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 CS 475

Project 3
Functional Decomposition
Writeup

Table (Temperature, Precipitation, Grain Height, Deer Population, Fertilizer Levels)

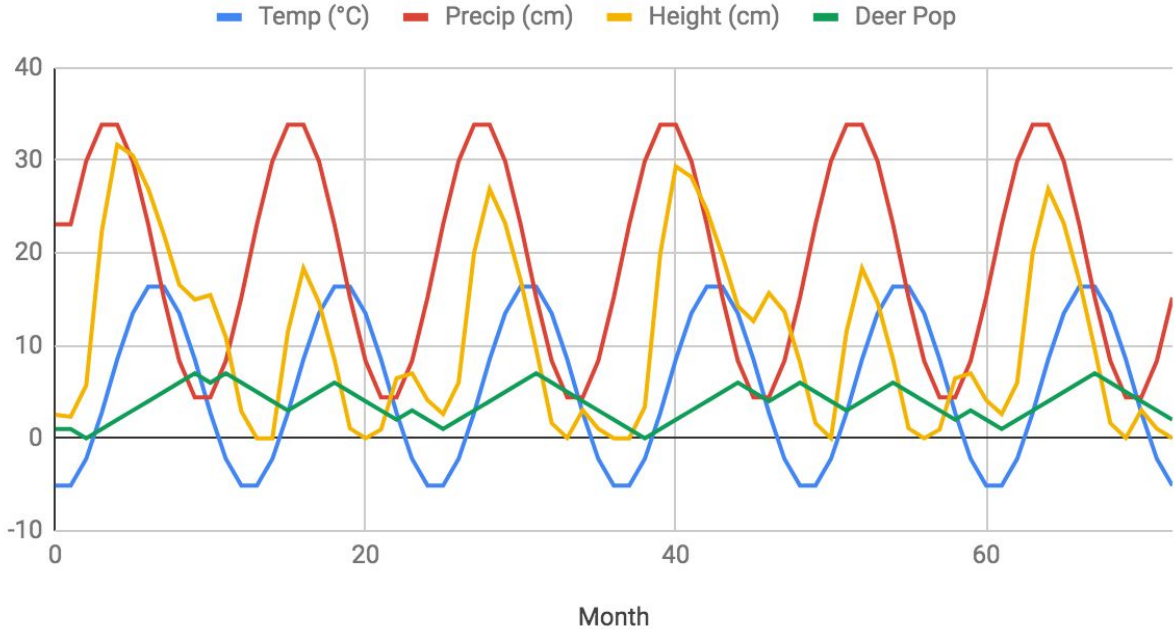
Month	Temp(°C)	Precip (cm)	Height (cm)	Deer Pop	Fertilizer
0	-4.8814	21.2101	2.54	1	0
1	-4.8814	21.2101	2.4512	1	0.01
2	-2.0057	28.042	6.606	0	0.0207
3	2.9753	31.9864	24.742	1	0
4	8.7268	31.9864	33.9595	2	0
5	13.7078	28.042	32.6663	3	0
6	16.5836	21.2101	29.0233	4	0
7	16.5836	13.3213	24.0801	5	0
8	13.7078	6.4894	18.4541	6	0
9	8.7268	2.545	15.8258	7	0.0347
10	2.9753	2.545	16.0727	6	0.1201
11	-2.0057	6.4894	13.9251	7	0.1735
12	-4.8814	13.3213	9.5291	6	0.2739
13	-4.8814	21.2101	8.6555	5	0.3788
14	-2.0057	28.042	15.2252	4	0.4607
15	2.9753	31.9864	37.2218	5	0.4608
16	8.7268	31.9864	50.7229	6	0.3177
17	13.7078	28.042	50.8058	7	0.0983
18	16.5836	21.2101	44.0808	8	0
19	16.5836	13.3213	34.0576	9	0
20	13.7078	6.4894	23.3516	10	0.0018
21	8.7268	2.545	15.6805	9	0.118
22	2.9753	2.545	15.0794	8	0.2645
23	-2.0057	6.4894	13.3262	7	0.3858

24	-4.8814	13.3213	13.2428	6	0.4908
25	-4.8814	21.2101	16.7775	5	0.5665
26	-2.0057	28.042	27.1615	6	0.5844
27	2.9753	31.9864	49.1328	7	0.5506
28	8.7268	31.9864	61.9179	8	0.3737
29	13.7078	28.042	60.5983	9	0.1262
30	16.5836	21.2101	51.8988	10	0
31	16.5836	13.3213	39.3356	11	0
32	13.7078	6.4894	26.0897	12	0.0203
33	8.7268	2.545	16.2533	11	0.1748
34	2.9753	2.545	14.268	10	0.3769
35	-2.0057	6.4894	12.2582	9	0.5645
36	-4.8814	13.3213	13.2672	8	0.738
37	-4.8814	21.2101	19.2844	7	0.8735
38	-2.0057	28.042	33.3662	8	0.9317
39	2.9753	31.9864	59.8533	9	0.909
40	8.7268	31.9864	77.3809	10	0.7077
41	13.7078	28.042	80.3075	11	0.3984
42	16.5836	21.2101	74.5994	12	0.096
43	16.5836	13.3213	61.4475	13	0
44	13.7078	6.4894	45.6616	14	0
45	8.7268	2.545	32.8733	15	0.0605
46	2.9753	2.545	23.4838	14	0.2516
47	-2.0057	6.4894	13.849	13	0.4867
48	-4.8814	13.3213	8.1969	12	0.7677
49	-4.8814	21.2101	9.7368	11	1.0631
50	-2.0057	28.042	22.591	10	1.3164
51	2.9753	31.9864	54.3565	9	1.4386
52	8.7268	31.9864	82.6457	10	1.2806
53	13.7078	28.042	97.2135	11	0.9298
54	16.5836	21.2101	102.3041	12	0.4943
55	16.5836	13.3213	97.2461	13	0.0488
56	13.7078	6.4894	82.4518	14	0
57	8.7268	2.545	69.6635	15	0

58	2.9753	2.545	59.0454	16	0
59	-2.0057	6.4894	41.7578	17	0.0151
60	-4.8814	13.3213	21.4422	16	0.1963
61	-4.8814	21.2101	6.2916	15	0.5074
62	-2.0057	28.042	2.7744	14	0.9079
63	2.9753	31.9864	21.1583	13	1.3061
64	8.7268	31.9864	41.6748	12	1.5295
65	13.7078	28.042	58.76	13	1.5613
66	16.5836	21.2101	74.1426	14	1.4886
67	16.5836	13.3213	86.7483	15	1.3248
68	13.7078	6.4894	95.3428	16	1.0918
69	8.7268	2.545	102.1992	17	0.821
70	2.9753	2.545	105.7247	18	0.5263
71	-2.0057	6.4894	96.5918	19	0.2338
72	-4.8814	13.3213	78.1816	20	0.0433

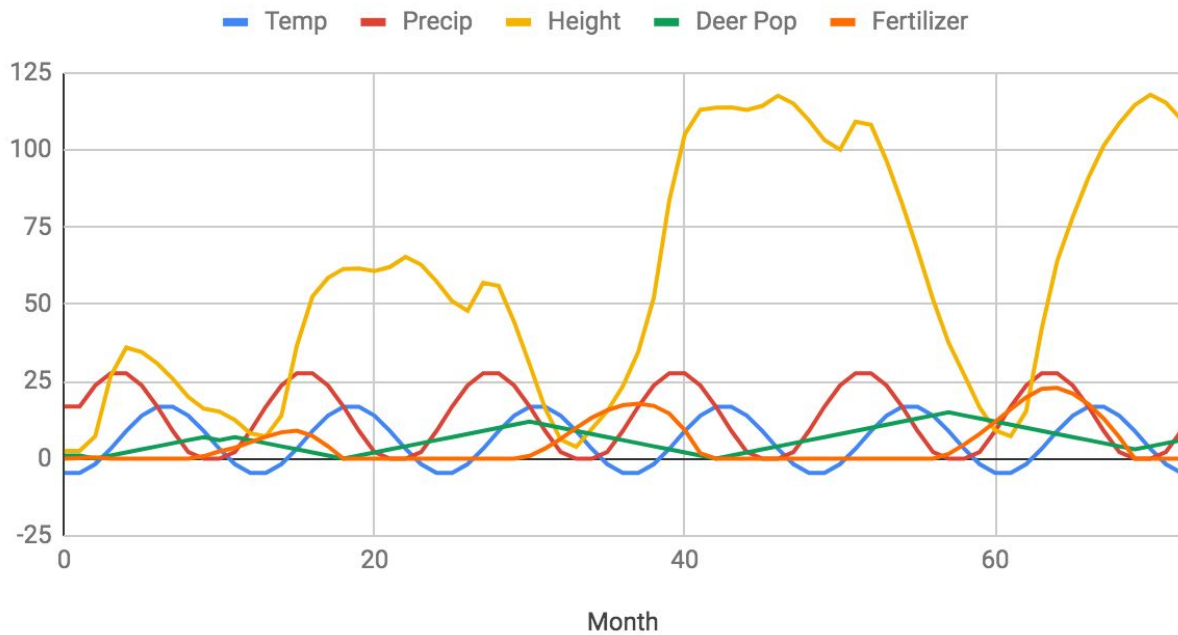
Graph 1 (Without My Agent through year 2025)

Temp, Precip, Grain Height and Deer Pop Over Time



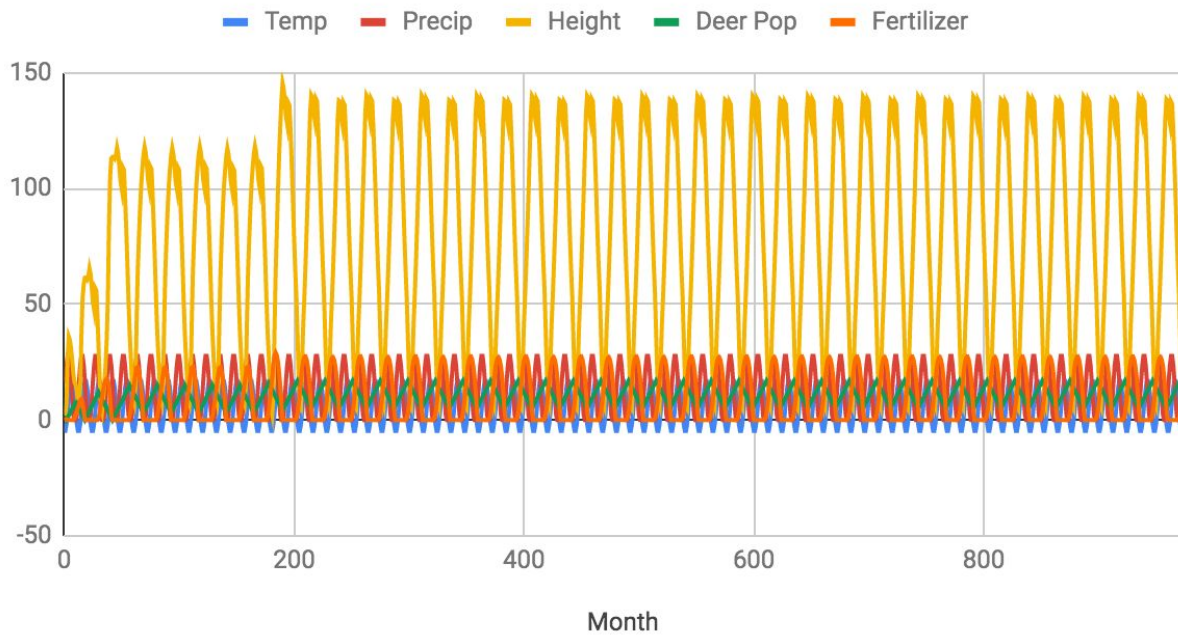
Graph 2 (With Fertilizer through year 2025)

Temp(°C), Precip (cm), Height (cm), Deer Pop and Fertilizer



Graph 3 (With Fertilizer through year 2100)

Temp(°C), Precip (cm), Height (cm), Deer Pop and Fertilizer



Commentary

1. What your own-choice quantity was and how it fits into the simulation. **I used fertilizer (from deer droppings) as my agent. It is calculated as a function of the NowNumDeer and the NowHeight (Fertilizer = $.4 * \text{NowNumDeer} - .2 * \text{NowHeight}$). The deer increases the amount of fertilizer, while the grain decreases it. The fertilizer also affects the number of deer. When there is more fertilizer than deer, the deer population is negatively affected. This can be seen in the lines that state 'if (NowNumDeer > NowHeight || (NowFertilizer > NowNumDeer && NowNumDeer > 0))' 'NextNumDeer = NowNumDeer - 1'. The fertilizer also affects the grain height, by boosting the growth of the grain using the equation "NextHeight += $.05 * \text{NowFertilizer} * \text{GRAIN_GROWS_PER_MONTH}$ ". This is how the fertilizer agent fits into the simulation**
2. A commentary about the patterns in the graph and why they turned out that way. What evidence in the curves proves that your own quantity is actually affecting the simulation correctly? **The graphs from this simulation turned out to be very interesting, especially when compared to the graphs from the original simulation. The fertilizer has a very large effect especially on the growth of the grain and the height it reaches. This also impacts the amount of deer that are allowed to grow before piling up of fertilizer and decreasing grain heights bring the deer population back into check. This cycle continues, but the growth height for the grain gets larger in subsequent cycles. This eventually levels off as seen in the extended graph. The fertilizer is having the intended effect as evidenced by the fact that there is stark contrast between the original graphs and the graphs with fertilizer included. In the graphs with fertilizer, a marked effect on grain height is noticed, as well as negative effects on deer population during periods of sufficient deer growing grain height.**