

# Alice: A Fresh Approach to Teaching Computer Science

Carnegie Mellon University

Project Director, Randy Pausch (pausch@cmu.edu)



## Creating Movies and Games as a Motivation for Programming

Computer Science enrollments dropped 23% last year. In a country that is increasingly dependent on computing, it is critical that we reverse this trend. Introductory Computer Science courses often draw examples and assignments from the business computing and systems building domains. These contexts are intended to ground computer science concepts in a domain that makes the problems relevant to students, yet many students do not begin to see the relevance of their computer science classes until their sophomore and junior years. Rather than relying on business and systems building examples, we have created a programming environment that allows students to learn basic computer science while creating animated movies and simple video games where students control the behaviors of 3D objects and characters in a virtual world. Alice is freely available and open source.

## Alice has been Formally Shown to Improve Grades and Retention

Alice has been formally shown to help at-risk students (those with a weak math background and/or no prior programming experience) succeed in Computer Science\*. At-risk students who take an Alice class either prior to or concurrent with CS1 perform as well as students who are not at-risk, and substantially better than other at-risk students. Prentice-Hall has published a textbook based on Alice for college-level introductory programming.

### Alice Improves Student Performance in CS1:

Performance of at-risk students:	Grade in CS1	Take CS2?
Without Alice	C	47%
With Alice	B	88%

\* Moskal, M., D. Lurie, and S. Cooper, Evaluating the Effectiveness of a New Instructional Approach. In *Proceedings of 2004 SIGCSE Conference*, (Norfolk, VA), 75-79.

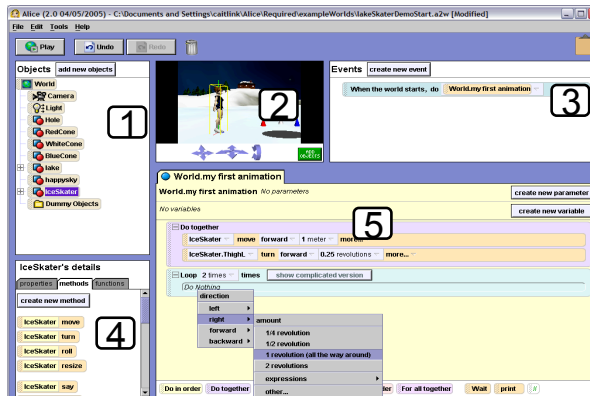


The Alice gallery contains more than 700 characters and objects.

## Alice: Visible Data, and No Syntax!

In Alice, students construct programs by dragging and dropping tiles that represent words in a programming language; Alice removes the possibility for syntax errors, a common source of frustration for beginning programmers. Students can watch their programs execute, which enables students to see where they have made mistakes. Unlike many programming environments for novices, Alice allows students to gain experience with all the programming constructs typically taught in programming courses.

## A Quick Tour of Alice



- 1 The object tree displays a list of objects in the current Alice world and allows students to select objects.
- 2 The scene editor allows students to lay out objects in their 3D worlds
- 3 Students use events to associate methods with mouse clicks, object collision, etc.
- 4 The details area displays methods, functions, and data for the selected object.
- 5 Students can build programs by dragging methods from the details area.

## Schools Using Alice

- Bucknell University
- California Lutheran University
- California State University at Humboldt
- Camden County College
- Carnegie Mellon University
- Clemson University
- Colorado School of Mines
- Community College of Philadelphia
- Cornell University
- Duke University
- Georgetown College
- Haverford College
- Ithaca College
- Manor College
- Mississippi Valley State University
- Plymouth State University
- Saint Edward's University
- Saint Joseph's University
- Saint Lawrence College
- San Diego State University
- Sierra Nevada College
- Southwestern University
- Tompkins Cortland Community College
- University of Colorado
- University of Illinois
- University of Mississippi
- Virginia Polytechnic Institute
- And many high schools

Alice: a revolutionary way to teach programming



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