Creating Animations and 3D Virtual Worlds – Programming for Beginners
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What is Computer Science?

• Computer science is no more about computers than astronomy is about telescopes. - Edsger Dijkstra

• Computer science is not as old as physics; it lags by a couple hundred years. However this does not mean that there is significantly less on the computer scientist’s plate than on the physicist’s: younger it may be, but it has had a far more intense upbringing! - Richard Feynman
Computer Science is a young discipline

• First computer science department formed in 1962

Samuel D. Conte
Professor emeritus of computer science and mathematics was the founding department head of the nation's first computer science program. October 1962.
What is Computer Science?

• Artificial Intelligence

Roomba

Mars Rover

CMU’s Sandstorm
What is Computer Science?

• Animation
What is Computer Science?

- The Organization of Data, and Searching
What is Computer Science?

- Medicine, Genomics
What is Computer Science?

- Devices
Computer Science and Programming

• Computer Science is more than programming
  – Called *Informatics* in many countries
  – Elements of both science and engineering
  – Elements of math, physics, cognitive science, music, art, and many other fields

• To some programming is an art, to others a science, to others an engineering discipline.
Why is Programming Fun?

• What delights may its practitioner expect as a reward
  – First is the sheer joy of making things.
  – Second is the pleasure of making things that are useful.
  – Third is the fascination of fashioning complex puzzle-like objects of interlocking moving parts.
  – Fourth is the joy of always learning.
  – Finally, there is the delight of working in such a tractable medium. The programmer, like the poet, works only slightly removed from pure thoughtstuff.

Fred Brooks
Programming via Animation and 3D Virtual Worlds

• Introduce the programming language Alice
  – Free at [www.alice.org](http://www.alice.org)
  – Taught in CompSci 4 at Duke

• Demos

• Hand-on Alice programming
What Is Alice?

• A modern programming tool
  – 3-D graphics
  – 3-D models of objects
• Animation
  – Objects can be made to move around virtual world
    • a story simulation
    • video game
What does Alice run on?

• Alice is written in Java – should run on many systems
  – supports Mac and PC
Fast Start Up

• Can quickly learn to create
  – A simple animation in a few minutes
  – A non-trivial animation in a few class periods
• Can learn to use the Alice interface after a few more class periods
The Power of Alice

• Automatically keeps track of 3-D objects
  – What objects are in the virtual world
  – Types of objects
  – Positions of objects in the world
Objects in Alice

- Objects already exist
- Objects have parts
Demo1 – A story

Slithy toves?
A New Approach to Introductory Programming
Building Virtual Worlds with Alice

Susan Rodger
Demos 3 and 4 - Events
Demo 5 – Binary Code game

• Three digit code
  – 0 means switch up
  – 1 means switch down
• Code is randomly generated
• Example: 101
• Guess the code by moving the switches
Demo 6 – Sorting by heights
Demo from Scratch: Objects in Alice

• Objects already exist
• Objects have parts
Add Chicken to World

• Click on “add objects”
• Select object from gallery
• Double click on it
• It is added to your world
Adjust placement of Chicken

- Adjust placement of chicken with controls
- Don’t use copy
- When done, select “Done”
Program the Chicken

- Objects appear in “Object tree”
- Click on Chicken to program it
- It’s methods (things it can do) appear
- Drag methods over to insert in the program
Also Drag up Tiles for Ordering commands

• Do together
  – Put commands to be done at the same time

• Do in order
  – List of commands to be done one at a time
Program - Chicken

**Do in order**
- Chicken.Neck.Head turn right 0.25 revolutions more...
- Chicken move up 0.5 meters more...
- Chicken.Neck.Head turn left 0.25 revolutions more...
- Chicken roll right 2 revolutions more...

**Do together**
- Chicken say Duke is going to be fun! duration = 4 seconds more...
- Chicken move down 0.5 meters more...
- Chicken move forward 10 meters style = abruptly more...
Adding an Event

• Create a new method to get the bunny to hop
Attach the method to an Event

- Create an event
- When “up arrow” is pressed, bunny will hop
Now Your Turn to Experiment

- **Start Alice**
  - Click on Alice.exe

- **Run the Demo worlds (click Play to run)**
  - lakeSkater – movie
  - amusementPark – movie
  - LightDemo – movie
  - almostAllAboutAlice – movie, click to continue
  - snowLove – movie, click to continue
  - flightSimulator – use arrow keys to control plane through hoops
Experiment (cont)

• Try to build the chicken and bunny demo
• Create your own demo
  – Choose objects and place in world
  – Create a story scene
  – Create some events
Thanks for Coming

• Alice is available for free
  – www.alice.org

• At Duke, Alice is taught in CompSci 4