Creating Animations with Alice for Projects in all Disciplines

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Outline

• Motivation for Integrating Computer Science into Disciplines
• Introduction to Alice
• Discipline Specific Projects
• Getting Started – Curriculum Materials
• Conclusion and Future Work
• Try Alice
Computer Science
What? When? Where?

• What?
  – Not just using a computer, but problem solving
  – Not just writing a program, but an efficient one

• When? Relatively new field
  – only about 60 years old...
  – Compare to math, physics

• Where does it fit in Middle and High Schools?
  • Technology
  • Science
  • Mathematics
  • Language Arts
  • History
  • Foreign Language
  • Music
  • Art
Three Problems with Computer Science

1. Students don’t know what it is
   Not keyboarding, PowerPoint, spreadsheets

2. Computer Science is not in many K-12 schools
   Few high schools teach AP computer science
   Fewer middle schools teach computing
   Not required at the college level

3. Where are the women and minorities?
   Number of underrepresented groups in computer science is low
Why Schools Should Teach Computer Science (CS) – (from NCWIT.org)

• Computer Science gives students vital 21\textsuperscript{st} century skills
  – C.S. underlies most innovation today

• C.S. means rewarding careers
  – Predicted shortage of technical jobs in the future
  – Wide range of options in CS (health, environment, finance, arts, security ...)

• C.S. is more than just technology
  – CS teaches design, logical thinking and problem solving
Efforts to get Computer Science into K-12

• 10,000 teachers – NSF
  – Computing for Everyone (CE21)
  – New AP Principles course

• Computer Science Teachers Association
  – csta.acm.org
  – CSTA K-12 Computer Science Standards
    • Outlines topics for each grade level

• Adventures in Alice Programming Project
  – supported by NSF ITEST and IBM
Why Alice?

• Lots of other great tools for teaching programming

- Greenfoot
- Scratch
- Lego
- Snap!

• Alice is easy to use, drag-and-drop, objects already exist

• Attractive to both girls and boys
Success - Alice attracts diverse group

• At Duke
  – CompSci 4 Spring 2005
    • 22 preregister, 30 enroll (12 female + 3 African Amer.)
  – CompSci 4 Fall 2005
    • 20 preregister, 31 enroll (17 female – 1 African Amer.)
  – CompSci 4 Fall 2006 – 2 sections
    • 64 students, 33 female, 7 African Amer.
  – CompSci 4 Fall 2007 – 2 sections
    • 84 students -> 50% female
  – CompSci 4 Fall 2008 – 2 sections
    • 100 students -> 50% female
  – Same for Spring 2009, Fall 2009...
  – Advertised in school paper
    • picture of ice skater
    • Web site of animations
  – This course is now CompSci 94
Alice Course at Duke - CompSci 94
www.cs.duke.edu/courses/fall13/compsci094

CompSci 94, Fall 2013
Home

Course Announcements

• August 27, 2013 is the first day of class. NOTE THE ROOM CHANGED and is now in LSRC D106.
• You will need to bring a laptop to class and install Alice version 2.3 by August 27 if possible. (NOTE, There are two versions of Alice that are quite a bit different. We will be using Alice 2.3 to start with, and later use Alice 3.1. DO NOT use the CD that comes with the book, but instead follow instructions on the Resources page)

CompSci 94
Introduction to Programming
Via Animation and 3D Virtual Worlds

CompSci 94 is an introductory programming course that teaches fundamental computer science concepts. This version of CompSci 94 uses the tool Alice to create 3-D virtual worlds. You will learn programming constructs such as looping, selection, and data structures, along with how to control objects (raise hands, flap wings, move, turn, spin, walk, etc.).

This is a hands-on course. During class we will be writing programs with partners, designing 3-D virtual worlds. Outside of class projects will be done alone, unless otherwise stated.

ATTENDANCE REQUIRED: Class attendance is REQUIRED since we program in class everyday. I need to know in advance if you have an excused absence for not attending class.

LAPTOP: If you have your own laptop, bring it to class. It will be much easier to keep all your work on your own laptop. There
Sample CompSci 4/94 project

TODD'S SNOW MACHINE HAS BROKEN DOWN... AND IT'S UP TO YOU TO SAVE HIM!

SARAH PALIN'S SEAPLANE ADVENTURE

INSTRUCTIONS  PLAY  CREDITS

TAKING FLIGHT
Success - Alice Excites 4th-6th Grade Girls

• Duke Femmes Event, April 07
• 60 girls – 4 groups of 15
• Taught them Alice for an hour
• Handout to take home
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Bring on Alice Virtual Worlds!

• Alice is
  – Hands-on!
  – Interactive!
  – Visual!
  – Less Error prone
  – Exciting Results right away!

• Alice has the potential to excite kids about computer science in the same way that experiments excite kids about chemistry, physics and biology!
Alice Programming Language

• Create interactive stories or games
• Learn programming in an easy way, drag-and-drop your code
• Problem solving with visual feedback
  – Logical thinking, Computational thinking
• Along the way, learn computer science concepts:
  – Loops, classes, methods, functions, arrays
Alice Developed by Randy Pausch

- Carnegie Mellon University
- Virtual Reality Researcher
- Wrote the Last Lecture
- Died of Pancreatic Cancer in 2008
The Alice Team – Alice is free!
www.alice.org

Meet the Alice Team

The Alice Project is a multi-university initiative, and the Alice Team is a collaboration among faculty, staff and students.

**Director**
Wanda Dann

**Research Scientist**
Dennis Cosgrove

**Carnegie Mellon**
Contact Wanda

**Carnegie Mellon**
Homepage

**Faculty**
Steve Cooper

[Image of Alice Team members and the Alice software interface]
More on ... Alice Programming Language

- Has libraries of 3D objects

- Keeps Track of objects you select
Objects Have Multiple Parts that are moveable
Object Position

• Objects
  – Are positioned in 3D space
  – Have six degrees of freedom
Alice Code is Easy to Learn

Select Code, Drag-and-Drop code in program
Play Alice Animation

- Chicken rises, cow turns head and talks

Moo Moo Moo
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Alice Demo: Kitty Story – children’s book on handicapped child

By Betty Stone
Animated by Deborah Nelson
Let’s visit Little Kitty the kitty. She lives with her Daddy, her Mommy, and her sister, Moon Song.
Let's look at your x-ray Kitty.

Sometimes Her mom takes her to the Doctor so that she can check out her knee. Sometimes that hurts a bit and sometimes it doesn’t.
At night, her mom or dad puts leg splints on her knees. Kitty does not like this one little bit! She does a good job of crying.
Science – Population Change
now we'll graph the data in a bar chart to see how the population changed over time
Science Example
How a volcano is formed
¡Bienvenido al programa de cocinar!
Cooking Spanish – More detailed

Vamos a hacer pan de plátanos!
Cooking Spanish – setting the table
Keyboarding
Harry Potter – Math/computing
Level 1 Charms - before
Harry Potter – Math/Computing
Level 1 Charms - after
Focus on math
Math Example – Plotting Numbers

I am going on a bike ride
Math Example – Rounding Numbers

Rounding World

Choose the level of difficulty by clicking on the handle:

- **Level 1**: round numbers up to the hundreds
- **Level 2**: round numbers up to the thousands
- **Level 3**: round numbers up to the millions

START
Math Example – Order of Operations
Math Stories to Attract Girls

- Danica McKellar
Math Story on Fractions
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Adventures in Alice Programming
Grades 5-12 Outreach

www.cs.duke.edu/csed/alice/aliceInSchools
Adventures in Alice Programming

• 2-week Teacher workshops
  – Over 200 teachers, middle school, high school, some elementary
  – All disciplines
  – Teach Alice, Develop Lesson Plans
  – One-week follow-up workshop
  – Summers 2008-2015, funding for lodging

• Main Sites:
  – Duke University, Durham, NC
  – Charleston/Columbia, SC
  – San Jose, CA (starting 2014)
Free Curriculum Materials/Lesson plans

• Over 60 free Alice Tutorials (from getting started to specific topics, sample projects)
• Teacher lesson plans available
• Most students use Alice for projects – instead of poster, report

• Subject teachers using Alice
  – Language Arts
  – Mathematics
  – Science
  – History
  – Foreign Language
  – Music, Art
  – Media, Technology
  – Business

• middle school and high school, some elementary
Using Alice in Middle/High Schools

• Teachers
  – Examples in lecture
  – Make interactive quizzes
  – Make worlds on concepts for students to view

• Students
  – Projects (in place of a poster, a model)
  – To take or build quizzes
  – To view and answer questions about a world
  – Older students can do more with Alice.
Our Free Materials Over 60 Tutorials

1. Getting started tutorials
   - 1-4 hours

2. Tutorials on CS topics
   - Methods, conditionals, lists, etc
   - Variables (timers/scores).

3. Animation tutorials
   - Lights, camera, scene change, billboards, invisible objects

4. Project tutorials
   - Short projects, longer projects, games
New getting started tutorial

Hey! Welcome to my island!
Getting Started Tutorial – 3 part
Example: Getting Started Tutorial teaches:

• Placing objects
• Moving objects
• Setting up Camera tripods and moving between views
• Using built in methods and writing your own
• Gluing objects together
• Adding sound, 2D pictures to enhance world
Sample tutorial: Scene Change
New Tutorial – Camera views following a person
Tutorial for Project: Book Report

Charlotte's Web
by E.B. White

Click
Tutorial for Simple Game – Control boat, earn points

To win this game, you must steer the boat through each ring and beat the clock. You receive one point for each ring, and there are 10 rings, so if your score is less than 10 at the end, you lose!
Tutorial for Adventure Game – Find objects in order
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Versions of Alice

• Alice 2.3 - WE WILL USE THIS VERSION
  – Good for Middle School/High School introduction to programming
  – Supported, will be around for awhile, stable

• Alice 3
  – Good for full High School programming course to lead into a Java course
  – Released last summer, still improving it

• StoryTelling Alice - Caitlin Kelleher
  – Written as prototype, not supported
  – PhD Thesis under Pausch
  – Now developing Looking Glass
Conclusions and Future Work

• Teachers using Alice in lots of disciplines
  – 1-2 classes in Alice to get students started
  – Students can explore further on their own
  – Teachers excited - see different ways to use it

• Projects best for integrating into a course

• More extensive use of Alice
  – Media/Business Technology - pairing up with teachers in other disciplines
  – Introductory computing class

• Workshops through 2015, Alice Symposium 2013

• Other formats for tutorials?
What a middle school kid can do with Alice – from teacher Chari Distler
What a 6\textsuperscript{th} grader can do with Alice
- teacher Chari Distler
Adventures in Alice Programming web site

www.cs.duke.edu/csed/alice/aliceInSchools

Questions?
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