Project plan

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# *Introduction*

In this project we are going to work on a problem in the ecological system of Oostvaardersplassen. Our project group has been tasked with the job of checking a possible solution to restore the ecological balance of the herbivores ( wild cattle, wild horses, deer ) by introducing grey wolves into the system.

***Context***

In the nature preserve called Oostvaardersplassen, three kinds of large herbivores and many other major species are living. There is an imbalance due to the absence of predators and the fenced-off nature of the preserve.

## *Result of preliminary research*

There already has been research conducted about the imbalance in an ecological system. Results of these researches are:   
  
1. You can model the system using mathematical formulae or by simulating it completely in a software application. Using mathematical formulae provide results good enough to use in decision making. Simulating would give much more detailed and reliable answers, but takes too much time to be practical.  
  
2. Scientists predict a rise in overall temperature during the next few decades. This will benefit the population of wild horses, but decrease the population of wild cattle to the point where it is no longer able to sustain itself.   
  
3. The influence of the deer on the other two herbivores is only 30%.  
  
4. The geese change the balance between the three kinds of large herbivores and the number sustainable in a direction the owner of the preserve does not like. However, reducing the number of geese using natural means (such as releasing foxes) gives chaotic and unpredictable results.

## *Situation in the organization*

The organization we are doing our project for is called Staatsbosbeheer. Staatsbosbeheer is a non-profit organization that has its focus on protecting and developing nature in The Netherlands. The main income of Staatsbosbeheer is through subsidy from the government. Beside subsidy’s, donations and renting is also a part of their income.

## *Problem statement*

The main problem is the overpopulation of large herbivores in Oostvaardersplassen, leading to unbalance in the ecological system. There are no major predators in the closed ecosystem, which aggravates the problem.

# *Goals of the project*

## *Objectives*

The main research question for this project is "*What will happen to the populations of deer, cattle and cow if releasing a number of grey wolves in the preserve (with the number of grey wolves being the free variable.)?".* Although there are many options to finding the answer to this question they all cannot be tested. However, using probability and statistics it is possible to predict an accurate outcome. Knowing this our goal is to make a mathematical model for an application that can predict the results of an ecological system, while changing the factors of the survival of the animals. After implementing this model into (java programming language) code, there should be a functional app that predicts and answers the main research question.

## *Main research question and sub-questions*

**How can we create an application that can help us to predict the balance of elements in an ecological system?**

1. What are the characteristics of the herbivores (wild cattle, wild horses, deer ) in the ecosystem?
2. What mathematical models can we implement?
3. What relevant factors are involved within the ecosystem? (Terrain and weather)
4. What should our graphical interface look like?
5. How do we display our results on the application?

# *Preconditions*

1. Access to the necessary data.
2. Basic knowledge/understanding on the necessary data.

# *Methodology*

## *Research Strategy*

Our strategy for tackling such a mathematically dependent application is to put accuracy at the top of what's important. To ensure our application will give accurate results we formed our sub-questions and dedicated our preliminary research to gathering necessary data on the factors we assumed to be highly relevant to the calculations to come. We will then create multiple mathematical models to present to client, once the client is updated on our progress we expect to start with implementation of the mathematical models into java before the user graphical interface.

## *Research Design*

* Finding the characteristics will be done with the research on the data collected from the ecosystem.
* Right Mathematical model will be designed with the help of literature study (Available Books on Mathematical design on ecosystem).
* Available data's, literature study and interviewing local people will be done to understand the factors of ecosystem (Weather, temperature and terrain).
* Flexible system supporting GUI which stimulates all the factors affecting ecosystem using relevant programming language.
* Graphs and statistics will be displayed on a webpage as the final result of our application.

# *Risks and solutions*

## *External risks*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Risk** | **chance** | **impact** | **priority** | **countermeasure** |
| Lack of acquirable data | 2 | 5 | 10 | -Also research using interviews & alternative sources to the net.  -Speaking to someone with in-depth domain knowledge |
| Encountering extremely complex codes. | 4 | 5 | 20 | -Code our application with the agile methods of programming. |
| Inability to deliver application on set release date | 3 | 5 | 15 | -Manage time by scheduled tasks and deadlines.  -Use MoSCoW prioritizing method and iteration planning schemes. |
|  |  |  |  |  |
|  |  |  |  |  |

## *Internal risks*

* A person’s inability to deliver his assigned tasks on time.
* A person’s inability to attend meetings and SCC classes.
* Group members’ inability to assist other group members.
* Disagreements between group members.

# *Task division and planning*

## *Product Breakdown*

The product envisioned is an application using mathematical models to predict the outcome of releasing grey wolves into a nature preserve, the application will offer options to change parameters (initial population sizes, number of grey wolves to release). Using the user's input, the application will calculate the results after a number of years and project the results in a graph showing the populations of the different species represented with lines of different colors. The results will then be stored for later viewing purposes.

## *Work Breakdown*

* Mathematical models - 40 hours
* Software architecture design - 100 hours
* Class codes (wolves, herbivores, etc.) - 13 hours
* Methods codes (eat, mate, die, etc.) - 13 hours
* Probability theory implementation codes - 20 hours
* GUI (graph & display) - 40 hours

## *Task distribution*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Week | Task | Group member | Review | milestone |
| 3 | Mathematical models | Everyone |  | Definitive version project plan  List of literature and data  Report structure |
| 4 | 1. Software architecture design  1. Mathematical model | 1. Justice, Pramish  1. Dylan, Tarif | 1. Dylan, Tarif  1. Justice, Pramish | Finalized Mathematical model. |
| 5 | 1. Class Codes  1. Probability theory implementation codes | 1. Pramish  1. Dylan, Justice | 1. Tarif  1. Pramish |  |
| 6 | 1. Method codes  1. Probability Theory implementation 2. GUI | 1. Tarif  1. Justice 2. Pramish, Dylan | 1. Dylan  1. Pramish 2. Tarif, Justice | Working Product |
| 7 | Testing and Improvements | everyone |  | Finalized models |
| 8 | Bugs and exception handling | everyone |  | Final research paper (report) |
| 9 |  |  |  | Project files and presentation submition |

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# *Contact information*

**List of group members and teachers involved, with email address and phone numbers.**

|  |  |  |
| --- | --- | --- |
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# *References*

Available data