Project IV

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I. Introduction

The particular project uses parallelism for convenience purpose while developing GrainVille, a month-by-month simulation is created where each agent of the simulation is executed in its own thread in order to react to its surroundings.

This report firstly discusses about the System Configuration and Load, then any Implementation Specifications, then it further explains the Story with the graphical representation of the simulation analyzing the correctness of the simulation.

II. System Configurations & Load

This project was implemented using the CentOS operating System Release 6.7, at OSU Computer labs that has about 8 CPU cores. Fig 1 below shows the CPU average load for 1, 5 and 15 minutes to be 0.71, 0.17 and 0.66 respectively.
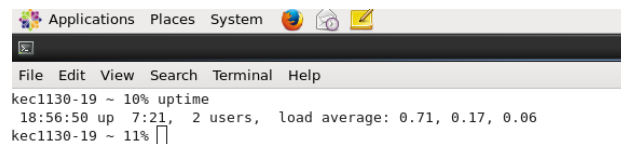

Fig 1. System configurations – System Load

III. Implementation Specifications

The implementation code is in the file namely, Project4_main.cpp. The output for the particular can be found in the Output.txt file. Moreover, the code generates it results into the excel spreadsheet which will automatically be created in the directory where you execute the particular. If you are testing on the Linux computers you may be able to access the Output.xslx file, however this file was generated by the code and does not contain the graph. Moreover, the preferred output for the same is in the file "CS 575 Project IV.xlsx" where the graph has been implemented.

IV. GrainVille (The Story)

GrainVille has many factors which affect each other in the given simulation scenario. This project uses factors such as Temperature & Precipitation, Grain Height, Deer's and Lions.

Firstly, the Grain Height is affected by temperature and precipitation. The grains grow feasibly if the temperature is above 5°C i.e., 41°F with precipitation above 3 inches i.e., 7.62cm. However, if the temperature is lower than or equal to 5°C with the precipitation being above/below 3 inches, the grains start to decay due to cold. Moreover, if the temperature is above 5°C but the precipitation is below or equal to 3 inches, the grain starts to decay as well. Also, note that temperature is clamped with 0°C, so that the temperature does not expect any negative values.

Secondly, the deer's eat grains if there are enough to help them all survive. However, if more and more deer's start to know about the magical food land of GrainVille, their population increases by a multiple of two, as deer's like to travel in pairs. But, if more and more deer's come then they start to fight, therefore in this scenario a maximum of 10 deer's and a minimum of 1 deer are only allowed at GrainVille. Nothing above or below the particular is acceptable.

Thirdly, when the deer population begins to rise, the lions begin to tell more of their friends and they come to hunt deer's. However, a lion can only eat 1.5^{th} of the deer in a month, their population increases by 1

and decreases by 1 based upon the number of deer's. However, there is always a single lion in GrainVille.

Based upon the above scenario please find the image below representing a graph which resembles the scenario.
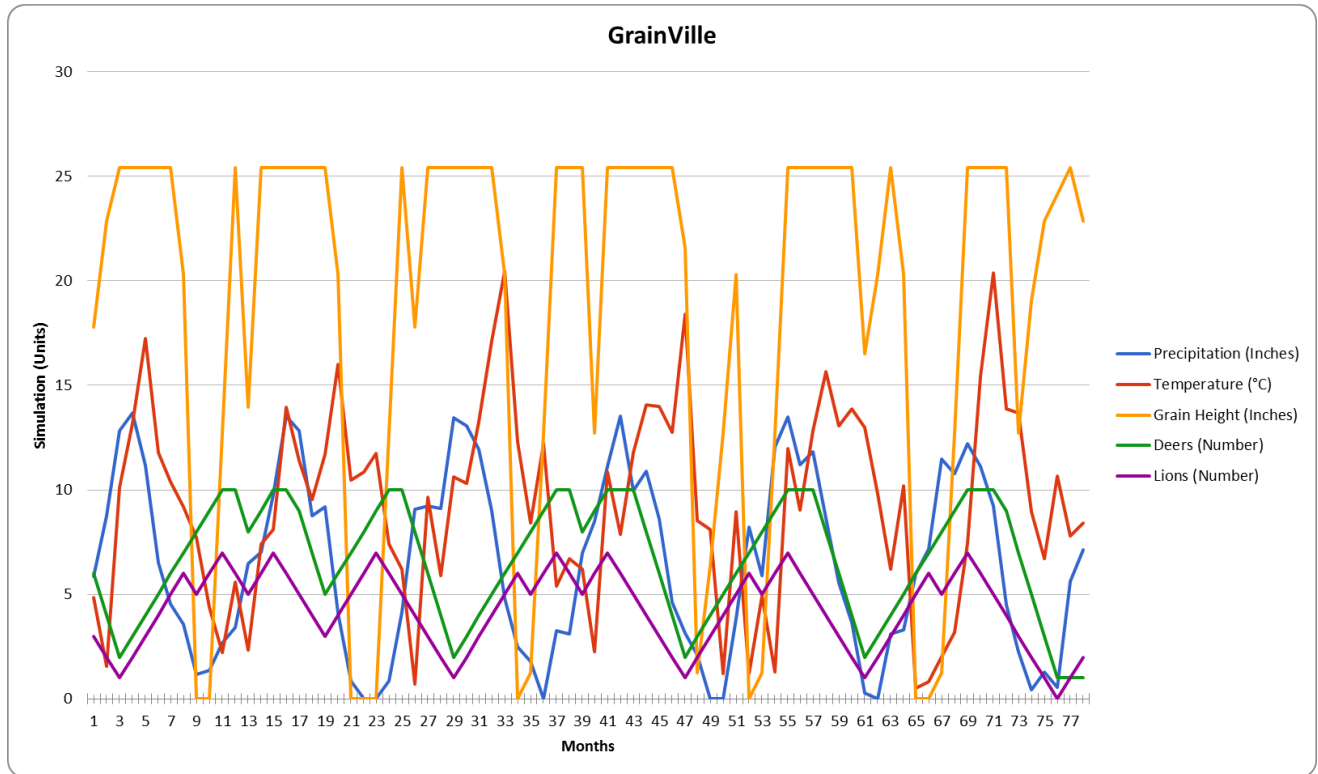

Fig 2. Simulation Graph

The Simulation graph is plotted with horizontal axis (0-78 Months) and vertical axis (different Simulation units). The particular has been plotted against 78 months instead of 72 months (as in the original question) for better understanding of what happens at the end of the year, where the value of deers drastically decreases with the increase in the population of lions. As the deer's start to reduce, the lions also start and reduce. Notice, that the number of deer's only increase with an increase in the grain height but there are lions which considerably maintain their population. The deer population starts to increase when there are the least number of lions, but when it steadily increase, the lions also increase.

The grains are affected by temperature, precipitation and number of deer's. When the deer population rises or starts to reach its apex, the grain height reduces accordingly. Note, that the best grain height result is found whenever the population of the deer's is the least and with a good temperature and precipitation conditions.

V. Conclusion

Therefore, the particular report represents the environmental factors which affect each other and maintain the balance of the simulation.