THINKING IN DIGITAL SYSTEMS

Topics

- Systems Thinking in Board Games
- An Exercise in Simple Instructions
- Game Analysis: Apple Picker

Systems Thinking in Board Games

- **Some board game rules are explicit**
  - **"Do not pass Go. Do not collect $200."**
- **Other board game rules are implicit**
  - **A players will not just place the dice on the values that she would prefer to have.**
  - **The dice must stay on the table and must land completely flat on a side to be considered a valid roll. Otherwise, they are rerolled.**
  - **Dice are generally not thrown at other players...or eaten.**

Systems Thinking in Digital Games

- When developing digital games, all rules must be explicit!
- And, digital instructions must be simple.

An Exercise in Simple Instructions

- **Making a Peanut Butter and Jelly Sandwich**
  - **Each person in the class will take the next 10 minutes to write explicit instructions for making a PB&J sandwich**
  - **Your available equipment includes:**
    - A jar of peanut butter
    - A jar of jelly
    - A loaf of sliced bread in a bag
    - A butter knife
  - **Remember to make your instructions as explicit as possible**
  - **Don't make any assumptions about knowledge**
  - **You have 10 minutes...**

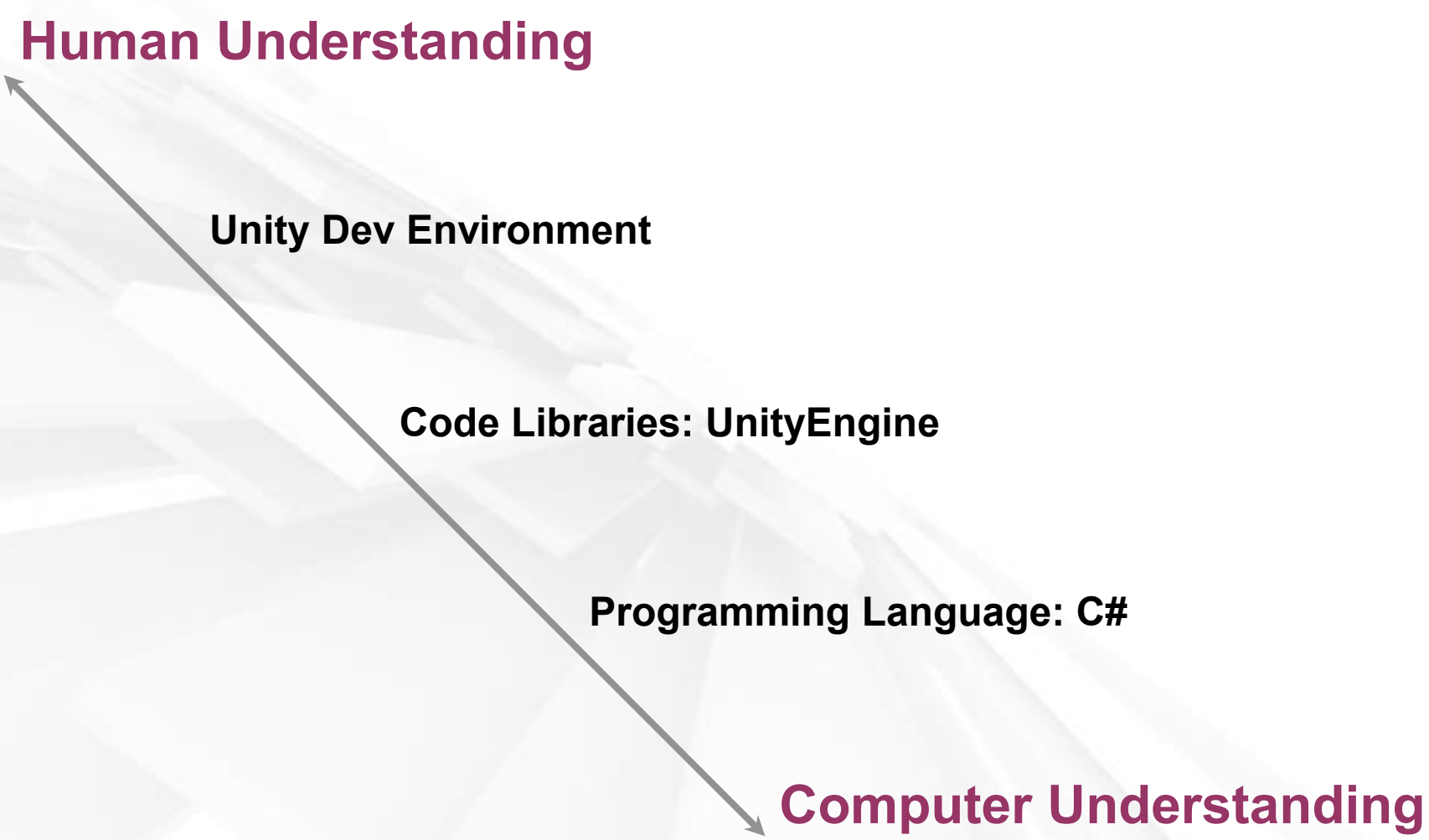
An Exercise in Simple Instructions

- Time's up!
- Turn in your instructions
- The instructor(s) will now each choose a sheet of instructions at random
  - And will follow them to make a PB&J sandwich

An Exercise in Simple Instructions

- How did it go?

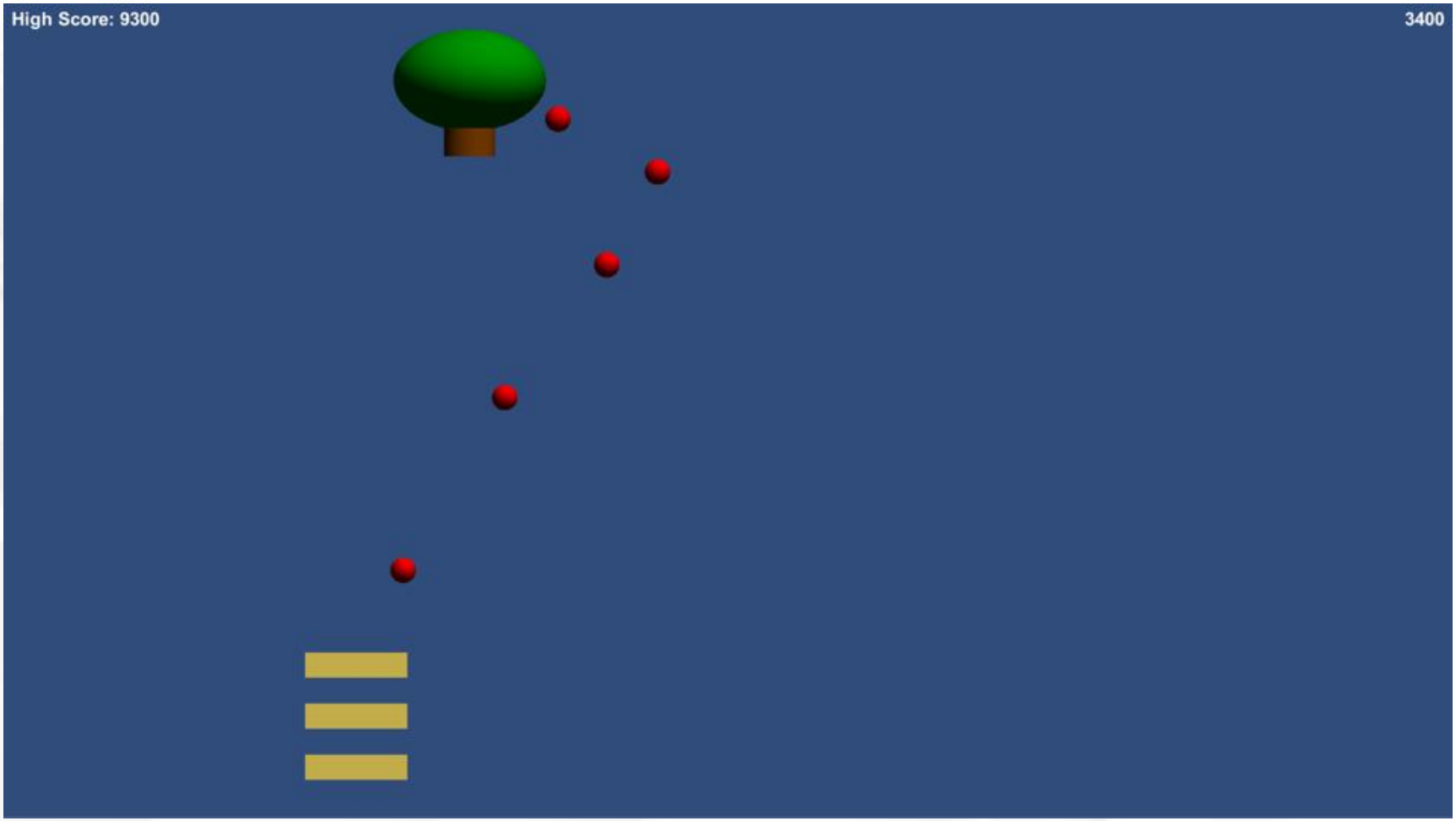
What This Means to Digital Programming



The Key to Computer Programming…

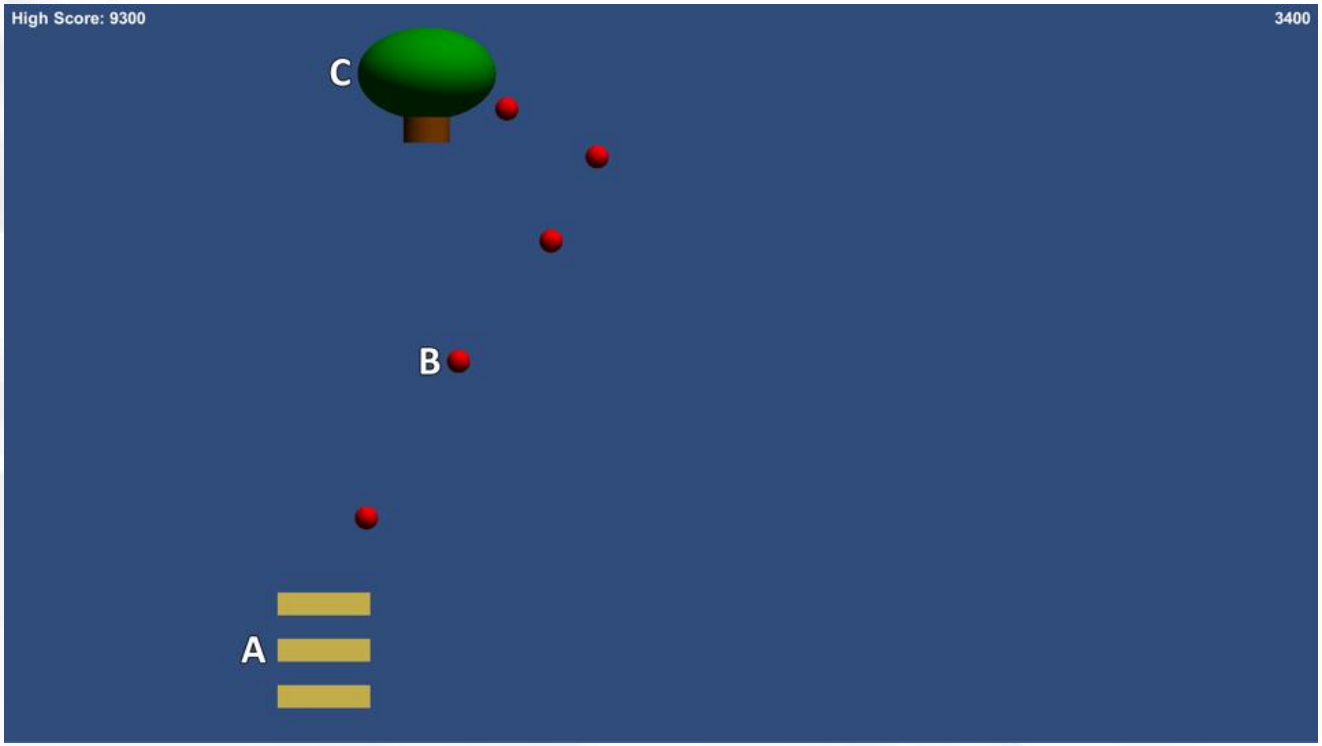
Breaking Complex Problems into Simpler Problems

Game Analysis



Apple Picker

- Based on the classic Activision game Kaboom!



- Player controls 3 Baskets (A) and tries to catch Apples (B) that are dropped by the AppleTree (C)

ApplePicker GameObject Action Lists

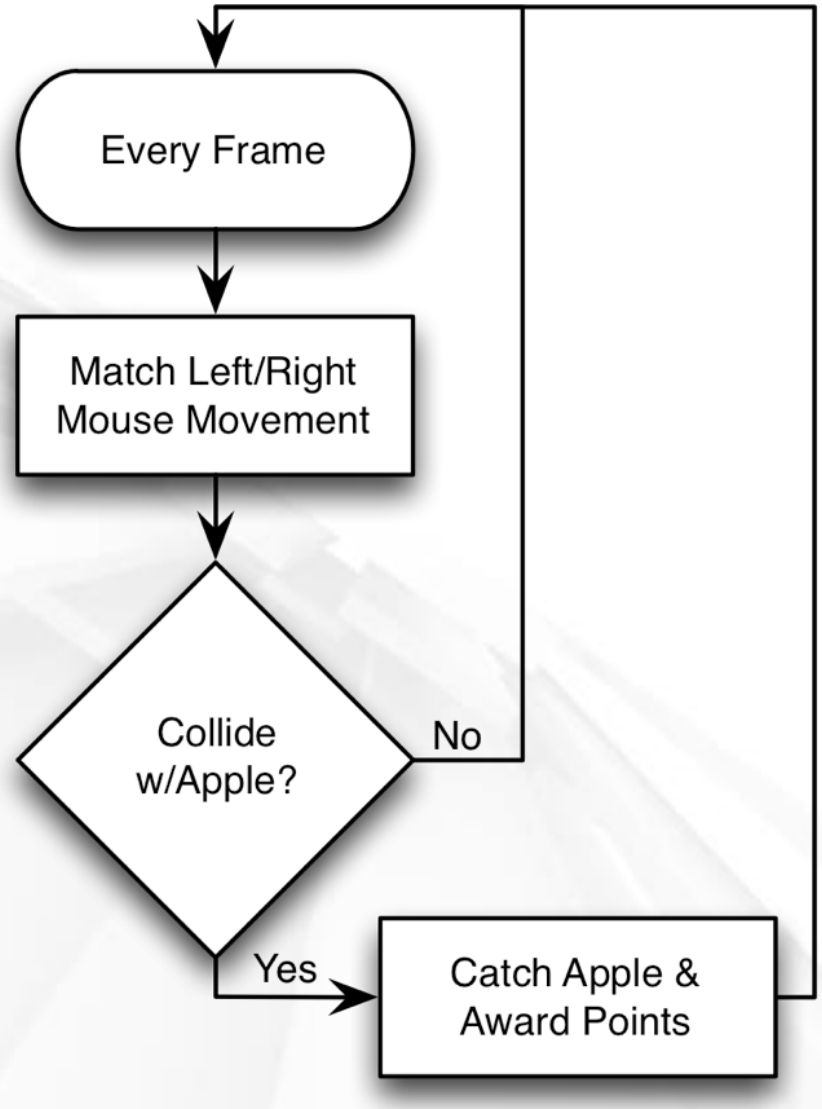
Basket Actions	Apple Actions	AppleTree Actions
Move left and right following the player's mouse.	Fall down.	Move left and right randomly.
If any basket collides with an Apple, catch the Apple	If an Apple hits the ground, it disappears and causes other Apples to disappear.	Drop and Apple every 0.5 seconds.

These can be parsed into flowcharts

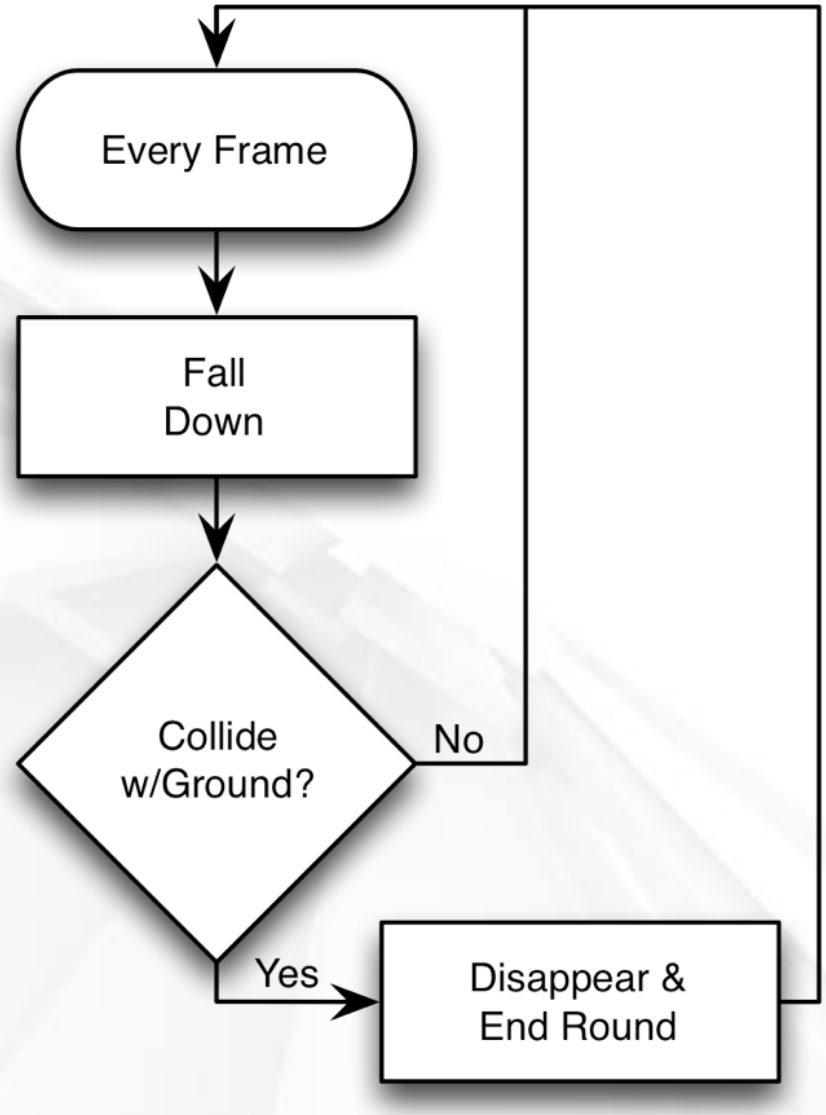
FRAMES IN COMPUTER GAMES

- **"Frame" comes from film**
  - **Describes a single image in a strip of film**
  - **Film was originally 16fps (frames per second), then 24fps**
- **Television**
  - **Describes a single pass of the electron gun**
    - (actually, two passes that are interlaced)
  - **30fps**
    - (60 fields per second)
- **Computer Games**
  - **Describes a single refresh of the screen**
  - **Also describes all the calculation involved in that refresh**

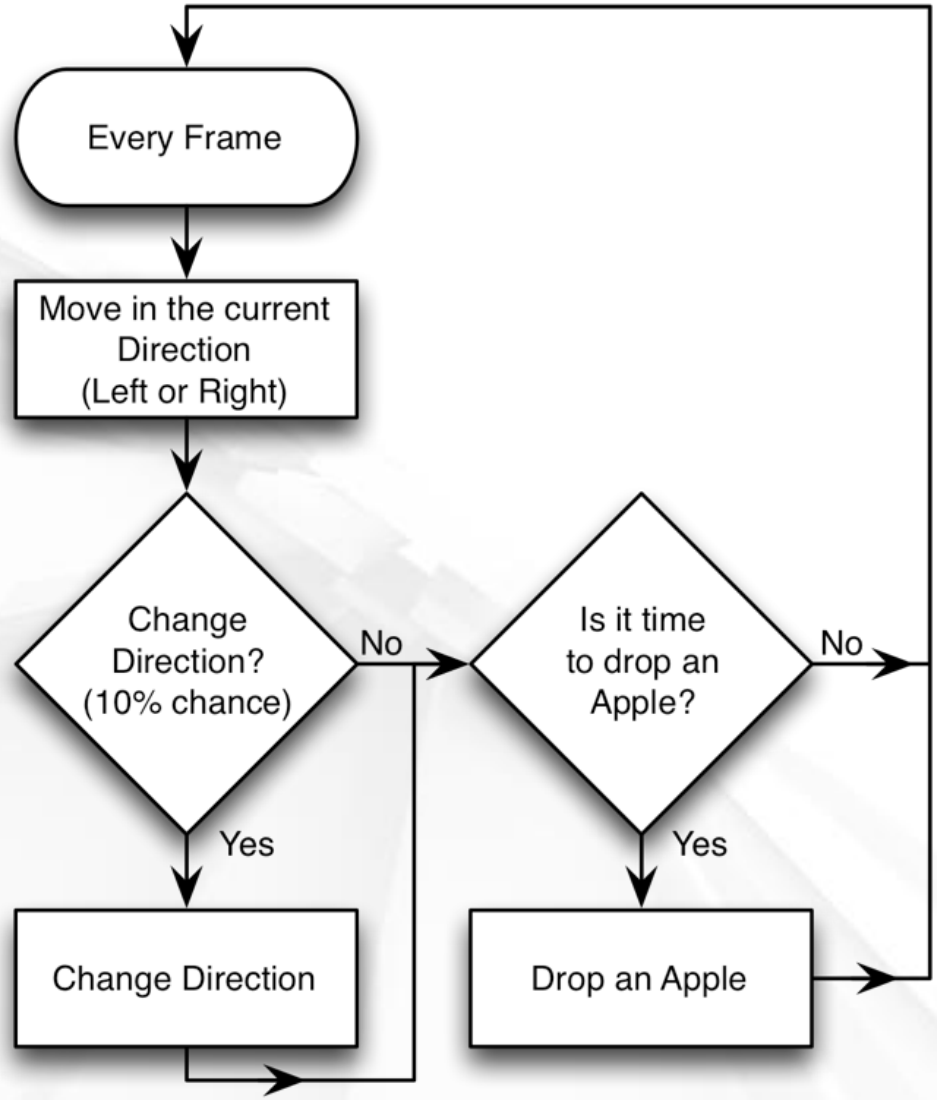
ApplePicker Flowcharts: Basket



ApplePicker Flowcharts: Apple



ApplePicker Flowcharts: AppleTree



Chapter 15 – Summary

- Board games have both explicit and implicit rules
- All rules for digital games must be explicit
- Computers only understand very simple, explicit instructions
- Programming languages (like C#) help us express these simple instructions to the computer
- Complex behavior can be broken down into much simpler instructions