Lab 9: The Game of Life

1. Open the Golly simulator and use the Draw tool (the  button) to create a few simple Life patterns. Use the Space bar to update the generation one step at a time. You can reset a pattern to its original starting state by pressing Command-R. In addition to your own, try out the following initial configurations of cells. For each one, approximately how many steps does it take for the resulting activity to settle down to stable (fixed or periodic) behavior? In the fixed case, how many "still life" structures result? In the periodic case, what is the final period of oscillation?

A single horizontal row of 4 adjacent cells	
5 adjacent cells	
6 adjacent cells	
7, 8, 9, 10, and 11 adjacent cells	… etc …
12 adjacent cells	
An inverted U-shape of 7 cells	
The "R pentomino" pattern	

2. Download and unzip the folder **LifePatterns.zip** from the course web page (under Labs) and put it on your Desktop. This folder contains many of the example Life patterns that we saw in class. Spend some time exploring the Game of Life on your own by using the Golly commands below to load, run, and view these patterns. The next page lists the available patterns, grouped by general themes. Some things to try:

   - Look for an oscillating "flower" pattern that appears in the wake of a **PufferTrain**. Can you find it?
   - Try turning off a single pixel in the interior of the **SpaceFiller**, and watch the chaos ensue!
   - How well can you follow the "bouncing pinball" around the **Racetrack**?
   - Watch the **VacuumCleaner** in action on high speed.
   - Don't miss the **GollyTicker**!

Key	**Action**
Command-O	Load a pattern file into Golly
Arrow keys	Move around the Universe
[or **]**	Zoom out or in
Space bar	Update generations one step at a time
RETURN	Update generations continuously (press RETURN again to stop)
= or +	Increase speed
–	Decrease speed
Command-R	Reset pattern

3. You can also easily edit patterns by using the *Select* tool button to highlight a region of cells, and then cutting (Command-X), copying (Command-C), or pasting (Command-V) the cells as desired. Command-K unselects the current selection. Open the **GliderGun** pattern, make a copy of the gun, position the copy so that it points at the original gun, and then watch what happens! What if you place the second gun very close to the original?

4. Using the editing tools and whatever Life patterns you like, design a cool new interesting Life pattern or configuration. For example, you might try creating a group of synchronized Gliders or Glider Guns, or assembling a set of oscillating patterns that coordinate their behaviors in some way. Be creative!

List of Game of Life Patterns

Simple fixed or periodic patterns:

StillLifes
TTetromino
Oscillators
Clocks
Galaxy

Simple patterns that generate complex dynamics:

RPentomino
Acorn

Moving structures:

Glider
Humanoid *(generates a Glider)*
GliderEater
Fish
Spaceships
Flotilla
SpaceshipRace
PufferTrain
PiFusePuffer

Shuttles and guns:

Shuttles
Bounce
GliderGun
GliderGun2
FishGun

Structures that grow infinitely large:

InfiniteGrowth1
InfiniteGrowth2
InfiniteGrowth3
SpaceFiller
Breeder
Breeder2

Large structures with complex interactions showing various types of signal propagation:

SpaceshipGun
Racetrack
GliderStreamCrystal
VacuumCleaner

Irregular and unpredictable long-term behavior:

BrokenLines

Huge, very organic-looking structures:

BigSpaceship
BigGun
BigGun2
SpaceshipFactory
ZigzagWickstretcher *(looks like a ribosome moving down a strand of RNA)*

Programmable structures:

GollyTicker
MetaGalaxy *(Life simulated inside of Life!)*