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CS 475
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Project 03

Hardware

This experiment was ran on Gentoo Linux with kernel 5.4.28 on a desktop pc with the following hardware configuration:

CPU: AMD Ryzen 7 3800X 8- (16) @ 3.900GHz
GPU: NVIDIA GeForce GTX 1080
Memory: 32078MiB DDR4

Experiment

The experiment was a month-by-month simulation of grain growth operation and a relevant deer population over the course of 72 months from 2020 to 2026. The simulation was run in C++ program and a python script was used to redirect it's output to a CSV file to be uploaded to google sheets for analysis.

The python3 program can be called with ./run.py
The script compiles and executes the C++ program once for a simple input output redirection. The C++ program prints the month, rainfall, temperature (in celcius), grain deer population, and the number of deers hunted in a comma separated format to be redirected to a CSV file when executed.

Added quantity

The simulation added hunters to the equation. Every odd month was a "hunting month" and 0 to 3 hunters could spawn to kill the grain deer. This was added to simulate a mechanism of deer population control that resembles real world scenarios. The amount of grain grown was therefore affected by the deer population in a more random way than if it had been left to be a matter of temperature and precipitation.

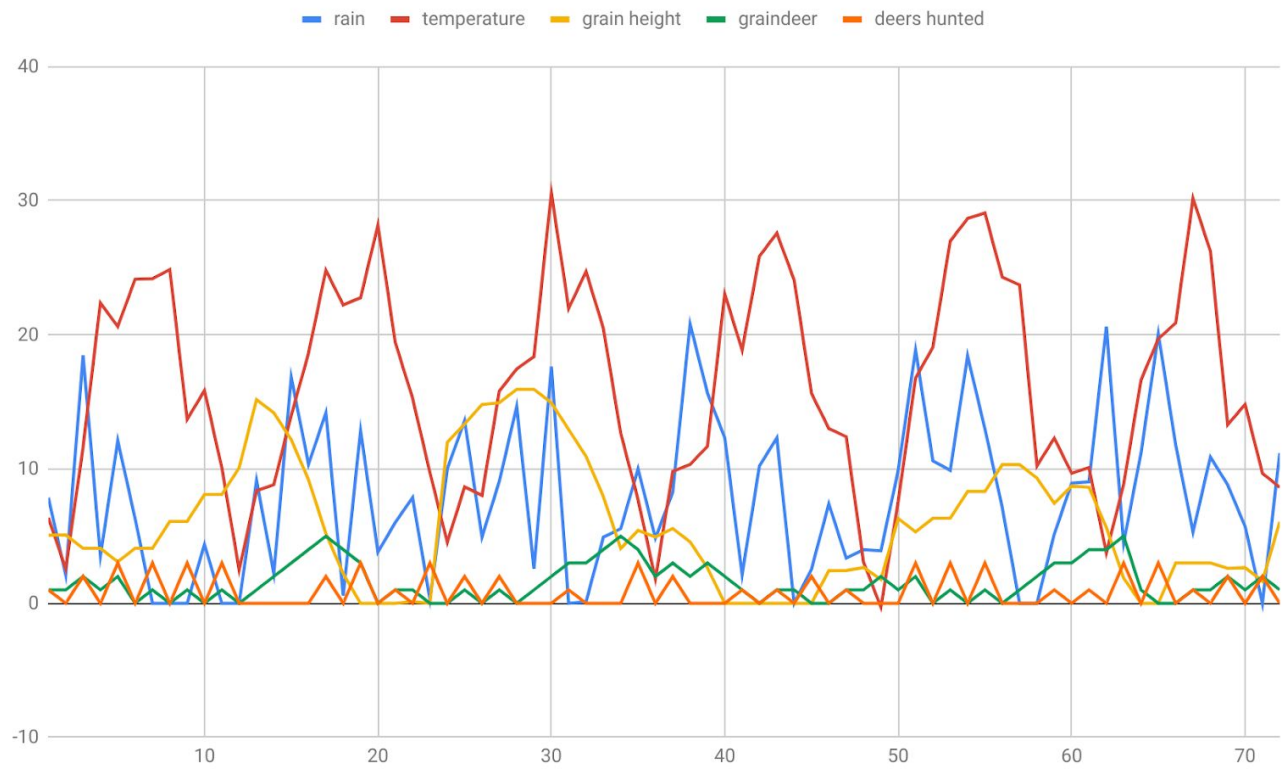
Results

month	rain	temperature	grain height	graindeer	deers hunted
1	7.873665	6.371248	5.077439	1	1
2	2.098382	2.574342	5.093052	1	0
3	18.483784	11.629393	4.094317	2	2
4	3.53182	22.381464	4.094322	1	0
5	12.118141	20.621567	3.095516	2	3
6	6.316355	24.148975	4.095524	0	0
7	0	24.177755	4.095524	1	3
8	0	24.875006	6.095524	0	0
9	0	13.696018	6.09555	1	3
10	4.389975	15.857038	8.101234	0	0
11	0	10.097627	8.101379	1	3
12	0	2.485831	10.10174	0	0
13	9.16555	8.385209	15.177286	1	0
14	2.225871	8.841126	14.188702	2	0
15	16.844982	13.999672	12.193014	3	0
16	10.359699	18.64374	9.205944	4	0
17	14.201447	24.820768	5.205946	5	2
18	0.576493	22.230186	2.205946	4	0
19	12.869378	22.772747	0	3	3
20	3.814636	28.185242	0	0	0
21	6.020757	19.446959	0.001257	1	1
22	7.876097	15.277854	0.129168	1	0
23	0.297611	9.740431	0	0	3
24	10.015501	4.546481	11.996748	0	0
25	13.615051	8.676614	13.360228	1	2
26	4.934357	8.040439	14.815063	0	0
27	9.086924	15.81373	14.940722	1	2

28	14.653883	17.461933	15.94498	0	0
29	2.571626	18.383383	15.945046	1	0
30	17.640831	30.587547	14.945046	2	0
31	0	21.97105	12.945046	3	1
32	0.108206	24.723299	10.945046	3	0
33	4.927567	20.482906	7.945211	4	0
34	5.560366	12.669232	4.085286	5	0
35	10.022268	7.725457	5.434859	4	3
36	4.858109	1.811839	4.945938	2	0
37	8.286761	9.825391	5.572242	3	2
38	20.814404	10.347526	4.572266	2	0
39	15.6697	11.696847	2.638043	3	0
40	12.333267	23.056932	0	2	0
41	2.132294	18.866264	0	1	1
42	10.237018	25.862066	0.000003	0	0
43	12.321519	27.581219	0.000003	1	1
44	0	24.097044	0.000003	1	0
45	2.540943	15.635529	0	0	2
46	7.414423	13.020515	2.425588	0	0
47	3.371587	12.415371	2.439782	1	1
48	3.9861	3.079158	2.66745	1	0
49	3.904646	-0.283388	1.773661	2	0
50	9.897361	7.571534	6.322852	1	0
51	18.871628	16.784227	5.322877	2	3
52	10.616817	19.075609	6.331301	0	0
53	9.907283	26.991123	6.331301	1	3
54	18.429878	28.671951	8.331301	0	0
55	12.996963	29.096684	8.331301	1	3
56	7.129699	24.301754	10.331312	0	0
57	0	23.724886	10.331312	1	0
58	0	10.241538	9.33145	2	0
59	5.158772	12.312444	7.447671	3	1
60	8.949163	9.697125	8.744171	3	0
61	9.04835	10.110925	8.648869	4	1

62	20.621758	3.754705	5.64898	4	0
63	4.492546	8.865181	1.879097	5	3
64	11.195463	16.637976	0	1	0
65	20.070038	19.708984	0	0	3
66	11.786386	20.888103	3.001025	0	0
67	5.318472	30.17136	3.001025	1	1
68	10.899728	26.235754	3.001027	1	0
69	8.815046	13.310575	2.613595	2	2
70	5.732092	14.819874	2.658102	1	0
71	0	9.689671	1.658269	2	2
72	11.186323	8.644182	6.073339	1	0

Graph over the course of 72 months



Commentary

Grain height was at its highest when rain coincided with successful hunting operations and reasonable temperature. At around month 35 we see a 10 month period of low grain height mostly due to low rainfall and high temperatures. As a result, the deer population fell as well due to the hunters and lack of grain. As the grain recovered around month 50 so would the deer population if it was not for 3 consecutive hunting weeks (which are every other month) that resulted in 3 deer kills. The grain deer population recovered shortly after at around week 60 until more hunters arrived and weather conditions made grain height fall again.