Unit 3

Description of Material:

Participants will learn: the programming concepts of procedures, variables, randomness, and basic algorithms as seen in apps. We additionally cover different types and component properties. Unit material will include tutorials and readings.

Learning Objectives:
- use procedures and variables to modify existing code incorporating new features
- design a game algorithm that illustrates the coding principles examined in this Unit.
- construct a game application that incorporates randomness

Programming Concepts

There are some things that apps have to do repeatedly. A weather app will want to update information as information and time changes. A game app will want to move a mole around the screen to new locations so the user does not know where to mash it. A game app also might want to change the setup of the game each time the app is started or the game is reset. Anytime an app does something repeatedly, we want to use procedures. Please read the attached guide to find out more on procedures and how to use them in App Inventor ***Note that this guide was made for App Inventor Classic so the blocks are formatted slightly differently.*

- Read about procedures in the App Inventor book, in Chapter 21

Last unit, we introduced the idea that apps use data to store and retrieve information. Lists is one way to store data for many things. We use variables to point to a specific piece of data. That data could be a list, a piece of text, or a number. Please read the attached guide to find out more on variables and how to use them in App Inventor ***Note that this guide was made for App Inventor Classic so the blocks are formatted slightly differently.*

- Read about variables in the App Inventor book, in Chapter 16

Discovery Time -- App Experimentation

Play around with the following source code for the app Dancing Llama by experimenting and completing the following tasks:
- Rename the moveLlama procedure block. See how the corresponding blocks with that procedure also change names.
- Rename the numberOfDances global variable block. See how the corresponding blocks with that procedure also change names.
- Answer the question: Why does the numberOfDances displayed on the label only increase when the timer goes off and not when the phone is shaken?
- What happens to the label when you shake the phone 3 times in a row?

Randomness is an important and common task in computer programming. To decide whether or not the ghost in Pacman should turn left or right at an intersection is determined randomly or whether or not a mushroom should appear in a game of Mario Kart. The generation of random numbers can be used to make these decisions. If you would like the Pacman to turn left approximately 25% of the time and to turn right approximately 75% of the time, you can use blocks like this:
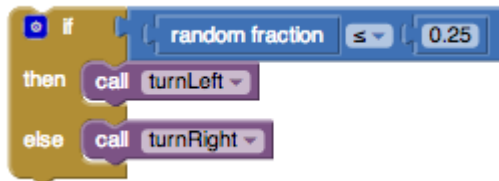
In this "Pacman" program, there are two procedures: turnLeft and turnRight. A random fraction [*between 0 and 1*] is used to determine which one should be called. If this fraction is less than or equal to 0.25, Pacman will turnLeft. Otherwise if it is greater than .25, Pacman will turnRight. Although it is random what will happen, because there is a greater possibility of numbers to randomly choose that lie in the range [.25-1.0], it is more likely that Pacman will turnRight in this program.

Basic (and advanced) algorithms are used all the time in Computer Science. Basic ones are used in app building to solve problems. For example, the Pythagorean theorem is an algorithm that allows you to solve for the length of the third side of ANY triangle, given the lengths of two sides. In game apps, there is an algorithm that tells the score to increase by one when the mole is hit. Essentially an algorithm is a set of rules or instructions that defines a sequence of operations.

What algorithms have you used so far in your apps?

Now is a good time to read the Design portion.

Challenge Time -- App Creation

This unit, your app assignment is to play with the source code and corresponding app for the following three games: Mole Mash, Get the Gold, and Space Invaders. Take notes about what you like/dislike about each one. Look at the blocks, components, and the design of the app.

- Mole Mash
- Get the Gold
- Space Invaders

Your assignment this unit is to think about your observations of these games as well as develop your own game app. A game is defined as structured play. Sometimes games can be work as in the case of professional athletes. But mostly games are for fun. The key components of all games are goals (to hit the mole), rules (you only get points if you hit the mole), challenge (the mole moves randomly across the screen), and interaction (the user plays the game on

the phone by touching the screen with a finger). This game can be a modification of any of the above apps or a new creation of your own.

For additional guidance on creating games using animation in App Inventor, feel free to read [Chapter 17 on Creating Apps With Animation](#) from the App Inventor book. *Note that this guide was made for App Inventor Classic so the blocks are formatted slightly differently.*

Products:

When you are finished you should have:
- A modified Dancing Llama.
- Your own game app.