Chapter 1
Learning to Program With Alice
(Duke Book)

Rather than typing a difficult, long and obscure computer language in the hopes of getting a calculation, with Alice you will be more like a director of a play, where on screen objects act out the script you have created.

“Why should I even take a programming course?”

Some benefits of taking even 1 programming course are:
  o It is a way of learning a new way to think
  o Increases problem-solving skills

Problem-solving is finding an answer to a question or figuring out how to perform a task. Computer programming is a pure, distilled form of problem-solving.

Alice was originally developed as part of a research project in virtual reality.

Alice is different from traditional computer programming because you use “natural English words,” like “move forward” or “turn right.”

You can create 2 things with Alice:
  o Be a director of a 3D animated film
  o Create an interactive video game

After you have learned how to use Alice, you will understand all of the fundamental ideas involved in programming without all of the frustration of the syntax of a computer language.

Computer Program is a set of instructions that tell the computer what to do.

Think of computer programming not only as a way of telling a computer what you want it to do, but as a way of telling another human being what you want the computer to do.

Elegant a program is considered “elegant” if other human beings can easily understand and appreciate the intentions of the original programmer.
One can create an “elegant” program by documentation → comments in the program, a web page for reference, or an accompanying written document like a user’s manual that helps someone else understand what you were trying to do.

All Computer Programs are Made From Very Simple Ideas:

1. A list of Instructions:
   - **Sequential programming** → when you perform a task in a specific order
     
     EXAMPLE: a recipe
     - Beat eggs
     - Mix in flour, sugar, and shortening
     - Pour into a baking pan
     - Bake at 375 degrees for 45 minutes

2. If’s:
   - **Conditional execution** → perform an action based on a condition.
     
     EXAMPLE:
     - If you have Dove chocolate, you must share with Mrs. Martin.

3. Repeating Behavior:
   - **Looping** or **Iteration** → an action that is repeated for a “given” (numeric or conditional) time
   - If a condition is true/false
     
     EXAMPLE:
     - For a numeric amount of times:
       - Stomp your feet 5 times
     - Conditional:
       - As long as there are M&M’s, keep eating them

4. Breaking things up into smaller pieces:
   - **Problem Decomposition; Stepwise Refinement; Top-Down Design; Algorithm** → the process of doing a complicated task by breaking the task down into a list of smaller, simpler tasks. Once all of the simpler tasks are done, the complicated task is also accomplished.

   - **Reductionism** → an ancient philosophical approach to the process of doing a complicated task by breaking the task down into a list of smaller, simpler tasks.
5. Compute a Result:
   - Perform a sequence of steps to obtain a result that is an answer to a question.

   EXAMPLE:
   - Look in the phone book and find the phone number for John Brown.
   - This action actually asks a question of, “What is John Browns phone number?”
   - Function \( \rightarrow \) in computer programming, a “function” is just a question.
   - Calling a Function \( \rightarrow \) is asking a question so that you can compute a result.

* Computer programming is really just using the previous 5 ideas in various combinations.

* In reality, most computers really only understand about 100 different instructions.

* The millions of programs that run on computers use the same 100 instructions, but each in different orders and combinations. These different orders and combinations is what causes the complexity of computer programming.

  - EXAMPLE: Think of the game of chess
    - There are only 6 kinds of chess pieces
    - Each piece can only move in a simple pattern
    - What makes chess “hard” or “complex” is all of the possible combinations of moves.

* Learning how to think about arranging a sequence of instructions to carry out a task—such as how to design a program—is probably the most valuable part of learning to program.

* Object-Oriented Programming (OOP) \( \rightarrow \) Most modern computer programming languages in which programs are organized into a set of methods that manipulate the properties of objects stored in a computer.
Why did they name this software Alice?

- The Alice system is based on the use of objects. What makes Alice different from traditional OOP languages is that you can actually see the objects on the screen.

- The team that developed Alice named it so in honor of Charles Lutwidge Dodson. Dodson was an English mathematician that wrote under the name, Lewis Carroll. He wrote, “Alice’s Adventures in Wonderland” and “Through the Looking Glass.” Dodson and the developers of Alice both had a common belief: the most important thing to doing something complex was to make things simple and fascinating to a learner!

Virtual World is a video game or simulation implemented in 3D. All Alice virtual worlds begin with a scene of a ground and sky. Some objects such as trees and houses provide a setting, while other objects such as people and animals play the role of actors in your script.

Alice has a large number of 3D models; these models are like a blueprint used to design a house. The blueprint provides the size, color and other attributes of the model.

3 Dimensions and 6 Directions

- Objects in Alice are 3 dimensional.

- Each object has width, height, and depth; these properties are in relation to the object, not in relation to the camera’s view.

  - **Height** → vertical, top to bottom
  - **Width** → horizontal, left to right
  - **Depth** → front to back, forward and backward
Each object in Alice has what is known as 6 Degrees of Freedom ways it can move around in the world; possible directions of motion.

- Each object knows the 6 directions of movement in relation to itself.

**Orientation** → the 6 degrees of freedom in relation to the object, not the camera.

**Bounding Box** → is a yellow box that is displayed when you mouse-click on an object.
(See picture above)

### Center of an Object

- Each object in Alice has a unique center → it is not based on a calculation, but rather determined by the graphic artist when they first created the 3D model.

- The center point provides a reference for a pivot or spin type of movement, so not all “centers” for an object are at the center of mass.

- Objects that sit or stand have their center located at the bottom of the bounding box; for people it would be between their feet.

- Objects that are held also do not have their centers at the center of mass. This is so that when you rotate the object, it will swing, or rotate, about that point.

### Distance

- Distance → is measured from one objects center to another object.

### Position

- Position → is the point used from the center of an object within a world.
Alice automatically puts the center of the ground at the center of the world at position \((0,0,0)\).

Exercise:
- Select a template to start a world
- In the "Object Tree," select the "ground" object
- In the "Details Area," select the "properties" tab
- If you look at the "pointOfView" you will see the coordinates, or position, as \((0,0,0)\), which is the center of the world.

Any object in the world is located relative to the center of the world.

Animation

Animation is a fantasy of vision, an illusion.
In Alice, you move objects about creating an illusion of movement, and Alice renders, or creates; the animation.

3D Text

In "Scene Editor" mode click on "Create 3D Text" in the Local Gallery.

A text dialog box pops up and lets you choose font, bold, italics and a box to type in the text you want.

Once you click "OK" the text is entered into the world as an object and is also displayed in the Object tree.

To change a text object:
- Click the object in the object tree
- Click the properties tab in the Details Area
- Click the text and then a pop-up box will appear and you can change the text.

Modifying a String in the text object does not modify the name of the object.
Billboards

* You can create **flat 2D images** in any paint tool program and then import them into Alice. **Billboards** - The flat images you created elsewhere and imported into Alice.

* The images must be saved as either: `.gif`, `.jpg`, or `.tif`

* Steps to import an image into Alice:
  
  o Create an image using a paint tool program
  o Save the image with any of the 3 extensions listed above
  o Open Alice
  o Go to File/Make Billboard
  o Navigate to wherever you saved your image
  o Click “Import”

* One use of billboards is an “**instruction box**” providing information to the user about how to play a game or simulation.

Instructions:

Up Arrow - - forward
Down Arrow - - backward