**ENGS 65 - Group Project Proposal**  
**Project Description**

We are planning on creating a grid-based ecosystem of an African Savanna with six major components. Here's the basic outline:

1. PLANTS  
 - trees, grass, etc.

- will grow in sunlight, take water from ground, can be eaten (a parameter of an interaction)

- all will fall under one general interface class (hopefully we will learn about these soon in class)

2. ANIMALS  
 - predator, prey, etc.  
 - all will fall under one general interface/template with general properties (inheritance)  
 - properties will need to be public to be updated by the interactions class (i.e. hungriness, tiredness)  
 -decision making function: where to move, which action to perform  
3. GRID  
 - discrete grid implemented as a matrix of linked lists - each coordinate will have a list of items at that spot  
 - for simplicity, have only 2/3 objects at each spot (ex: tiger and grass)  
 - ability to print to screen for visual aspect  
4. WEATHER  
 - will need to be time dependent for day/night  
 - sunlight, rain, natural disasters may cause changes to the environment or affect animals  
5. TERRAIN  
 - land, water, mountains, caves for hiding  
 - static unless we want them to be changed by natural disasters (cave collapses during earthquake?)  
 - include plants as a property  
6. INTERACTIONS/ACTIVITIES  
 - eat, hunt, etc.

-multiply (after having gained a certain amount of sustenance or meeting an animal of opposite gender)

-escape/survive attacks from predator

- each interaction will be its own class using ADT... for example:  
         class Eat {  
  
               Eat(Animal a, Plant p) { // for an herbivore interaction  
                     a.energy++;          // change animal properties  
                     a.hungriness--;  
                     p.eaten(p.x, p.y);    // will call "eaten" function to deplete resource at coordinate x,y  
               }  
               Eat(Animal predator, Animal prey) {      // for carnivore interaction  
                     predator.energy++;  
                     predator.hungriness--;  
                     delete prey;                                  // prey has been eaten  
               }  
         };  
  
**Implementation Plan**  
 We will start with a small, hard-coded grid where we can define a few interactions, test animal behavior, and solidify how each object will interact with the others.  We need to make sure that we can accurately simulate the effects on a couple of animals and plants with a simple terrain before we create an entire ecosystem. Once we have this working, we can add complexities like having different animals (predator/prey hierarchy), a varied terrain, weather conditions, extra interactions, etc.  
  
**Why it’s complex and OO** Given initial conditions, the program should be able to simulate an ecosystem where the plants/animals/weather make their own decisions. This provides a sense of randomness where the interactions and probability determine behavior. Having the interactions as separate classes allows us to have inputs affect multiple parts of the ecosystem, including resources, terrain, and life. This is similar to the Tinker-toy example as presented in class, where we can change the inputs (i.e. how many animals we start with of a given species, or system parameters) and see how it affects the system as a whole, at steady state. The goal is essentially to design a system that is sustainable and won’t result in one species population ballooning in size to the detriment of all other species, because that is not realistic.  
  
**Potential Extras**

* Include human behavior (e.g. hunters in our eco system)
  + Turn model into a ‘game’ where you have a hunter entering the ecosystem and having to hunt and return home with a certain amount of food by the end of the day.
* In addition to the weather affecting the plants, weather could also be affected by the plants in the ecosystem
* Add gender to the animals and define some new behavior such as producing offsprings (a positive impact on the population of that animal in the ecosystem)
* Add hierarchy of predators and prey - a level 10 can eat anything <=9, whereas a 5 can only eat anything <=4
* Add more realistic qualities to animal interactions - more safety in a herd, wolves run in packs, a pack would be more likely to take down a single animal and a single predator would not attack an entire herd - this would affect the intuition of each animal
* Seasons, add more complexities to weather like hurricanes, tornados, earthquakes, lightning