


Artificial Life

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What is life?



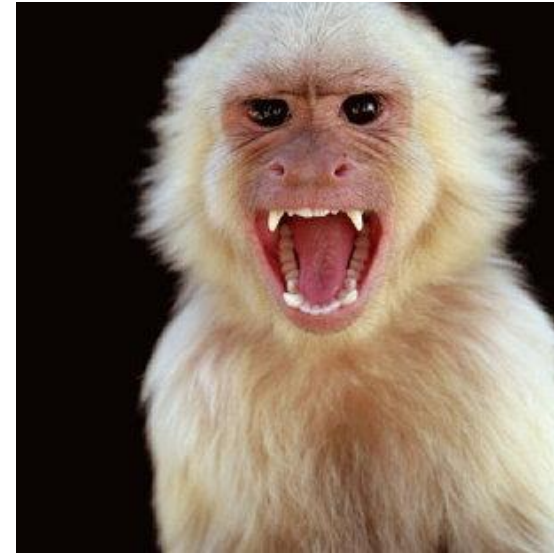


What are the
requirements for
life?

Life Has....

Homeostasis: Regulation of the internal environment to maintain a constant state.

Warm Blooded - Internally



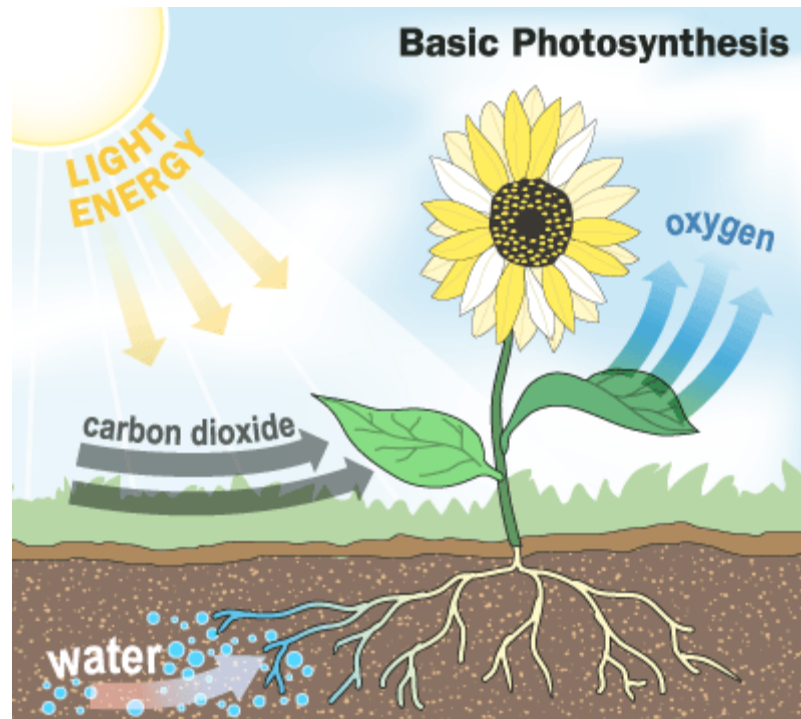
Monkey

Cold Blooded – Externally



Gecko

Metabolism: Consumption of energy by converting chemicals and energy into cellular components.



Plants use light and water to make sugar, this process is called Photosynthesis .

Growth



Snail Shell



Tree Rings



Hermit Crab

Adaptation: The ability to change over a period of time in response to the environment



Lantern Fish



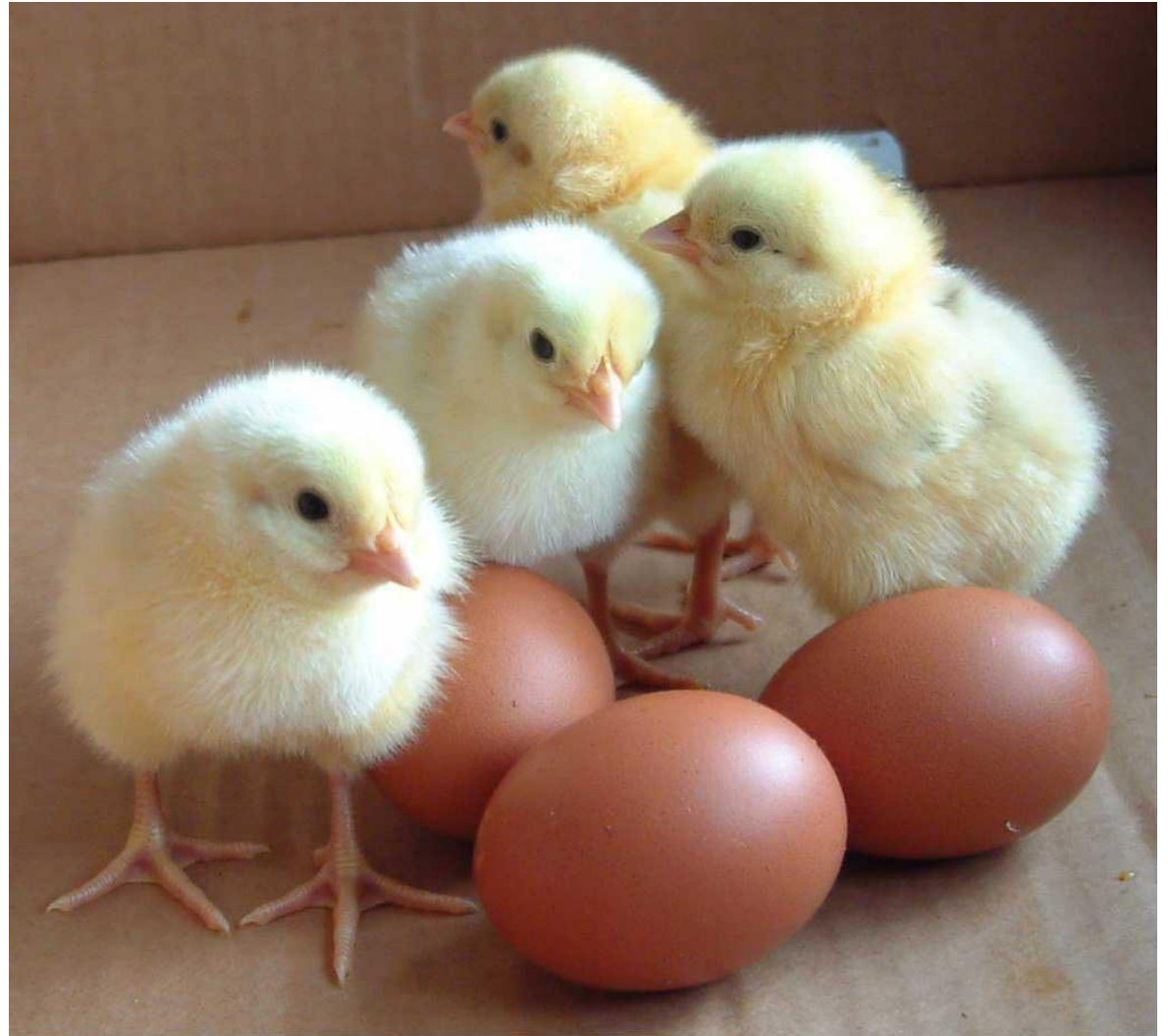
Angler Fish

Response to stimuli



Venus Fly Trap

Reproduction





Artificial Life

Computer Simulation

Computers – What are they good for?

- Calculations
- Storing Data

Augmentation of Computers...

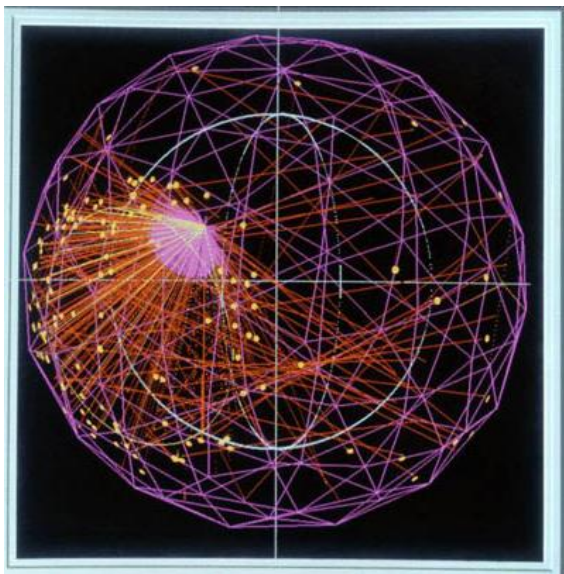
Need for an interface to the real world.

How do we make computers interact with humans and act more human-like?

(Sensors & Actuators, including Keyboard, Mouse, Monitor)

Reasons for creating an artificial world:

- Test theories about Biological Behavior or Physical Properties
- Fun and Games
- Training and Rehabilitation



Your world
Your rules

In a simulated world, you define the
rules and formulas for your world.

Watch your world live!

How To Create an Artificial World:

Observe real life and identify
Variables...

Discover what effects things. If you
change something what is the result.

Develop rules to simulate this life.

Interaction
with the environment
Features of the real world (time,
climate, etc.)
How to mimic these in an artificial
world

What are our 5 senses?

- Sight



- Hearing



- Smell



- Taste



- Touch



What is real?



How can you sense what is around you if you cannot see (Substituting one sense for another)?

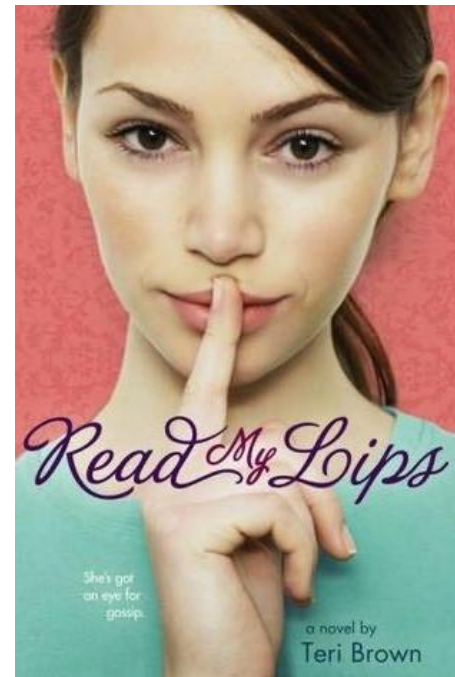
Echo Location (Bats, Dolphins)

Touch
things



How can you tell
something makes a
sound around you,
if you cannot hear?

Read Lips



How can a computer represent the 5 senses for artificial life?

Sight? Cameras



Hearing? Microphone



Touch? Pressure Sensor

Taste and Smell?
Chemical Sensors



How do we learn?



We learn by...

Empirical Observation (Self)



- Extrapolation (Watching others)



- Reinforcement
(Reward or Penalty)



- Someone tells you information



- Innate -

Innate behaviors are the things an animal can do or has the urge to do without being taught.

Behavior that is hardwired in from birth.



Memory:

If-Then Memory

If you do something and get a result, next time the result may be similar.

"Memories are formed by strengthening the connections between brain cells, known as synapses. If you touch a hot stove, the pain signal from your hand and the visual signal from your eyes reach the brain at about the same time, forging a memory."



[Reference](#)

Communication:

Discussing Ideas

History

Communications and memory for artificial creatures

Artificial Intelligence

How do computers remember what they learn and communicate to each other?

Computer memory
(RAM)

Disk storage

Network access

Examples of Artificial Life

- Robotics
- Video Games
(Street Fighter)
- Virtual Reality (2nd Life)



Transformer Video

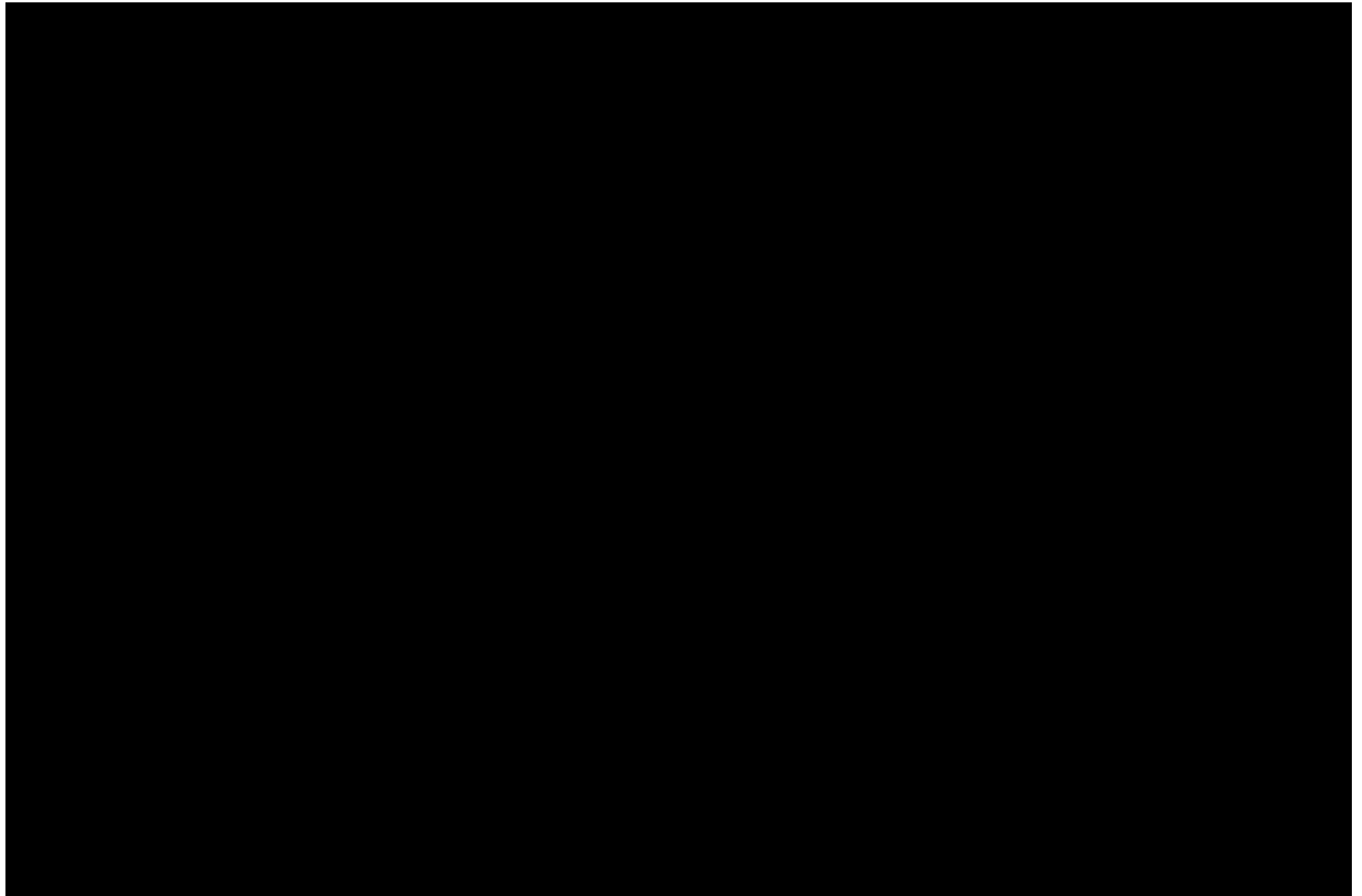


Video Game – AI (Makes Mistakes)



The computer controlled racers do not avoid the car on the track.

Second Life – Thriller Video



Programming a Virtual World

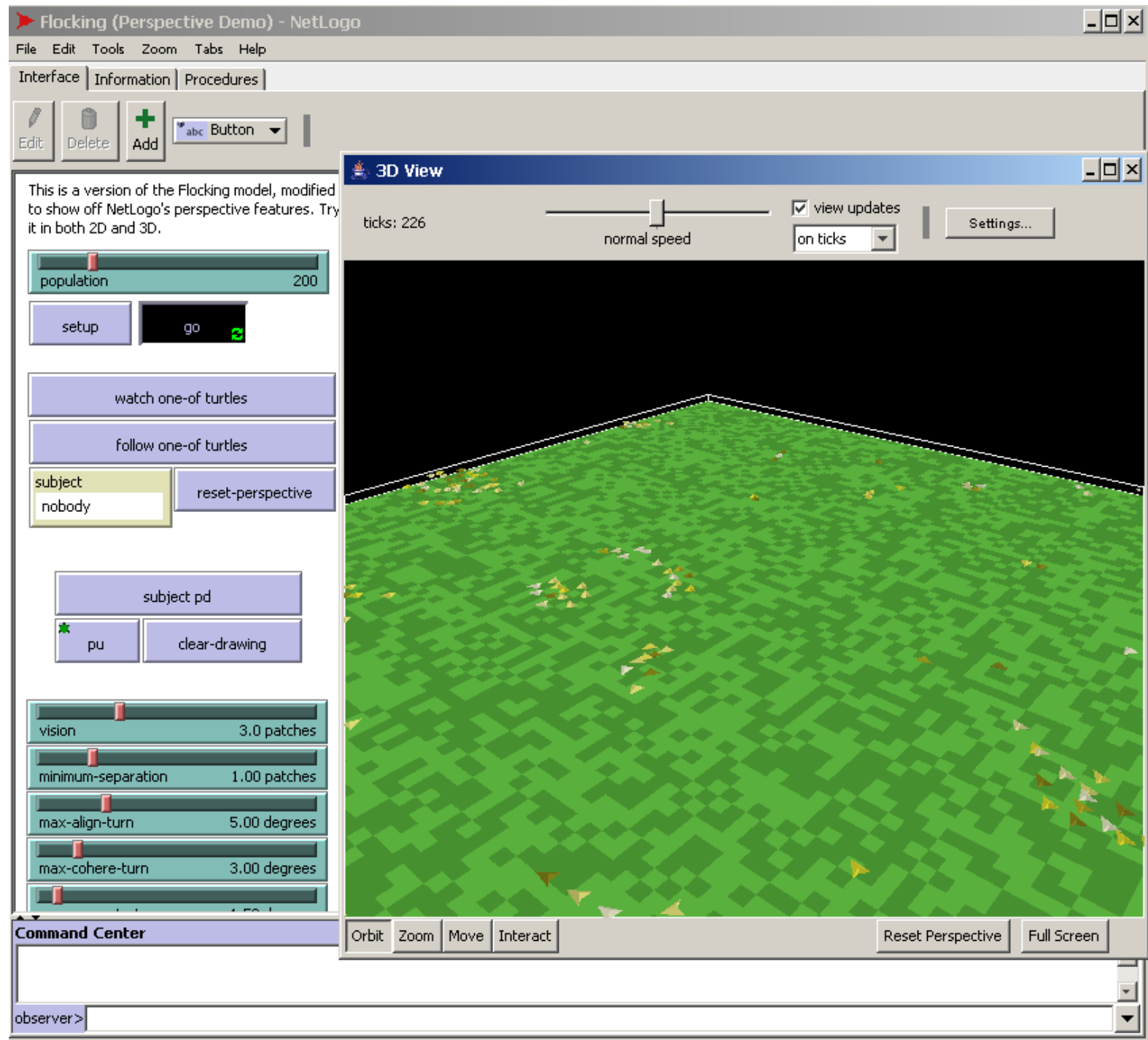
Netlogo

An authoring tool to create
a virtual world

Logo used to be for controlling a robot and drawing



Netlogo lets you create your own virtual world



Netlogo contains “turtles” which you can control.

In Netlogo you can observe the world and tell the turtles to do things.

You can ask all the turtles, or you can ask specific turtles.

Turtles don't have to look like a turtle, you can define them to look like anything you want to draw.

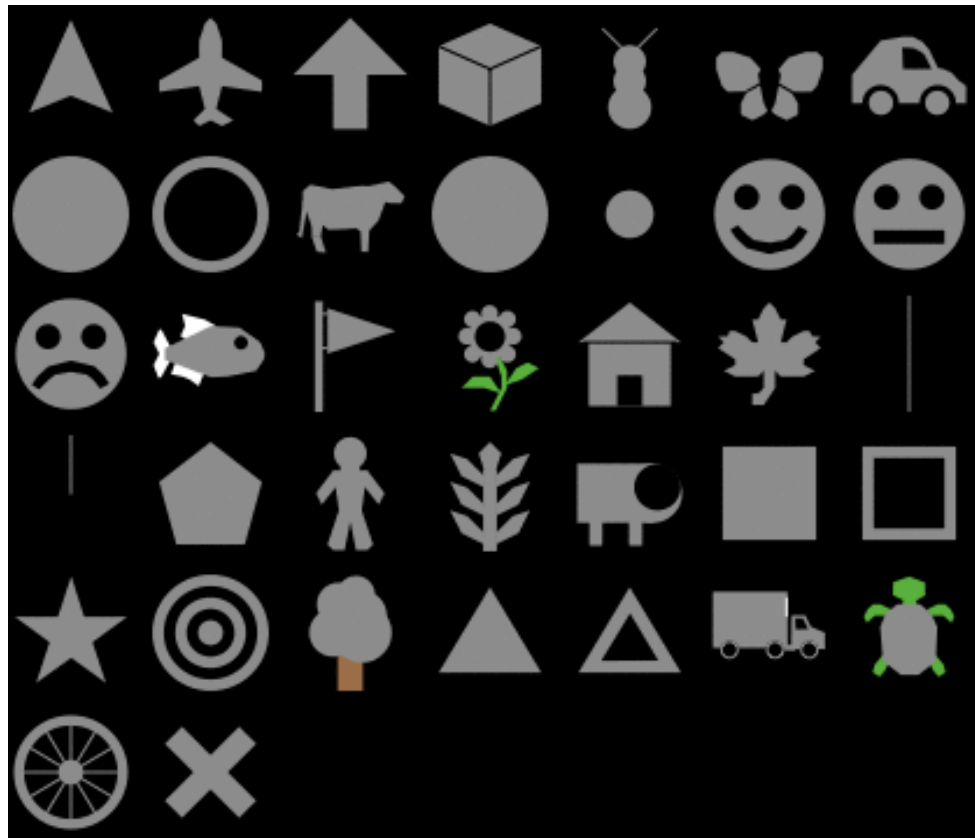
For example you can tell a turtle to:

- Move forward (or some direction)
- Move towards another turtle
- Set a value in the turtle (such as health)
- Hatch (give birth to a new turtle)



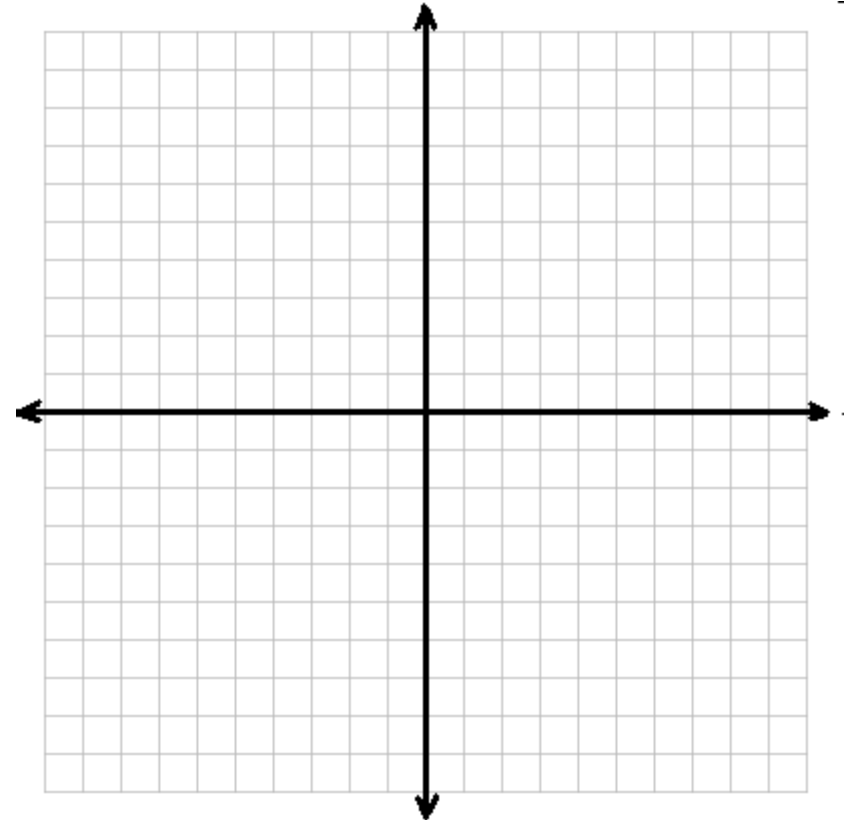
Agents – Controllable and interact in the world.

NetLogo enables the quick and easy authoring of models



You'll need some basic math

- Algebra
- Coordinate Plane
- Plotting a graph



Multimedia aspects

Storyboard

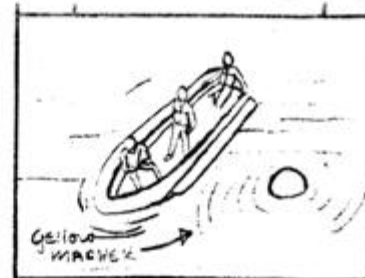


DOCTOR
That is impossible. Only human
mutation is designated by the surgo-
records.

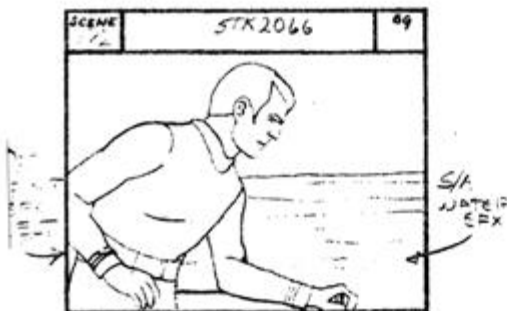


SPOCK & KIRK LOOK AT EACH OTHER

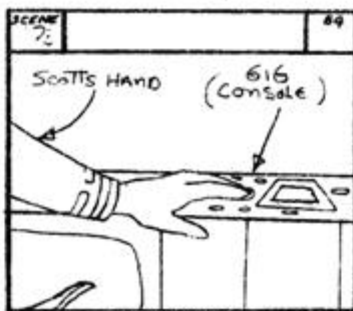
~ music sting ~



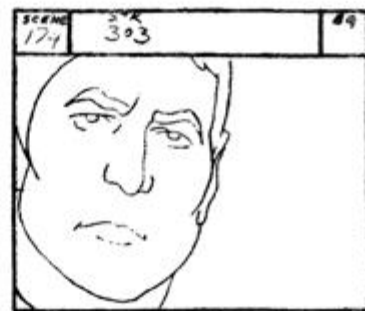
McCoy's VOICE
(on communicator)
Enterprise to Mr. Scott



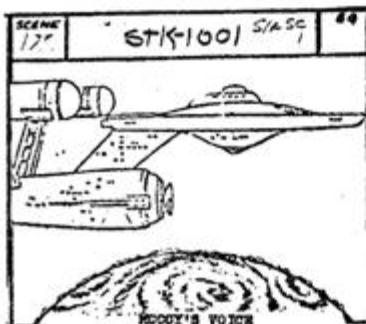
SCOTT
Scotty here. What is it,
Doctor?



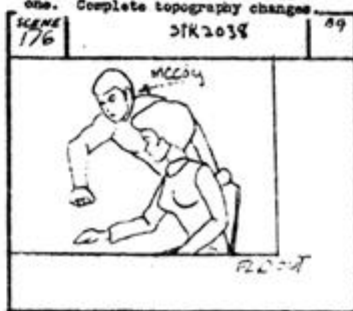
MCCOY'S VOICE
(on communicator, urgently)
Sensors just gave us an update
reading, Scotty. There's a sea
quake due in that area -- a bad
one. Complete topography changes



SCOTT
How soon?

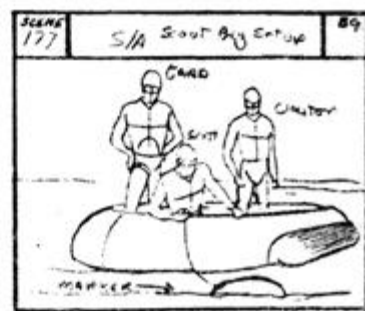


MCCOY'S VOICE
(on communicator)
Within four hours. When are
Jim and Spock due to make contact?
SCOTT
MCCOY'S VOICE



SCOTT
We can try like blue blazes.
Scott out.

Diss



(SCOTT'S SIGNAL CUES)

2D graphics

3D graphics



Graphical User Interface



Sounds



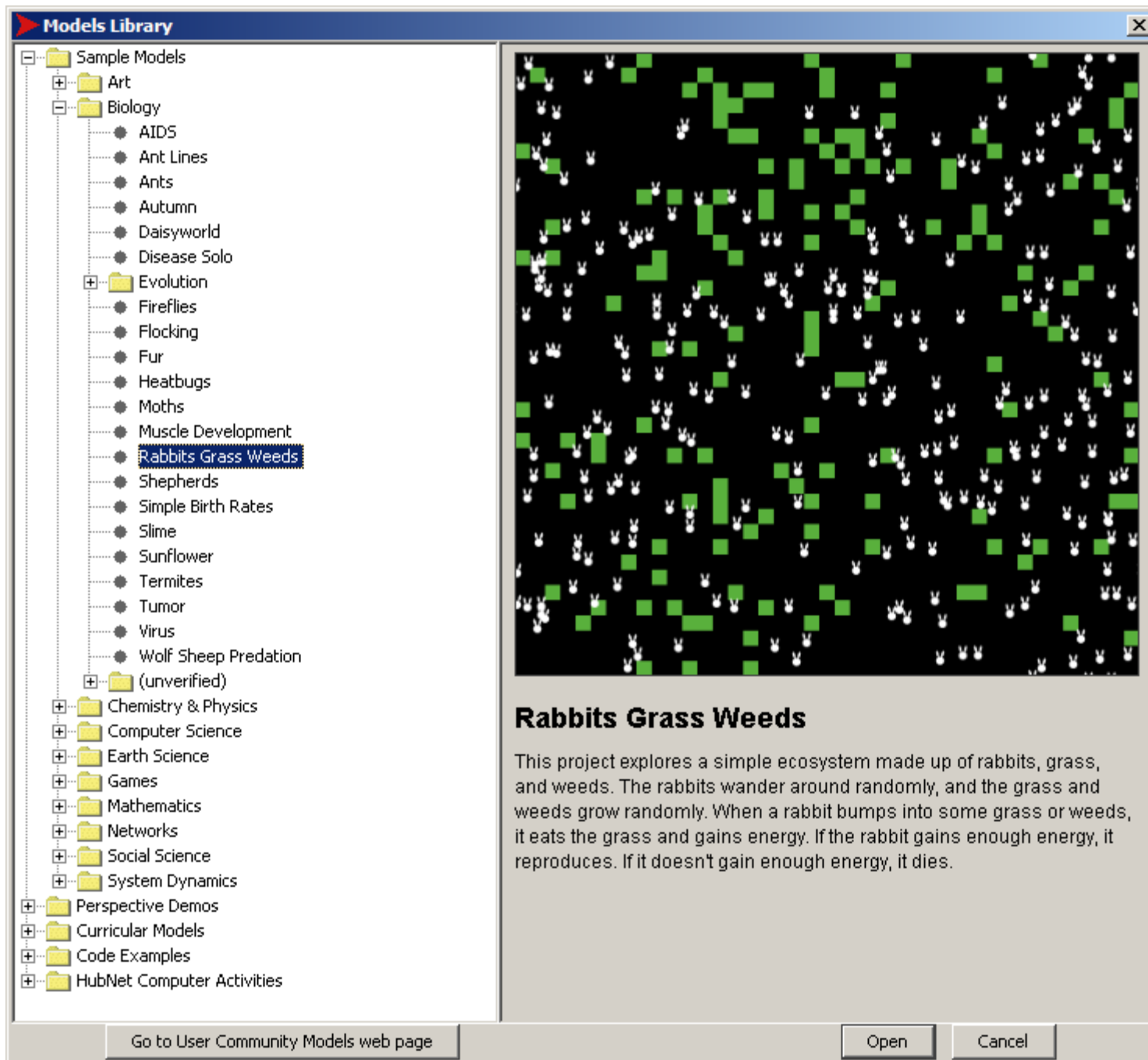
Closing Remarks:

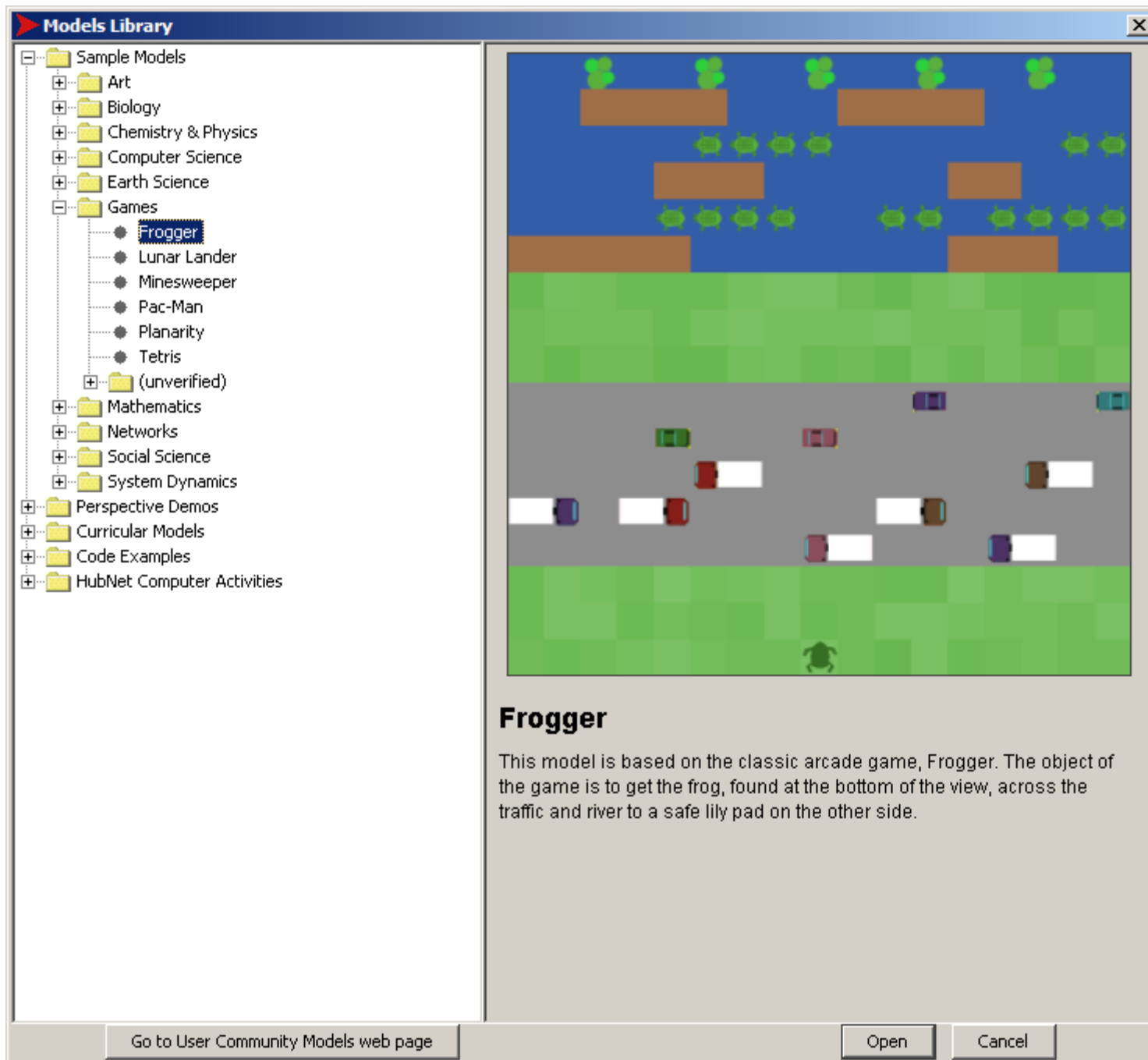
- Come up with the idea for your simulation.
- Do research on how the simulation should behave.
- Create a storyboard or diagram for the look of the simulation.
- Program it.
- Test.
- Fix bugs until the project works perfectly.
- Publish.
- Think about taking a Six Week Seminar in Artificial Life!

Let's play with Netlogo!

You can download it for your home computer. It's available for both Mac and PC for free!

Let's try some examples...





The End

Any Questions?