 2001 on DUE's Web site at <http://www.ehr.nsf.gov/EHR/DUE/>. Revised proposals are definitely welcome and will be given a *de novo* review.

PROPOSAL NO: <i>0088407</i>	INSTITUTION: <i>Hope College</i>
PRINCIPAL INVESTIGATOR: <i>Dershner, Herbert</i>	NSF PROGRAM: <i>CCLI - EMD</i>
PROPOSAL TITLE: <i>An Object-oriented Execution Visualization Environment for Learning Introd</i>	
<p style="text-align: right;"><i>C.S.</i></p> <p>*Criterion 1: What is the intellectual merit of the proposed activity?</p> <p>*Criterion 2: What are the broader impacts of the proposed activity?</p> <p>Please attach a separate sheet(s) with your evaluation of this proposal with respect to each of the above criteria per instructions on the previous page. Your specific comments on the proposal's strengths and weaknesses are critical. Do not share, copy, quote or otherwise use or disclose material from this proposal. Destroy it after you complete your review.</p> <p>Summary Statement: (Include comments on the relative importance of the two criteria in assigning your rating. Continue on an additional page, if necessary.)</p> <p style="text-align: center; font-size: 1.2em;"><i>(see attached)</i></p>	
<p>Overall Rating (check one);</p> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> <input type="checkbox"/> Excellent: <input type="checkbox"/> Very Good: <input type="checkbox"/> Good: <input type="checkbox"/> Fair: <input type="checkbox"/> Poor: </div> <div> <p>Outstanding proposal in all respects; deserves highest priority for support.</p> <p>High quality proposal in nearly all respects; should be supported if at all possible.</p> <p>A quality proposal worthy of support.</p> <p>Proposal lacking in one or more critical aspects; key issues need to be addressed.</p> <p>Proposal has serious deficiencies.</p> </div> </div>	
YOUR IDENTITY WILL BE KEPT CONFIDENTIAL	
<p>NSF keeps reviews and your identity as a reviewer of specific proposals confidential to the maximum extent possible. We will, however, send the Principal Investigator(s) a copy of this review without your name and affiliation.</p>	
<p>REVIEWER'S SIGNATURE:</p> <div style="border: 1px solid black; height: 150px; margin-top: 10px;"></div>	<p>REVIEWER'S NAME AND ADDRESS (TYPED):</p> <div style="border: 1px solid black; height: 150px; margin-top: 10px;"></div>
<p>OTHER SUGGESTED REVIEWERS (OPTIONAL)</p> <div style="border: 1px solid black; height: 150px; margin-top: 10px;"></div>	<p>FASTLANE PIN:</p> <div style="border: 1px solid black; height: 40px; margin-top: 10px;"></div>
<p>PLEASE RETURN BY:</p> <div style="border: 1px solid black; height: 40px; margin-top: 10px;"></div>	

Panel Summary

0088407

Dershem

Hope College

An Object-Oriented Execution Visualization Environment for Learning Introductory Computer Science

This EMD proposal for \$74,000 represents an extension of several previous grants to Hope College. This project consolidates previous work into a single environment to aid in student mastery of introductory computer science concepts. The goals of this project are to build a visualization environment from previously funded components; to integrate this environment into a complete course with web-based lectures, in-class activities and homework; to evaluate the environment through student surveys, student usage logs and external expert evaluations; and finally to disseminate these materials and build a "community of users." The requested funds are largely for faculty salaries. The University will provide matching funding for these costs.

Strengths:

- Very well-written proposal
- Specific goals clear
- Good that this work is based on previous work
- Visualization is a "hot" topic
- Hope College shows solid support for the proposal
- Good use of REUs
- Outside reviewers good idea
- Good modules

Concerns:

- Original challenge not reiterated, only implicit
- Evaluation and assessment is weak
- What are outside reviewers reviewing?
- How this project is significantly different from BlueJ
- No evaluation until 2002; does this mean no evaluation the first year?
- Shouldn't the beginning materials also be evaluated before full development?
- Need for 4 summer months might be excessive since materials already exist
- Not clear what the work is, given that most of the components are in place

Suggestions:

- Move this into the realm of EMD—dissemination to a larger audience
- A set of summer workshops moving project to a higher level; include more institutions; more diversity

PROPOSAL NO: 0088407	INSTITUTION: Hope College
PRINCIPAL INVESTIGATOR: Dershem, Herbert	NSF PROGRAM: CCLI - EMD
PROPOSAL TITLE: An Object-oriented Execution Visualization Environment for Learning Introd	
<p style="text-align: right;">C.S.</p> <p>*Criterion 1: What is the intellectual merit of the proposed activity?</p> <p>*Criterion 2: What are the broader impacts of the proposed activity?</p> <p>Please attach a separate sheet(s) with your evaluation of this proposal with respect to each of the above criteria per instructions on the previous page. Your specific comments on the proposal's strengths and weaknesses are critical. Do not share, copy, quote or otherwise use or disclose material from this proposal. Destroy it after you complete your review.</p> <p>Summary Statement: (Include comments on the relative importance of the two criteria in assigning your rating. Continue on an additional page, if necessary.)</p> <p style="text-align: center; font-size: 2em; margin-top: 20px;"><i>See Attached</i></p>	
<p>Overall Rating (check one);</p> <p><input type="checkbox"/> Excellent: Outstanding proposal in all respects; deserves highest priority for support.</p> <p><input type="checkbox"/> Very Good: High quality proposal in nearly all respects; should be supported if at all possible.</p> <p><input checked="" type="checkbox"/> Good: A quality proposal worthy of support.</p> <p><input type="checkbox"/> Fair: Proposal lacking in one or more critical aspects; key issues need to be addressed.</p> <p><input type="checkbox"/> Poor: Proposal has serious deficiencies.</p>	
YOUR IDENTITY WILL BE KEPT CONFIDENTIAL	
<p>NSF keeps reviews and your identity as a reviewer of specific proposals confidential to the maximum extent possible. We will, however, send the Principal Investigator(s) a copy of this review without your name and affiliation.</p>	
<p>REVIEWER'S SIGNATURE:</p>	<p>REVIEWER'S NAME AND ADDRESS (TYPED):</p>
<p>OTHER SUGGESTED REVIEWERS (OPTIONAL)</p>	
<p>FASTLANE PIN:</p>	
<p>PLEASE RETURN BY:</p>	

Proposal # 0088407

Hope College

Dershem

An Object-Oriented Execution Visualization Environment for Learning Intro. CS

Summary / Goal: The proposal describes a plan to use existing artifacts from previous NSF grants to develop software and course materials to support using visualization as a learning tool for OOD in an introductory CS course.

Strengths:

- Goals are very clearly stated.
- Reuse of current materials / extension of prior work.
- College shows obvious support for the work.
- PI and Co-PI have the background to support the proposal.
- Current NSF grant will expire before this proposal would begin so there would be no time conflict.
- Panel of outside reviewers should give objective review.

Concerns:

- Evaluation criteria is unclear
- How is it different from BlueJ?
- Where else is ObViz used?
- Is there a contribution to the CS Ed knowledge base here?

Dissemination Plan:

- Seems adequate

PROPOSAL NO: 0088407	INSTITUTION: Hope College
PRINCIPAL INVESTIGATOR: Dershem, Herbert	NSF PROGRAM: CCLI - EMD
PROPOSAL TITLE: An Object-oriented Execution Visualization Environment for Learning Introd	

C.S.

*Criterion 1: What is the intellectual merit of the proposed activity?

*Criterion 2: What are the broader impacts of the proposed activity?

Please attach a separate sheet(s) with your evaluation of this proposal with respect to each of the above criteria per instructions on the previous page. Your specific comments on the proposal's strengths and weaknesses are critical. Do not share, copy, quote or otherwise use or disclose material from this proposal. Destroy it after you complete your review.

Summary Statement: (Include comments on the relative importance of the two criteria in assigning your rating. Continue on an additional page, if necessary.)

SEE ATTACHED

Overall Rating (check one);

- ☐ Excellent: Outstanding proposal in all respects; deserves highest priority for support.
☐ Very Good: High quality proposal in nearly all respects; should be supported if at all possible.
☒ Good: A quality proposal worthy of support.
☐ Fair: Proposal lacking in one or more critical aspects; key issues need to be addressed.
☐ Poor: Proposal has serious deficiencies.

~~YOUR IDENTITY WILL BE KEPT CONFIDENTIAL~~

NSF keeps reviews and your identity as a reviewer of specific proposals confidential to the maximum extent possible. We will, however, send the Principal Investigator(s) a copy of this review without your name and affiliation.

REVIEWER'S
SIGNATURE:

REVIEWER'S NAME AND ADDRESS (TYPED):

OTHER SUGGESTED REVIEWERS (OPTIONAL)

FASTLANE PIN:

PLEASE RETURN BY:

NSF Proposal # 0088407
PI – Herbert L Dershem
Co-PI – Ryan L Mcfall
Hope College

**An Object-Oriented Execution Visualization Environment for Learning
Introductory Computer Science**

Intellectual Merit

This does address a major challenge in CS education.
It does build off of previous research.
The evaluation process is lacking in details.
First goal is to put together previous work? Don't we all do this?
Second goal is to put it in new environment? Don't we all do this?
Third goal to evaluate it, but are you evaluating effectiveness or only utility?
Outside evaluations appears nice, but what are they reviewing? Only the material, what about the outcomes or topics, etc..
Fourth goal to disseminate?
The target audience, pedagogy, and lit review seems good. I only question where it would go from here?
Adequate university support? Hope College has some matching funds which some proposals did not have as much.

Breadth of Impact

Enhancing student learning is the goal and as such it must be measured.
Without this it will be of little use to other institutions.
100 students and two faculty? How can we get more bang?
Not sure where it would go from the end of the proposal.
Not enough faculty appear to be involved.
Does not address common themes of NSF DUE.

Conclusions

Well written proposal. Seems like going to the NSF money machine too many times without getting some support from elsewhere for research.

Rating

Good with major additions to proposal, fair as currently written.

PROPOSAL NO: <i>0088407</i>	INSTITUTION: <i>Hope College</i>
PRINCIPAL INVESTIGATOR: <i>Dershem, Herbert</i>	NSF PROGRAM: <i>CCLI - EMD</i>
PROPOSAL TITLE: <i>An Object-oriented Execution Visualization Environment for Learning Introd</i> <i>C.S.</i>	

*Criterion 1: What is the intellectual merit of the proposed activity?

*Criterion 2: What are the broader impacts of the proposed activity?

Please attach a separate sheet(s) with your evaluation of this proposal with respect to each of the above criteria per instructions on the previous page. Your specific comments on the proposal's strengths and weaknesses are critical. Do not share, copy, quote or otherwise use or disclose material from this proposal. Destroy it after you complete your review.

Summary Statement: (Include comments on the relative importance of the two criteria in assigning your rating. Continue on an additional page, if necessary.)

See attached

Overall Rating (check one);

<input type="checkbox"/> Excellent:	Outstanding proposal in all respects; deserves highest priority for support.
<input checked="" type="checkbox"/> Very Good:	High quality proposal in nearly all respects; should be supported if at all possible.
<input type="checkbox"/> Good:	A quality proposal worthy of support.
<input type="checkbox"/> Fair:	Proposal lacking in one or more critical aspects; key issues need to be addressed.
<input type="checkbox"/> Poor:	Proposal has serious deficiencies.

YOUR IDENTITY WILL BE KEPT CONFIDENTIAL

NSF keeps reviews and your identity as a reviewer of specific proposals confidential to the maximum extent possible. We will, however, send the Principal Investigator(s) a copy of this review without your name and affiliation.

REVIEWER'S SIGNATURE:

REVIEWER'S NAME AND ADDRESS (TYPED):

OTHER SUGGESTED REVIEWERS (OPTIONAL)

FASTLANE PIN:

PLEASE RETURN BY:

Proposal Number: 0088407
PI: Herbert Dershem
Hope College

The project aims to build an environment for visualizing program execution in support of student learning, use these materials in an introductory Java-based computer science course, evaluate the impact of this, and disseminate the materials.

The PI's are qualified and have had successful NSF research in the past. Some of the components of the proposed system are already in place from this research.

The choice of classes and methods in object-oriented programming, recursion, and event-driven programming as the three instructional topics to focus on was a good choice that came out of previous work. Including lecture illustrations, and both in-class and out-of-class activities was also a good idea.

An evaluation plan involving student survey data and monitoring usage of the software is provided. A plan to evaluate student learning is not included. Having a panel of outside reviewers was a good idea. Perhaps the panel could be involved in designing assessment materials to evaluate student learning.

A dissemination plan is included. Giving a workshop allowing participants to use the materials to design activities for their own students was a particularly good method of dissemination.

This has the potential to be a very good use of technology in support of programming instruction.

PROPOSAL NO: <i>0088407</i>	INSTITUTION: <i>Hope College</i>
PRINCIPAL INVESTIGATOR: <i>Dershner, Herbert</i>	NSF PROGRAM: <i>CCLI - EMD</i>
PROPOSAL TITLE: <i>An Object-oriented Execution Visualization Environment for Learning Introd</i>	
<p style="text-align: right;"><i>C.S.</i></p> <p>*Criterion 1: What is the intellectual merit of the proposed activity?</p> <p>*Criterion 2: What are the broader impacts of the proposed activity?</p> <p>Please attach a separate sheet(s) with your evaluation of this proposal with respect to each of the above criteria per instructions on the previous page. Your specific comments on the proposal's strengths and weaknesses are critical. Do not share, copy, quote or otherwise use or disclose material from this proposal. Destroy it after you complete your review.</p> <p>Summary Statement: (Include comments on the relative importance of the two criteria in assigning your rating. Continue on an additional page, if necessary.)</p> <p style="text-align: center; font-size: 1.5em; margin-top: 20px;"><i>See attached</i></p>	
<p>Overall Rating (check one);</p> <p><input type="checkbox"/> Excellent: Outstanding proposal in all respects; deserves highest priority for support.</p> <p><input type="checkbox"/> Very Good: High quality proposal in nearly all respects; should be supported if at all possible.</p> <p><input checked="" type="checkbox"/> Good: A quality proposal worthy of support.</p> <p><input type="checkbox"/> Fair: Proposal lacking in one or more critical aspects; key issues need to be addressed.</p> <p><input type="checkbox"/> Poor: Proposal has serious deficiencies.</p>	
<p>YOUR IDENTITY WILL BE KEPT CONFIDENTIAL</p>	
<p>NSF keeps reviews and your identity as a reviewer of specific proposals confidential to the maximum extent possible. We will, however, send the Principal Investigator(s) a copy of this review without your name and affiliation.</p>	
<p>REVIEWER'S SIGNATURE:</p>	<p>REVIEWER'S NAME AND ADDRESS (TYPED):</p>
<p>OTHER SUGGESTED REVIEWERS (OPTIONAL)</p>	
<p>FASTLANE PIN:</p>	
<p>PLEASE RETURN BY:</p>	

0088407 EMD
Dershem Hope College

An Object-Oriented Excursion Visualization Environment for Learning Introductory Computer Science

Goal

The goal of this proposal is to develop web-based visualization environments via modules that will enhance student learning.

Strengths

The proposal builds upon previous NSF grants and extends prior work to include topics such as event-driven actions and recursion. The PI has delineated clear goals and objectives of the project.

Limitations and Concerns

There exist concerns relative to the proposal. The proposal lacks innovation and lateral development that can build upon existing materials to achieve a greater impact to the intended audience. It was difficult to see the long-term impact of the proposal and how it would best serve the computing community at large.

Evaluation and Assessment

The assessment of the project seemed adequate, but lacked breadth and depth. The use of outside reviewers seemed appropriate, although it is questionable what their role might be.

Dissemination

The dissemination appeared weak as it involves a possible submission as a paper or a workshop to a SIGCSE symposium. It is not clear if other dissemination avenues were explored.

Budget

Appropriate for proposal.

Rating: Good

PROPOSAL NO: <i>0088407</i>	INSTITUTION: <i>Hope College</i>
PRINCIPAL INVESTIGATOR: <i>Dershem, Herbert</i>	NSF PROGRAM: <i>CCLI-EMD</i>
PROPOSAL TITLE: <i>An Object-oriented Execution Visualization Environment for Learning Introd</i>	
<p style="text-align: right;"><i>C.S.</i></p> <p>*Criterion 1: What is the intellectual merit of the proposed activity?</p> <p>*Criterion 2: What are the broader impacts of the proposed activity?</p> <p>Please attach a separate sheet(s) with your evaluation of this proposal with respect to each of the above criteria per instructions on the previous page. Your specific comments on the proposal's strengths and weaknesses are critical. Do not share, copy, quote or otherwise use or disclose material from this proposal. Destroy it after you complete your review.</p> <p>Summary Statement: (Include comments on the relative importance of the two criteria in assigning your rating. Continue on an additional page, if necessary.)</p> <p style="text-align: center; font-size: 1.2em;"><i>(see attached)</i></p>	
<p>Overall Rating (check one);</p> <p><input type="checkbox"/> Excellent: Outstanding proposal in all respects; deserves highest priority for support.</p> <p><input checked="" type="checkbox"/> Very Good: High quality proposal in nearly all respects; should be supported if at all possible.</p> <p><input type="checkbox"/> Good: A quality proposal worthy of support.</p> <p><input type="checkbox"/> Fair: Proposal lacking in one or more critical aspects; key issues need to be addressed.</p> <p><input type="checkbox"/> Poor: Proposal has serious deficiencies.</p>	
YOUR IDENTITY WILL BE KEPT CONFIDENTIAL	
<p>NSF keeps reviews and your identity as a reviewer of specific proposals confidential to the maximum extent possible. We will, however, send the Principal Investigator(s) a copy of this review without your name and affiliation.</p>	
<p>REVIEWER'S SIGNATURE:</p> <div style="border: 1px solid black; height: 150px; margin-top: 10px;"></div>	<p>REVIEWER'S NAME AND ADDRESS (TYPED):</p> <div style="border: 1px solid black; height: 100px; margin-top: 10px;"></div>
<p>OTHER SUGGESTED REVIEWERS (OPTIONAL)</p>	
<p>FASTLANE PIN:</p> <hr/> <p>PLEASE RETURN BY:</p>	

0088407
Dershem
Hope College

An Object-Oriented Execution Visualization Environment for Learning Introductory Computer Science

This proposal comes from a PI with a strong record of participation and completion of NSF funded work. The visualization materials that have been developed at Hope have been disseminated in the past and the REU project has critical acclaim.

This EMD proposal for \$74,000 represents an extension of several previous grants to Hope College. This project attempts to consolidate previous work into a single environment to aid in student mastery of introductory Computer Science concepts. The goals of this project are to build a visualization environment from previously funded components; to integrate this environment into a complete course with web-based lectures, in-class activities and homework; to evaluate the environment through student surveys, student usage logs and external expert evaluations; and finally to disseminate these materials and build a "community of users." The requested funds are largely for faculty salaries. The University will provide matching funding for these costs.

The materials address three instructional topics: class/method protocol for OOP; recursion and event-driven computing in Java.

This proposal acknowledges the existence of the BlueJ project in Australia, and of the software. What the proposal does not make clear, however, is how this differs significantly from that effort, or how it would mesh with it.

This extension of the earlier work at Hope is clearly outlined. It fills in the gaps in terms of supplying ancillary lecture and homework materials so that others may more easily adopt the materials. It also utilizes visual environments for the development of programs capitalizing on the strengths of the co-PI. The proposal indicates that the work on the ObViz has been used "elsewhere", but that is not documented.

The assessment portion of the project includes survey instruments and logging data as well as outside reviewers, but does not include student performance or retention. Demographics of students and learning objectives are also not addressed.

The budget seems reasonable. There does not seem to be a plan for commercial distribution, but through free distribution through professional societies and the web. This material is reaching a state of development that should move it beyond proof-of-concept. The goals may not be far-reaching enough.

Rating basis

Summary and challenge faced:	implicit in other work—previous problem not discussed enough, good
Clarity of goals	very good
Rationale for activity selection	previous work; good
Student background considered	not addressed
Assessment of student learning	student use, not student learning: good

Effective use of technology	excellent
Capability of faculty	excellent
Adequacy of facilities and commitment	excellent

Integration into academic program	very good
Contribution to knowledge base	good
Communication of results	excellent
Potential for wide-spread dissemination and adequacy of plan	excellent

Which objective addressed

quality SMET	(very good)	interdisciplinary (no attempt)
underrepresented group	(no attempt)	literacy (some)
national standards	(outdated)	

FILE IN PROPOSAL FILE

Proposal Number: 0088407

PI: Dershem, Herbert

Co-PI: McFall, Ryan

Institution: Hope College

Title: An Object-oriented Execution Visualization Environment for Learning
Introductory Computer Science

Project goals:

1. build environment for visualizing program execution
2. produce materials that use the visualization environment for a Java-based CS1 course
3. evaluate the impact of the environment on learning
4. disseminate materials/evnironment

Strengths:

Well written proposal.

Builds a good, complete case for the project. PI is well qualified to do this work.

Good institutional support shown by academic year release time.

There is good use of NSF REU!

Concerns:

Greater majority of the work is to be done during the first summer (2001). However, no plans for evaluation are included for developing the evaluation materials until Summer 2002. Does this mean that no evaluation will take place during the 2001-2 academic year when the course is first taught?? How will the PIs evaluate the success/failure of the materials developed?

The need for 4 summer months (including both PI and co-PI) for the second year seems excessive. Unless there is a major disaster, what major development needs to occur which would require this much time?

The panel of outside reviewers is a good idea. It is unclear what they will be reviewing – are they only looking at the materials developed? Perhaps they might be more helpful at the beginning of the development process by reviewing the types and content of materials to be developed. Is the panel meeting together or is each member of the group reviewing the materials separately?

Would be helpful to know the number of students who would be affected.

Budget:

Budget is all salary.

Proposal Number: 0088407
PI: Herbert Dershem
Institution: Hope College

This proposal builds on considerable previous work to extend capabilities for visualization in the introductory computer science course. More specifically, the proposal seeks to provide support for faculty oversight for on-going student-faculty collaboration in integrating existing tools into current courses and to expand those tools somewhat.

The PI has an extensive and strong track record of facilitating on-going student-faculty research, and this proposal contains many solid components that reflect this experience. The goals and objectives are well defined and clearly stated, the environment for the work is clearly described, past work is described with appropriate supporting figures, the implementation plan and timetable are well laid out, the evaluation plan includes both internal data collection and external review, and the dissemination plan follows the well-established form which the PI has used with considerable success in the past. Altogether, the writing and organization for the proposal are nicely done.

With these many positives, however, the proposal contains relatively description of the actual work to be done. More specifically, the proposal describes four existing packages developed by the proposers: ObViz as a visual interface for invoking class/object methods, VizFun for visualizing the execution of recursive methods, AWTViz for viewing Java event-driven method calls, and JaDE as a java Development Environment. The proposal seeks to integrate these tools, but it is not clear just what this work might entail as each piece seems to be complete already. Similarly, little detail is provided for the logging component of the work, or how the logging described here would differ from efforts underway by others (e.g., Samuel Rebelsky at Grinnell College). Finally, while the proposal references the Blue and BlueJ environments, there are few details concerning how the current/proposed effort might differ.

Altogether, the proposal creates a sense that the new work will continue the on-going and successful effort of the PI and his colleagues, and the proposal has many qualities one might expect of an experienced grant-writer and developer. However, the proposal also seems overly brief concerning some important details and directions.