

# Semantic Visual Search: Visual Exploration of Spore Creations



CS294 Initial Problem Presentation

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# Problem Description



Spore database:  
140 million+  
creations

How do you  
browse / search  
this data?

How do creatures  
relate to each  
other?

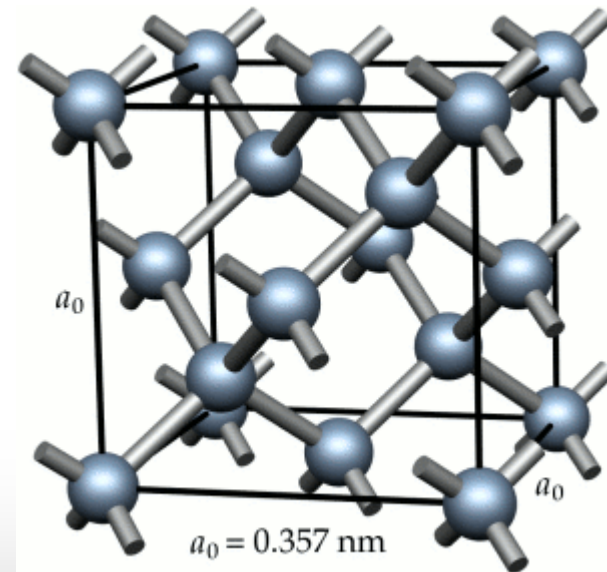
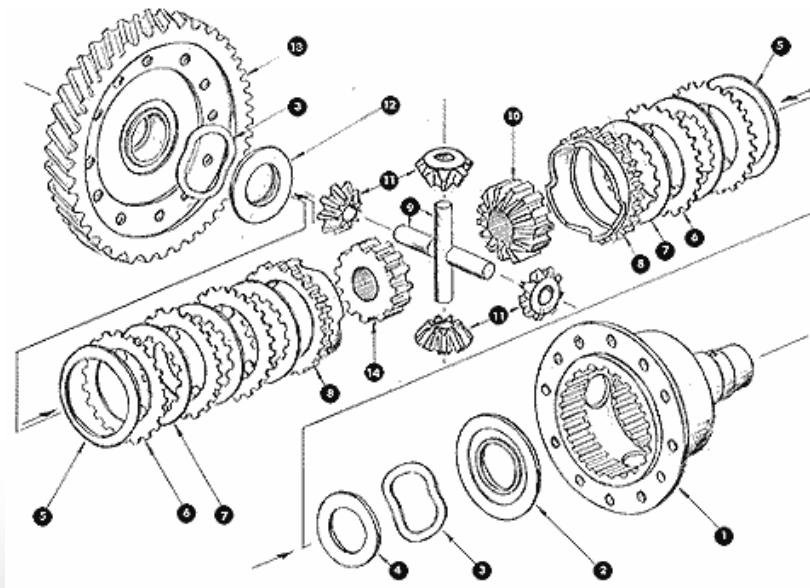
# Motivation: Not Just For Games

**Biology** (taxonomy, eg: Encyclopedia of Life)

**Mechanical Engineering** (automobile parts commonality)

**Chemistry** (crystal structures / formations)

Anything that can be broken down into building blocks



# Existing Keyword-based Search

**Slow, not very interactive**

Type in search terms, select category, pages of results

**Inaccurate, imprecise**

Mislabeled / mistagged creations, ambiguity

The image shows a search interface with a green and white color scheme. At the top, there are four navigation tabs: 'Home', 'Browse', 'Search', and a partially visible 'Log Out' tab. The 'Search' tab is currently selected. Below the tabs is a search bar with the placeholder text 'Enter Search Term' and a 'Search' button with a magnifying glass icon. Underneath the search bar, there are four filter options: 'Creation Name', 'Creator Name', 'Tags', and 'Description', each with a checked checkbox. Below these is a section for 'CREATION TYPE:' with four options: 'Creatures', 'Buildings', 'Vehicles', and 'Adventures'. Each option has a checked checkbox and a link to 'select subtypes'. At the bottom, there is a 'FILTER BY:' section with four radio button options: 'Newest', 'Highly Rated' (which is selected), 'Recent Highly Rated', and 'All (slow)'. Below the radio buttons are links for 'Select All' and 'Select None'.

# Example: Search for 'Insect'



Ordering is not meaningful  
Filter by 'Highest Rating', 'Newest', or 'Featured'

How do you refine your query?  
Hard to find similar results

# Solution

## Dynamic query techniques

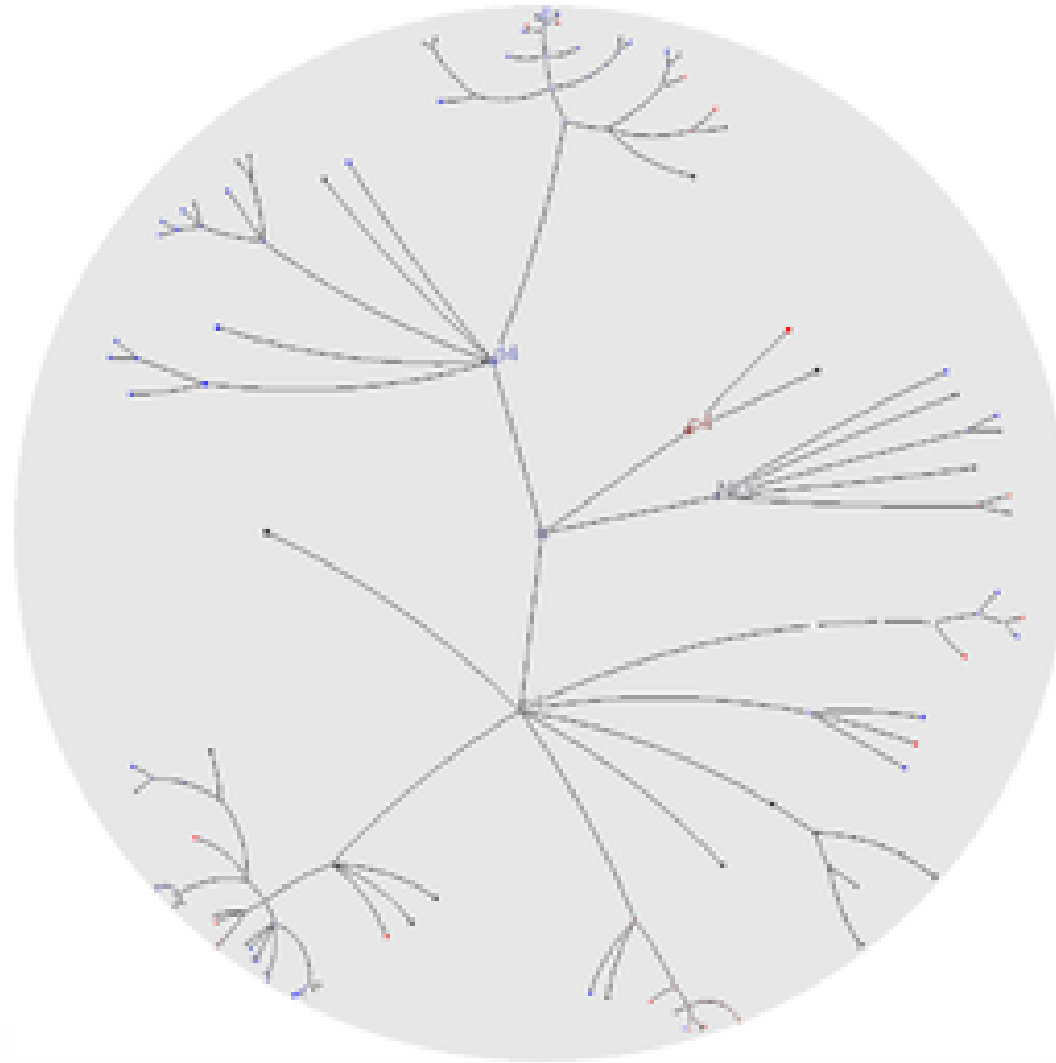
Trees with overview, zoom & filter, details-on-demand

## Auto-generate semantically-meaningful results

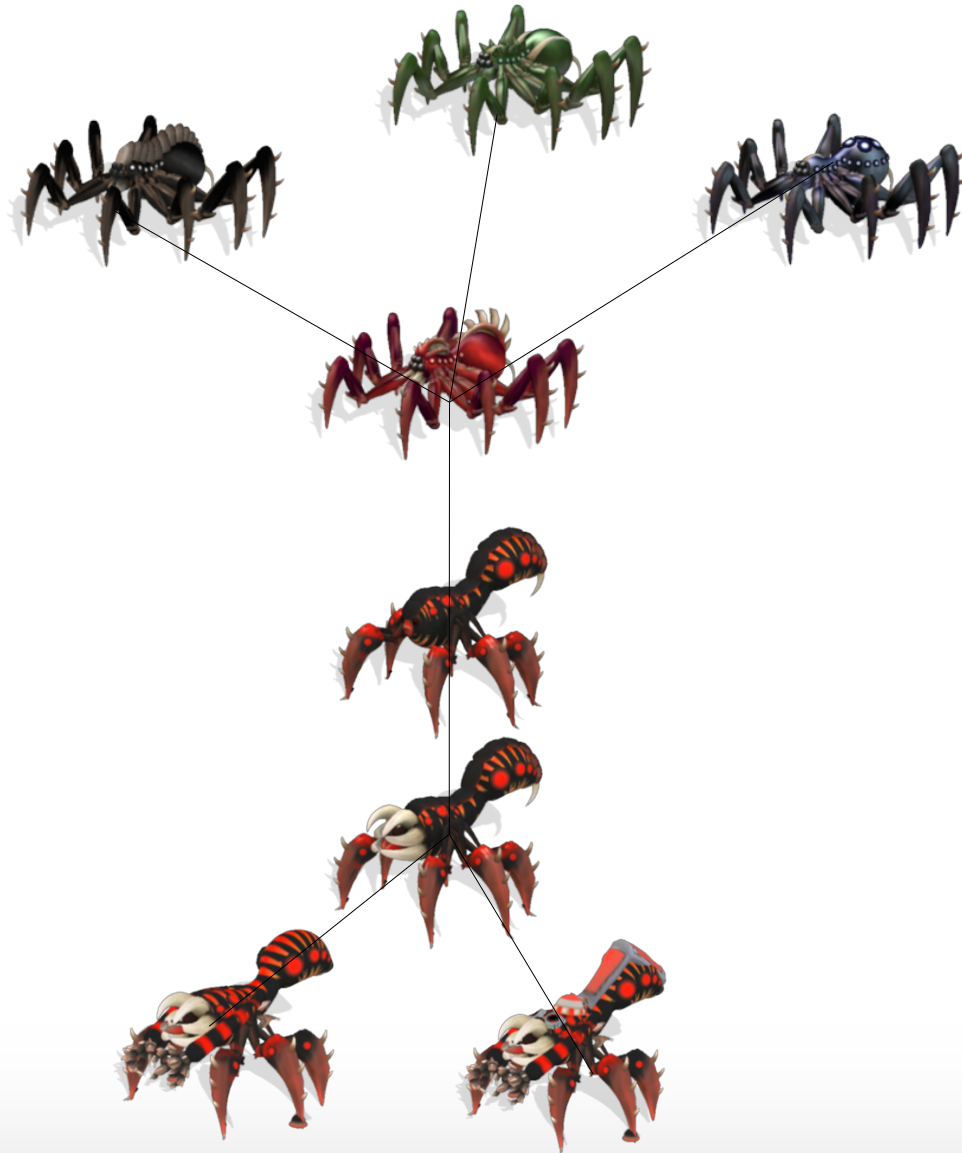
linked by lineage, morphology, creator, etc.



# Storyboard: Overview



# Storyboard: Zoom





# Storyboard: Filter

**Example: 6 legs**



# Storyboard: Details-On-Demand

**Mutated Spider** Not rated

By Klondyke  
03/28/2010 - 23:25:56

Type: Creature  
Rating: -1 (Not rated)  
Tags: bug, ganik, insect, overkill10k

Lineage 

Details  
+ Analysis  
View on Spore.com


Download 

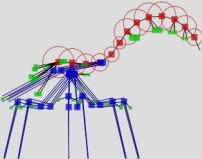
See more... 



**Description**



Ganik are the fiercest of the fierce. They will attack anything they come in contact with. They live in a barren desert on a planet named "Saneeshia".



**Details**


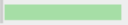
Height: 2.12 



Cost: 1675 DNA points  72 Bones 

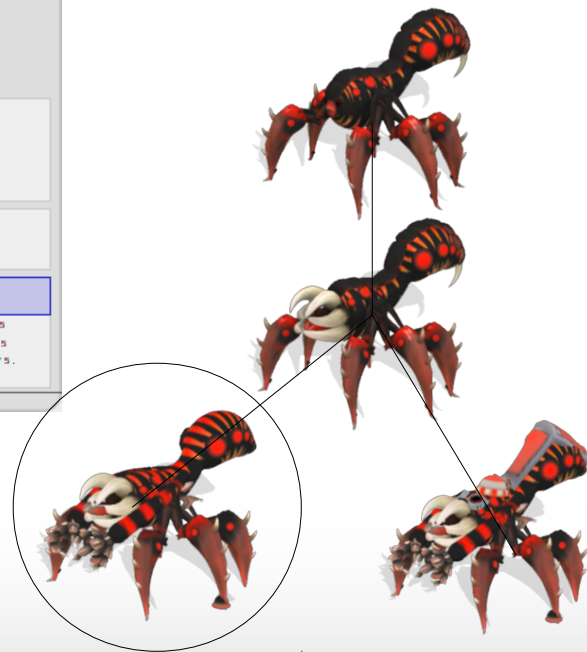
Diet: Carnivore  4 Feet 

Health: +5  2 Hands 

Meanness: 17%  Cuteness: 57.77% 

Sociability	Aggressiveness	Hability
4 / 20	13 / 20	9 / 15
Sing: 1 / 5	Draw: 3 / 5	Glide: 4 / 5
Dance: 1 / 5	Charge: 1 / 5	Spine: 0 / 5
Gesture: 2 / 5	Strike: 4 / 5	Stealth: 1 / 5
Posture: 0 / 5	Spit: 5 / 5	

Series: 1.0 / Developer: 0.0

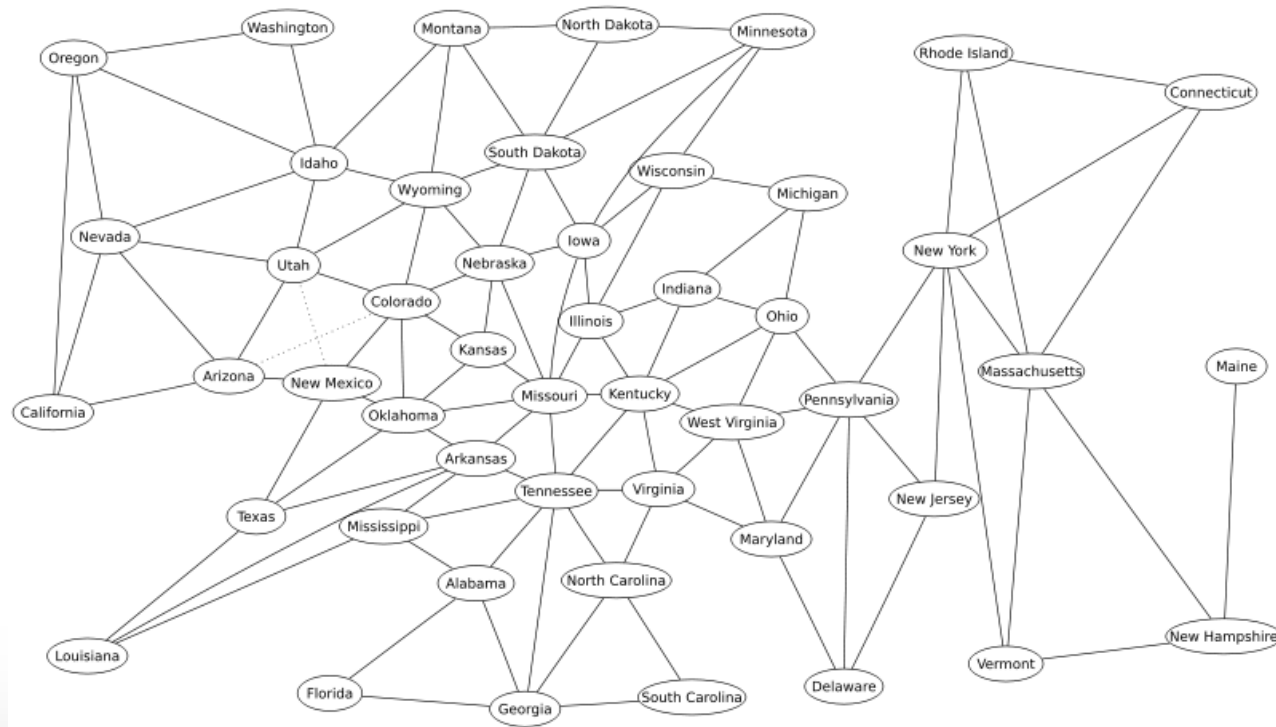


# Related Works: GraphViz

Emden et al: An open graph visualization system and its applications to software engineering

<<http://www.graphviz.org/Documentation/GN99.pdf>>

**Automatically convert text description into graph**

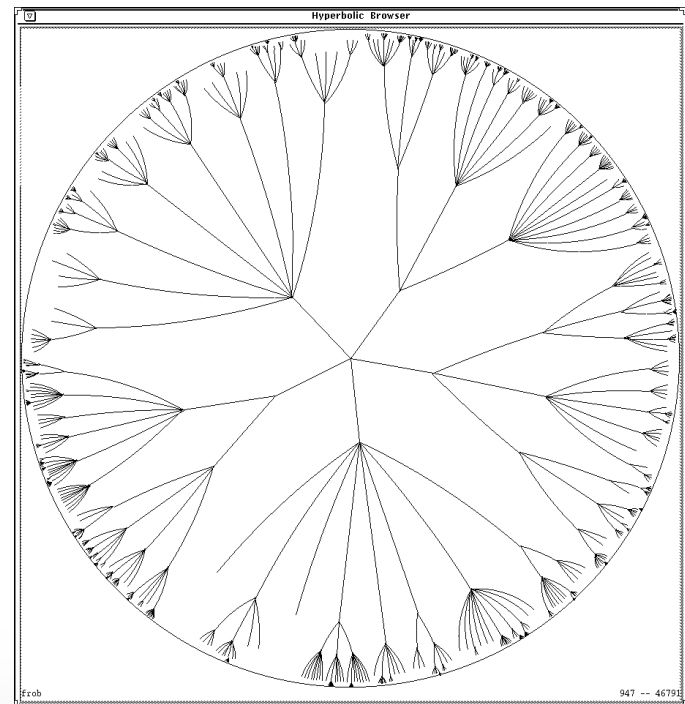


# Related Works: Hyperbolic Trees

Lamping et al: A Focus & Context Technique Based on Hyperbolic Geometry for Visualizing Large Hierarchies

<http://portal.acm.org/citation.cfm?id=223956>

**Fish-eye lens view of entire tree reduces visual clutter**



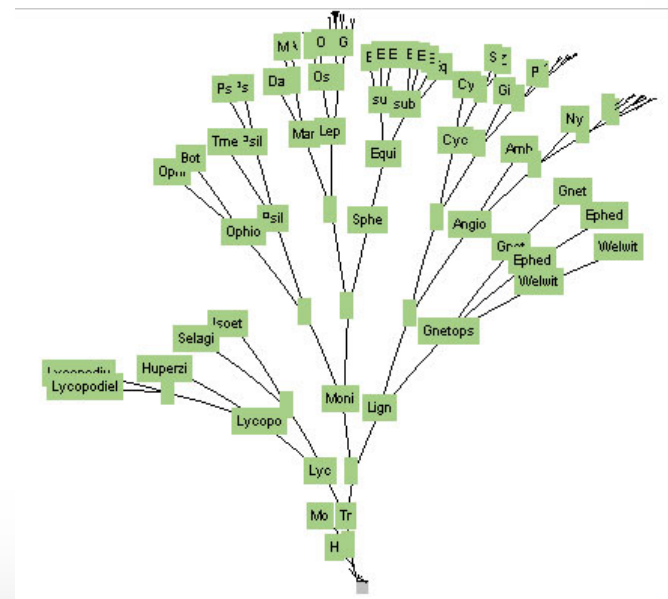
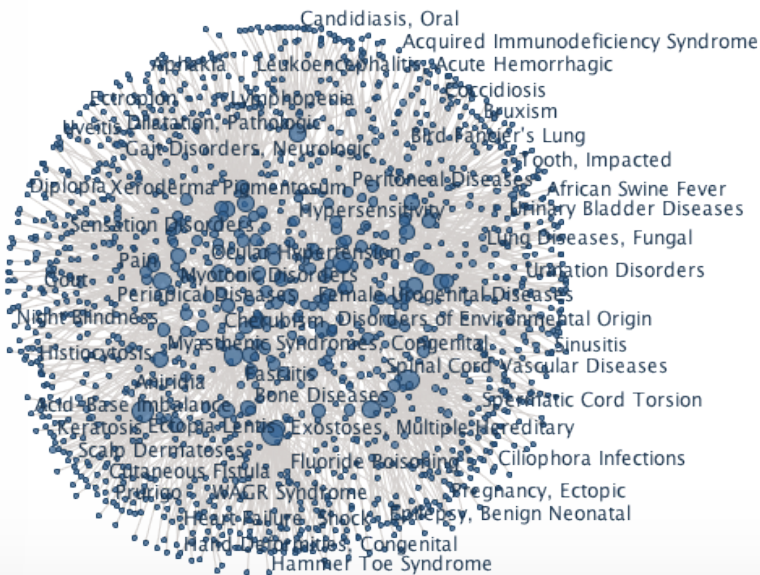
# Related Works: Hyperbolic Trees

NSF Tree of Life

<<http://ucjeps.berkeley.edu/TreeofLife/hyperbolic.php>>

Disease taxonomy (ManyEyes)

Hyperbolic tree applets with overview, zoom, but no filtering or details-on-demand.

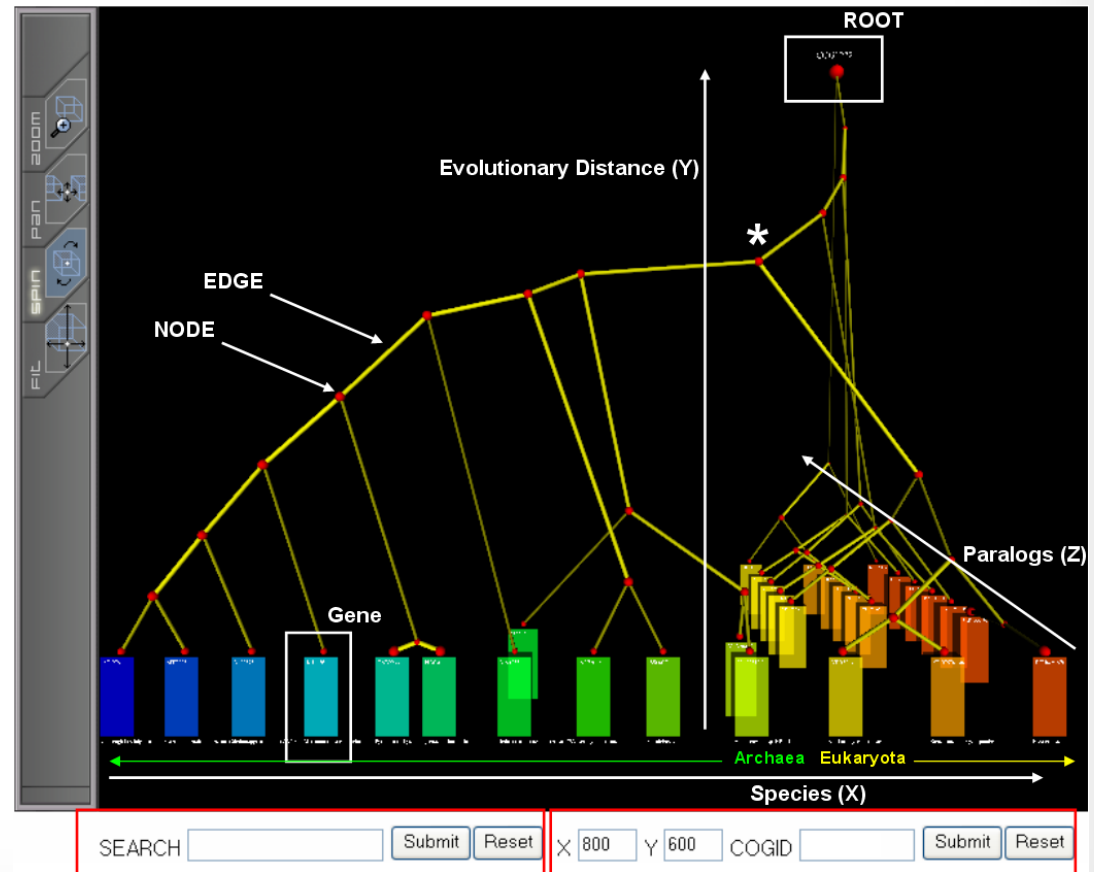


# Related Works: Phylogeny

3DPE: 3D Phylogeny Explorer:  
<http://bioinfo.mbi.ucla.edu/3DPE/>

Phylogeny shows hierarchy (but different users' spore creations don't share common ancestor)

Manually specified relationships; my system is automatic



# Roadmap & Milestones

Phase 1: ~2010.04.19 (2 weeks)

Datasource parsing, initial hyperbolic graph implementation

Phase 2: ~2010.05.03 (2 weeks)

Dynamic queries: filtering, details-on-demand

Phase 3: remaining time (1 week)

Performance optimization, visual polishing, etc.

# Technical Challenges

## Performance

If web-based API is too slow for interactive dynamic queries, then cache results to SQLite database. Restrict domain to just animals; no buildings/vehicles.

## Occlusion

Already solved problem, bootstrap off of Graphviz or some other library; focus on dynamic queries.

## Morphologies

Cannot query API for all creatures using a particular part; instead need to query creations for common parts. May need to do joins in database to build tree structure.



**Questions?**

# Image Credits, Related Work Sources

Sporepedia (<http://www.spore.com/sporepedia>)

Sporistics (<http://sporistics.atomicday.net>)

Wikipedia (<http://en.wikipedia.org>)

Full list of references at:

<http://vis.berkeley.edu/courses/cs294-10-sp10/wiki/index.php/FP-ArpadKovacs>