CS475 – Project #2

Functional Decomposition

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My Own Choice Quantity

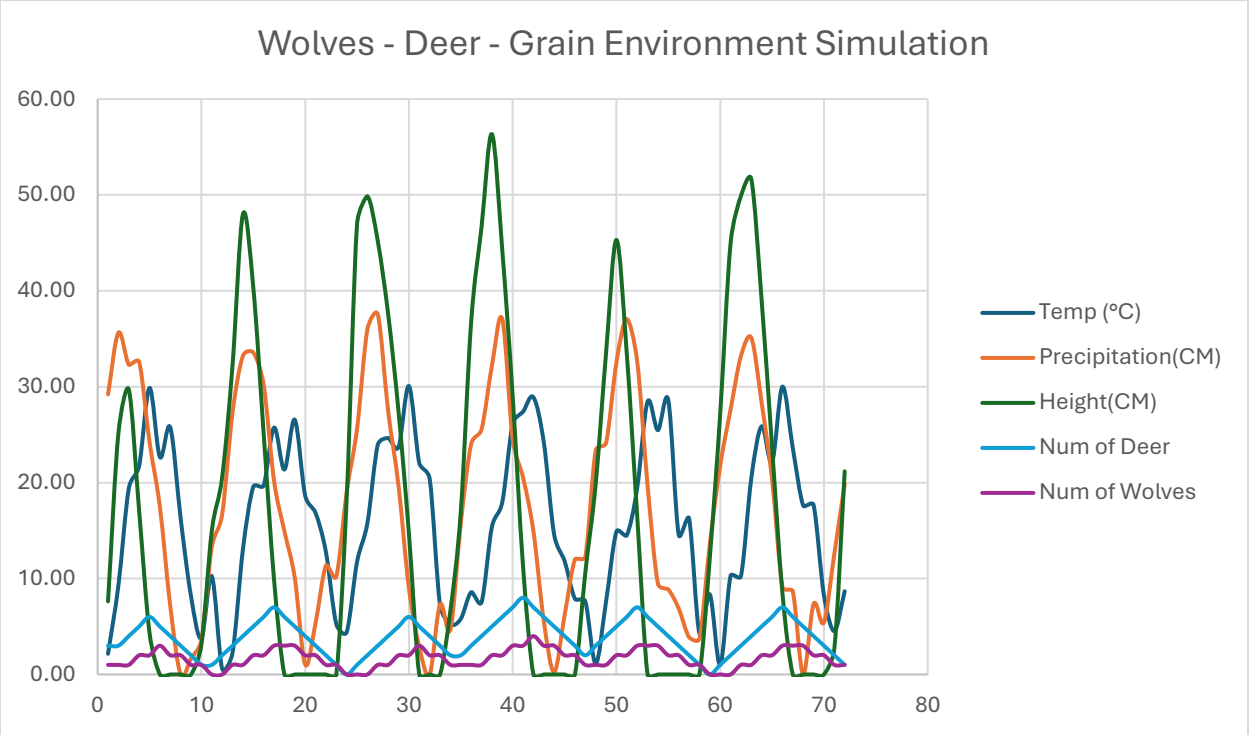
My own-choice quantity was the number of wolves, which I added to make the simulation more realistic by introducing a predator-prey relationship. Wolves depend on deer for food, so their population changes based on how many deer are available. When there are more deer, the wolf population increases; when there are fewer deer, the number of wolves decreases. This creates a natural balance where wolves help control the deer population, which in turn affects how much grain is eaten. By adding wolves, the simulation now includes a more complete and dynamic ecosystem involving grain, deer, and wolves.

Table

Month	Temp (°C)	Precipitation(CM)	Height(CM)	Num of Deer	Num of Wolves
1	2.16	29.21	7.62	3	1
2	9.27	35.64	25.15	3	1
3	19.38	32.31	29.72	4	1
4	21.75	32.59	17.04	5	2
5	29.88	24.23	4.34	6	2
6	22.67	17.48	0.00	5	3
7	25.75	7.14	0.00	4	2
8	16.26	0.00	0.00	3	2
9	8.14	1.68	0.00	2	1
10	3.78	3.61	3.10	1	1
11	10.25	13.28	14.96	1	0
12	0.59	16.69	20.57	2	0
13	2.24	27.31	32.23	3	1
14	13.03	33.22	47.98	4	1
15	19.56	33.58	40.36	5	2
16	19.71	30.20	25.12	6	2
17	25.74	20.22	9.91	7	3
18	21.37	14.94	0.00	6	3
19	26.56	10.08	0.00	5	3
20	18.65	1.04	0.00	4	2
21	16.86	5.36	0.00	3	2
22	12.77	11.33	0.00	2	1
23	5.26	10.21	0.00	1	1
24	4.40	19.02	18.31	0	0
25	11.72	25.60	46.94	1	0
26	15.79	35.99	49.86	2	0
27	23.95	37.57	45.19	3	1

28	24.65	27.46	37.57	4	1
29	23.69	19.66	27.41	5	2
30	30.07	8.99	14.71	6	2
31	22.03	2.87	0.00	5	3
32	20.40	0.00	0.00	4	2
33	7.22	7.32	0.00	3	2
34	5.21	4.70	6.68	2	1
35	5.80	15.77	16.99	2	1
36	8.57	24.03	36.78	3	1
37	7.53	25.55	46.66	4	1
38	15.39	32.18	56.34	5	2
39	17.97	37.06	44.22	6	2
40	26.13	24.59	29.06	7	3
41	27.39	20.55	11.28	8	3
42	28.90	14.94	0.00	7	4
43	24.22	5.59	0.00	6	3
44	14.56	0.25	0.00	5	3
45	11.85	6.15	0.00	4	2
46	7.89	11.99	0.00	3	2
47	7.62	12.27	10.62	2	1
48	1.14	23.32	19.84	3	1
49	7.61	24.13	33.50	4	1
50	14.90	32.54	45.31	5	2
51	14.52	37.06	33.43	6	2
52	19.43	32.66	16.56	7	3
53	28.43	19.74	0.00	6	3
54	25.47	9.47	0.00	5	3
55	28.59	8.86	0.00	4	2
56	14.58	6.88	0.00	3	2
57	16.26	3.89	0.00	2	1
58	4.27	3.73	0.00	1	1
59	8.35	13.59	12.17	0	0
60	0.99	21.77	27.15	1	0
61	10.28	27.61	44.93	2	0
62	10.23	33.20	49.89	3	1
63	20.46	35.10	51.64	4	1
64	25.88	28.30	38.96	5	2
65	22.10	20.37	23.72	6	2
66	30.01	9.12	8.48	7	3
67	23.60	8.66	0.00	6	3
68	17.61	0.00	0.00	5	3
69	17.67	7.34	0.00	4	2
70	8.25	5.44	0.00	3	2
71	4.51	12.57	2.67	2	1
72	8.68	19.86	21.18	1	1

Graph



Commentary

The simulation reflects an interdependent ecosystem where temperature and precipitation directly affect grain growth, which then impacts deer and wolf populations. For example, during month 14, favorable conditions (13.03°C and 33.22 cm precipitation) led to a grain height of 47.98 cm, supporting 4 deer and 1 wolf. As the grain height peaked at 56.34 cm in month 38, the deer population rose to 5, and the wolf population increased to 2, showing that wolves respond to prey availability. When deer numbers grew too high, overgrazing caused the grain height to drop to 0.00 cm by month 42, even though the temperature was 28.90°C which is ideal for growth. As a result, deer and wolf populations dropped due to food scarcity. The wolf agent accurately follows the deer population trends, such as in months 25–30, where deer increased from 1 to 6 and wolves followed from 0 to 2. These data-driven patterns confirm that the wolf agent is functioning correctly and meaningfully impacting the simulation.