Plant Modeling Using Environmental Parameters

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Abstract

- Modeling plants using environment parameters

- Genetic algorithms

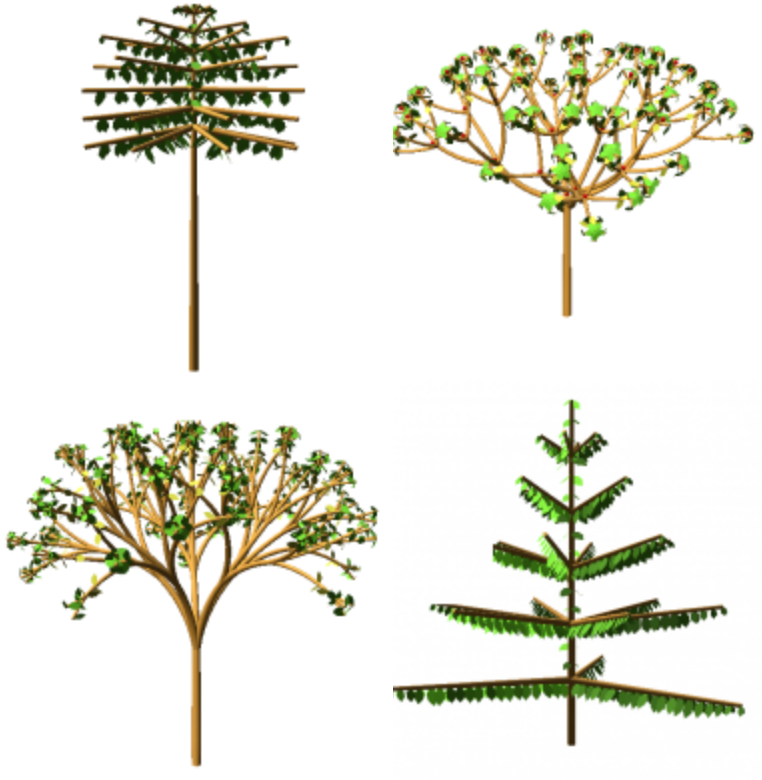
Introduction

- Karl Sims
- LSystem
- Panspermia

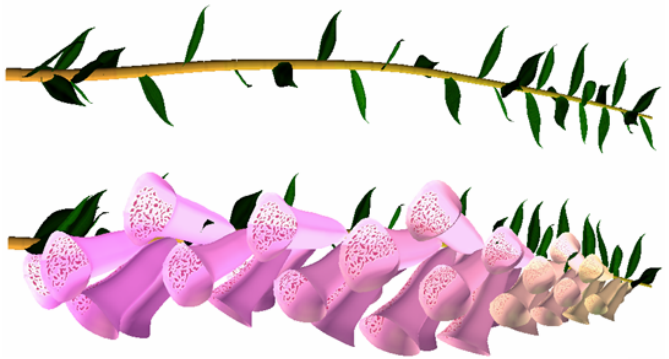
Existing framework

- OpenAlea
  - VPlants: L-py
  - PlantGL

“OpenAlea is an open source project primarily **aimed at the plant research community**… ... OpenAlea includes modules to **analyse, visualize and model** the functioning and growth of plant architecture.”

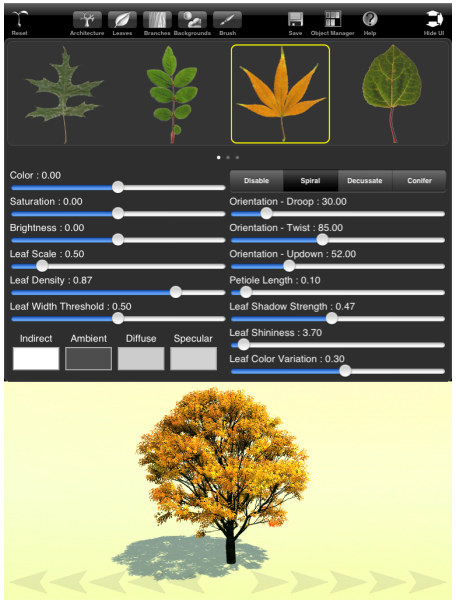


Existing framework



- Algorithmic Botany
  - VLAB
  - L-studio
  - TreeSketch

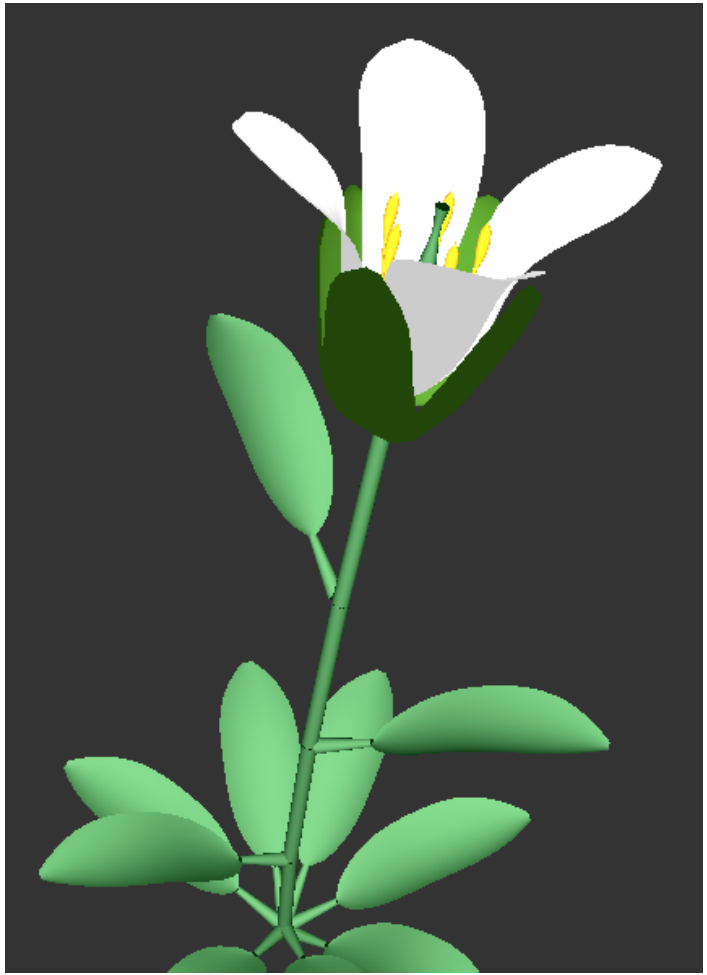
“The [Biological Modeling and Visualization] group studies the modeling, simulation, and visualization of plants.”



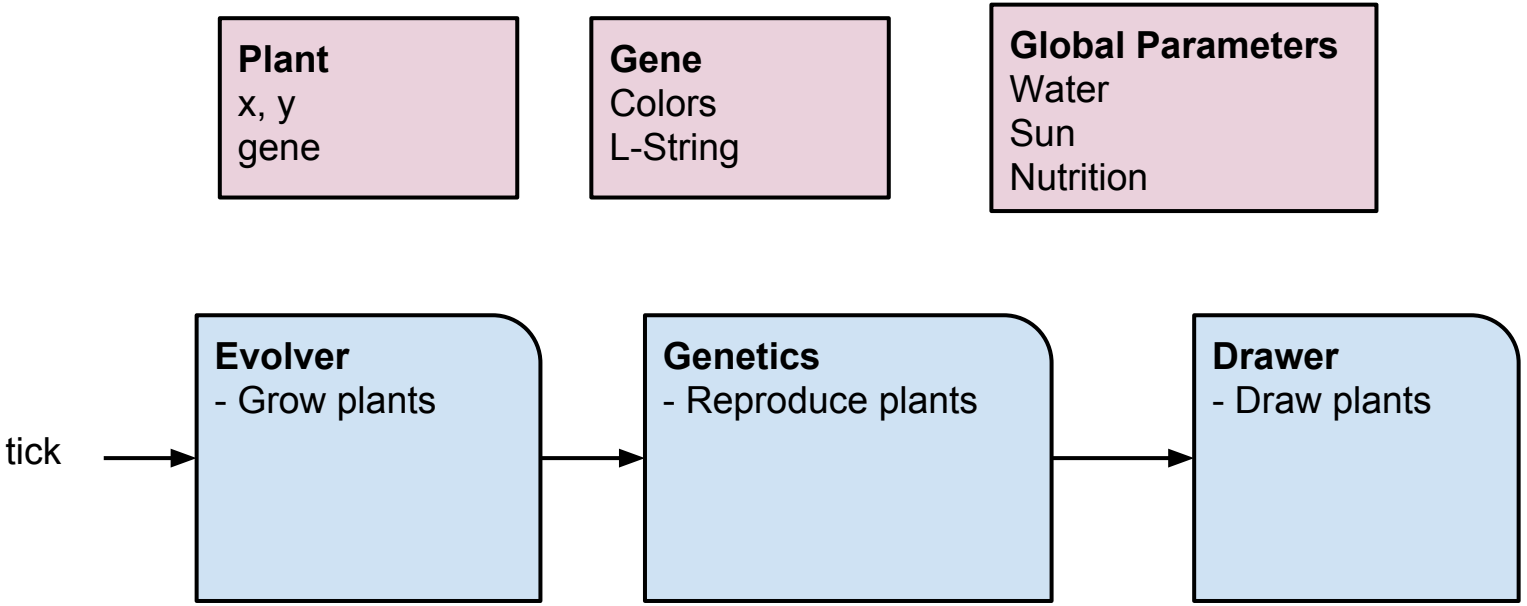
L-systems in L-py

```
# floral apex = Receptacle internodes + lateral organs.
# p corresponds to relative height in the receptacle (flower
profile):
# (p ranges from 0 to 1)
# State corresponds to zone (1=sepal,2=petal,3=stamen,
4=carpel)

FA(t):
  p=0
  for s in xrange(4): # loop on the states (=zones)
    zone_size = pth[s+1]-pth[s] # height of the current zone
    len = zone_size/nbwhorls[s] # length of an internode in
this zone
    for i in xrange(nbwhorls[s]):
      p=p+len
      w = receptacleProfile(p) # normalized width
      len2 = len * receptacleHeight # scaling length
      w2 = w * receptacleWidth  # and width
      beta = computeNormal(receptacleProfile,p,dp)
      #print "beta = ", beta
```

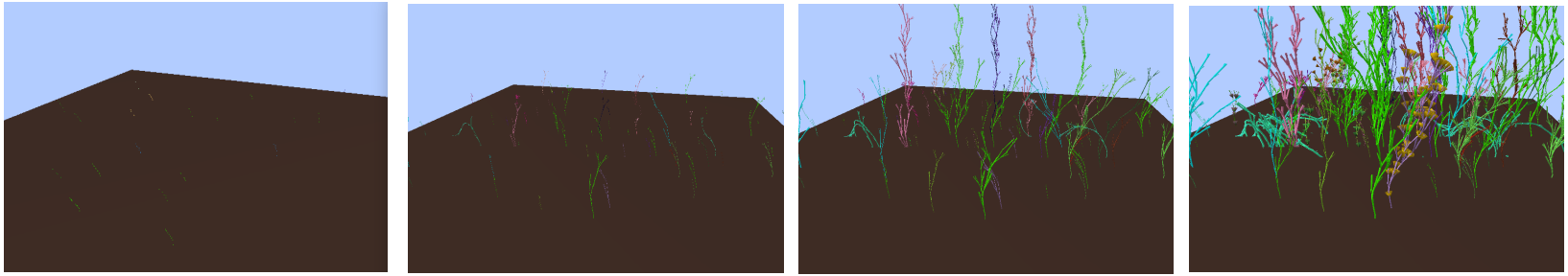


Architecture and Models



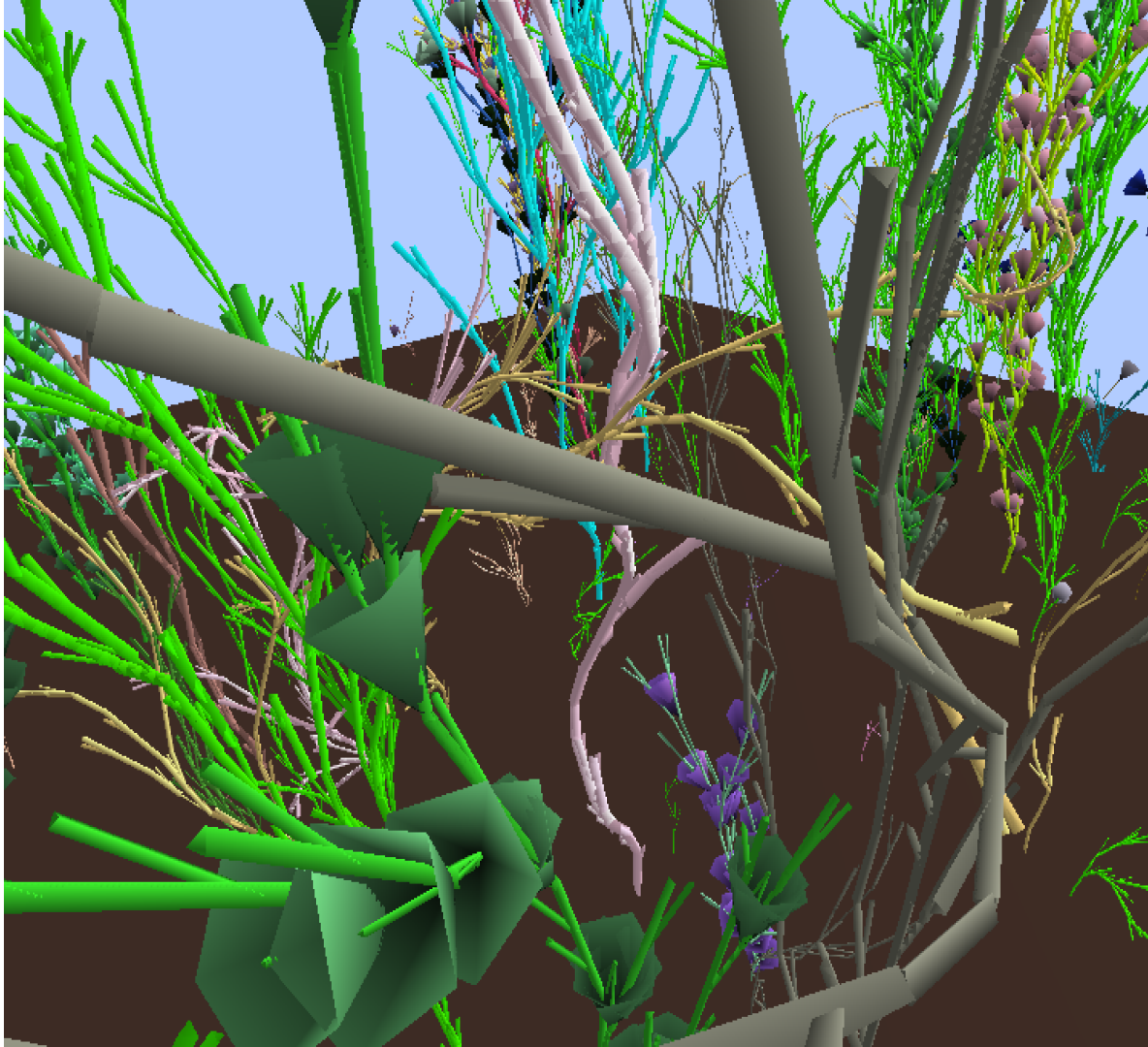
Simulation

- 8 tick is one season
- Plants grows over one season
- World evolves over multiple seasons

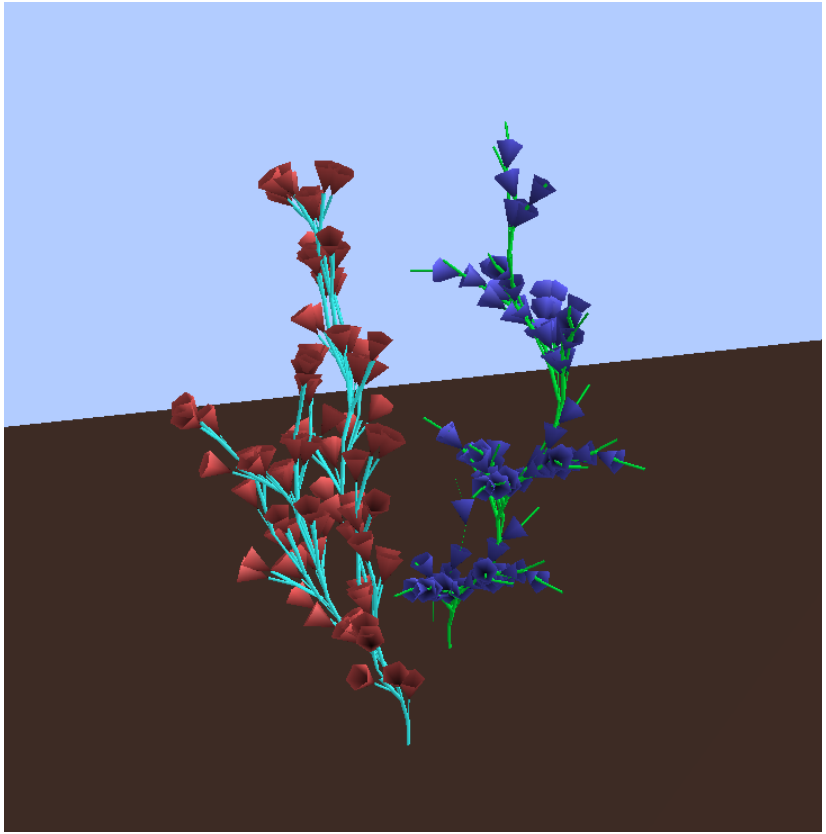


Genetics

- Asexual vs sexual
- Mutation
- Environment parameters



Demo



Future work

- Seasons should be controlled by sun and water factors
- Plants reaction to sun, water and nutrition