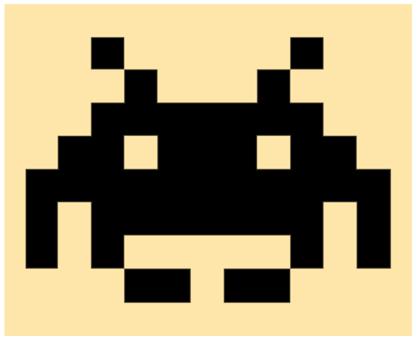
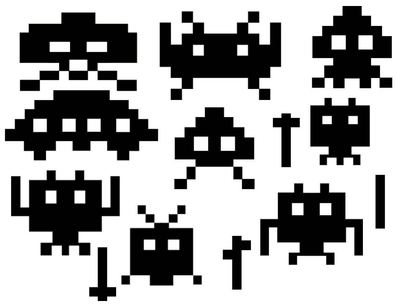
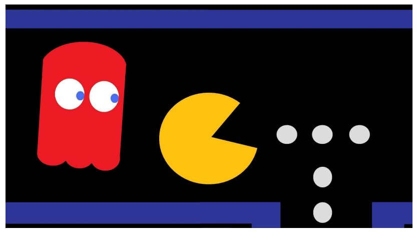
CSCI 1106 Lecture 3

Sprites







Announcements

- Today's Topics
  - Sprites
  - Costumes
  - Stage
  - Properties
  - Variables
  - Scripts
  - Cloning
  - Communication among Sprites

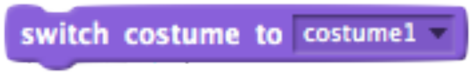
Recall: Sprites

- A sprite is a graphical object that is placed on the stage
- A sprite has associated with it
  - *costumes*
  - *properties*
  - *variables*
  - *scripts*
- A sprite represents game artifacts
  - Characters
  - Obstacles
  - Projectiles
  - Etc

Naming Sprites

- Key Idea: Each sprite has a name, e.g., *Ball*
  - The name should describe what the sprite is
  - Different sprites may have the same name
  - The name identifies the type of sprite, rather than a specific sprite
    - e.g., You can have several different car shaped sprites, all of them call *Car*
  - Most sprites will be unique
- Key Idea: Sprites are referred to by their name
  - There is no other way to refer to a sprite

Costumes

- Idea: A sprite can change its look by putting on a different costume
- A *costume* is a graphical representation of the sprite
- Each sprite has at least one costume
- Each costume has a name
- A sprite can change its look by switching costumes 

  switch costume to costume1
- Most sprites have only one costume

The Stage

- Idea: The *Stage* is a special sprite on which all other sprites are displayed.
- The stage does has *backdrops* rather than costumes, but they serve the same purpose
- All sprites will always be in front of the stage
- Like other sprites, the stage has
  – properties, sounds, and scripts associated with it

Properties

- Key Idea: All sprites have intrinsic *properties*
- A *property* is a characteristic of the sprite, e.g.,
  - *position* on the stage `x position` `y position`
  - *direction* of sprite (in degrees) `direction`
  - *costume* currently worn `costume #`
  - *size* of the sprite `size`
  - *visibility* (showing or hidden)
  - also: *colour, depth, etc...*
- Key Idea: Sprites are manipulated my modifying their properties
- But ... what if want to associate additional information with the sprite?

Extrinsic Properties

- Problem: We may wish to associate additional (*extrinsic*) information with a sprite, e.g.,
  - Lives or health of a character
  - Difficulty of destroying an obstacle
  - The amount of power in a power-up
- Observation:
  - Properties are typically represented as numbers, e.g.,
    - x position, y position, direction, etc...
  - Most extrinsic information is also represented as numbers, e.g.,
    - Health, Lives, Score, ...
- Solution: Use variables to associate extrinsic properties with a sprite

Variables

- Idea: A *variable* is a location in the program or a sprite that stores a value
- A variable has a name by which it is referenced
- A variable can be
  - accessed (read) to retrieve the value it stores
  - mutated (written) to modify the value it stores
- Idea: The scripts associated with a sprite can access and mutate the sprite's variables

Summary So Far

Sprite Name: Invader

Properties

10	x position
42	y position
90	direction
100	size

Variables

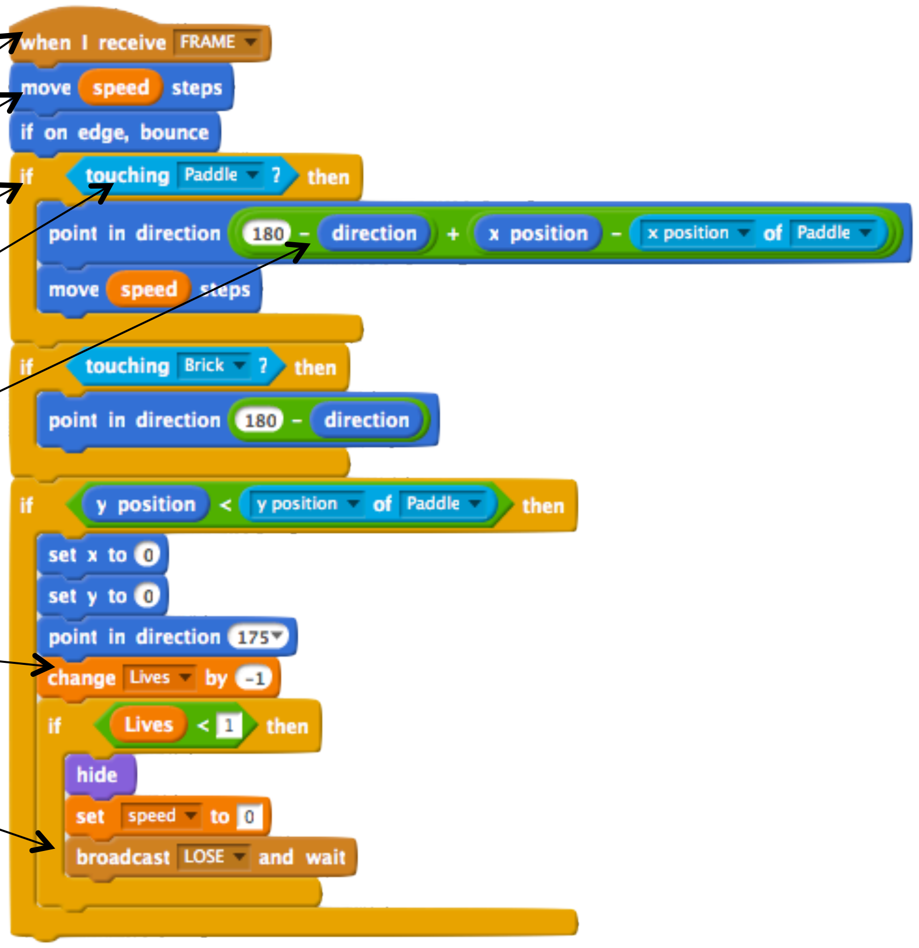
Score	123
Level	4
speed	5
Lives	2

Costume1

Costume2

A Sprite's Script

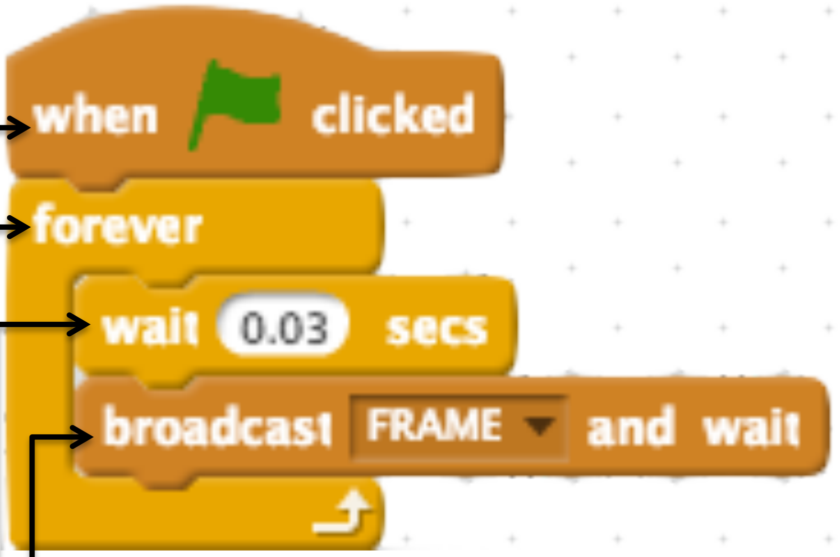
- Is a sequence of blocks
- Starts on a *when* block
- Contains
  - *motion* blocks
  - *control* blocks
  - *sensing* blocks
  - *operator* blocks
  - *data* blocks
  - *event* blocks
- Is executed when an event occurs



```
when I receive FRAME
move speed steps
if on edge, bounce
if touching Paddle ? then
    point in direction 180 - direction + x position - x position of Paddle
    move speed steps
if touching Brick ? then
    point in direction 180 - direction
if y position < y position of Paddle then
    set x to 0
    set y to 0
    point in direction 175
    change Lives by -1
    if Lives < 1 then
        hide
        set speed to 0
        broadcast LOSE and wait
```

A Script for the Stage Sprite

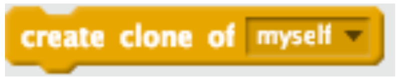
- Idea: Your game will need a FRAME event
  - 30 times per second
  - Allows sprites to update themselves
  - Generated by a script associated with the Stage
  - Generated when game is running
- Use the following script
  - when game starts
  - repeat forever
    - wait 1/30th of a second
    - generate FRAME event



```
when [flag] clicked
forever
    wait 0.03 secs
    broadcast FRAME and wait
```

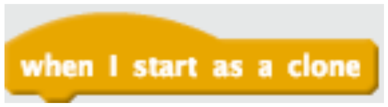
Manufacturing Sprites

Cloning Sprites

- Idea: We can make multiple copies of a sprite by *cloning* it. 

- When a sprite is cloned, everything is copied

  e.g., properties, variables, costumes, scripts, etc
- Key Idea: Manipulation of the clone or the original does not affect the other

  e.g., changing the clone's position will not move the original
- Both the clone and the original have the same name
- Two differences between clones and originals
  - clones are notified when they are created 

  - clones can be destroyed

Cloning Example

Sprite Name: Invader

Properties

10	x position
42	y position
90	direction
100	size

create clone of myself

Variables

Score	123
Level	4
speed	5
Lives	2

Sprite Name: Invader

Properties

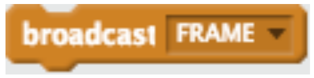
10	x position
42	y position
90	direction
100	size

when I start as a clone

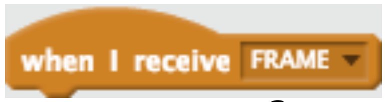
Variables

Score	123
Level	4
speed	5
Lives	2

Communication Between Sprites

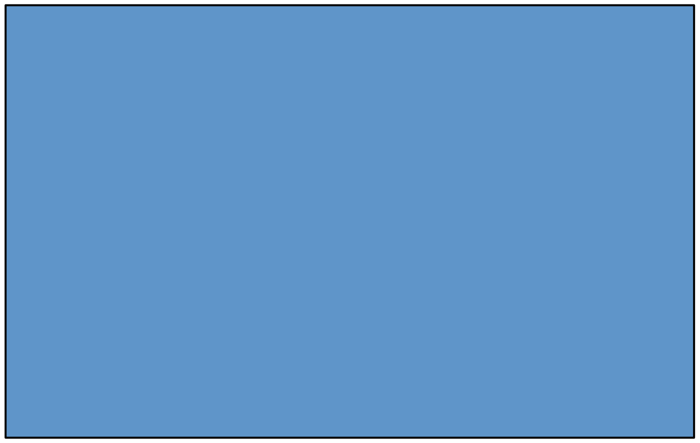
- Key Idea: Sprites communicate by broadcasting messages (events) 

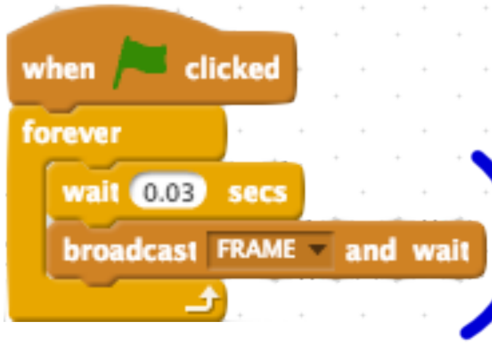
  - A broadcast means **every** sprite receives the message

    e.g., Stage broadcasts FRAME 30 times per second
  - A sprite can respond to a specific message (event) by having a script that receives it 

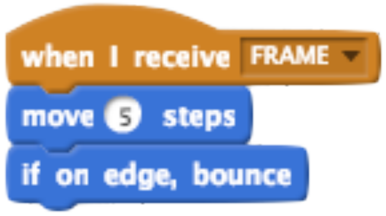
- Messages cannot be directed at a specific sprite unless only that sprite has a script to receive that message

Broadcast Example





```
when [flag] clicked
forever
    wait (0.03) secs
    broadcast [FRAME ▾] and wait
```



```
when I receive [FRAME ▾]
move (5) steps
if on edge, bounce
```