The Alice Suite

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Abstract

This paper presents the chronology of the development of the Alice software tool and its evolution into a suite of tools for a wide range of curricular goals. This paper will also help instructors determine the best component of the Alice suite to use in their particular classroom setting.

Over the last decade, the Alice Project has emerged as a pioneer and a leading innovator in providing a software tool for teaching and learning problem solving and fundamental concepts of computer programming. Alice was originally created in the early 1990's as a rapid prototyping tool for creating animations in virtual reality. Virtual reality is a computer-based simulation where the user wears a special set of goggles and gloves, and uses a 3D controller to move through and interact with a world that only exists in the user's perception.

The original Alice 3D animation software (we might refer to it as Alice 1) was developed by a research and development team directed by Dr. Randy Pausch, starting at the University of Virginia and continued at Carnegie Mellon University. Alice was used at Carnegie Mellon's Entertainment Technology Center in Building Virtual Worlds, a first course for graduate students who are preparing for a career in the interactive media industry (gaming and animation).

Figure 1 shows a virtual world created with the original Alice. The inset in the lower right corner shows Dr. Pausch wearing a virtual reality headset to view and interact with objects in the virtual world. The original Alice became the foundation and inspiration for the development of all educational tools that now compose the Alice Suite.

Figure 1. Virtual Reality

In the late 1990's and early 2000's, Drs. Wanda Dann and Stephen Cooper were actively researching the use of program visualization in Computer Science Education. Dann and Cooper proposed collaboration with Pausch to create a new Alice for use as a teaching and learning tool in introductory programming courses. The result of this collaboration is Alice 2 (currently in release 2.3). Alice 2 was originally developed and tested in early college and university settings. Textbooks and instructional materials were originally created for college professors and students. After introduction at the college level, Alice spread rapidly into high schools across the nation. Recently, we are seeing an increasing adaptation of these materials for use in middle schools.

With the contribution of the Sims2 art assets by Electronic Arts, the Alice Project began the development of Alice 3. Originally, Alice 3 was expected to replace Alice 2. This plan has been restructured. We are now providing an **Alice Suite** of tools composed of both Alice 2 and Alice 3. Alice 2 and accompanying instructional materials will now be targeted to middle school and lower high school levels. Alice 3 and accompanying instructional materials will now be primarily targeted to high school and early college levels with support for transition to a production level language, such as Java.

Table 1 summarizes the research focus, educational use, and target audience for each tool in the Alice Suite. (Please note that the original Alice for virtual reality research is now *retired*.)

Table 1. Alice Suite of Educational Tools

Alice tools	Research	Educational Use	Target Audience
Alice  **Retired, no longer available**	Virtual Reality	Rapid prototyping tool for creating animations for virtual reality (head-mounted devices, caves, and simulators).	Graduate students who are learning how to create computer animations for virtual reality.
 Alice 2.x **Actively supported**	Effectiveness for attracting and retaining students in introductory programming courses.	Program visualization tool for learning logical and computational thinking skills and fundamental principles of programming in the context of animation.	High School, as an introduction to fundamental computing principles. Middle school, introductory units and interdisciplinary use.
Alice 3.x **Actively supported**	Effectiveness of mediated transfer using Alice and Java.	Program visualization tool for a wide spectrum of students including beginners first learning fundamental programming principles to more advanced students with emphasis classes, objects, and inheritance and transition to the Java programming language.	High school and early college students enrolled in courses (classroom and online). Preference settings are available for more advanced levels, particularly for those transitioning to a production level language such as Java.

How Alice is being used

The Alice Project is focused on providing software tools and instructional materials for a conceptual core of computational thinking, problem solving, and computer programming. Consequently, the Alice Suite of educational tools is designed to support teaching and learning across a spectrum of ages, grade levels, and classes in K-12 and in early college or university courses. Table 2 illustrates typical courses where Alice is used.

Table 2. The Alice Suite – Typical Curricula Usage

Formal Classroom Courses	Alice 2	Alice 3
Introduction to Programming with Alice	x	x
Introduction to Programming (Pre-CS1)	x	x
Introduction to Programming (CS1)		x
Introduction to Object-Oriented Programming	x	x
Introduction to Java Programming		x
Introduction to Game Design	x	x
Introduction to Animation	x	x
Computer Literacy (programming component)	x	
Interdisciplinary courses using programming	x	