Oregon State University

CS 475 - Spring 2021

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Project #3

Functional Decomposition

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Quantity

My own choice of quantity was Magic Mushrooms. According to this and this link Reindeers love magic mushrooms. So, I introduced Magic Mushrooms to deers. This caused all of them to look for a mushroom before eating grain. If there are mushrooms, deers go eat the mushrooms first. If some of them cannot find mushrooms to eat, then they eat grain.

Mushrooms grow in certain conditions. If the humidity is high and temperature is reasonable, they grow very fast! On the other hand, If the temperature is very high and the humidity is very low, they dry out and the deers no longer want to consume them. Also, if the temperature is low, they cannot populate fast.

New carrying capacity is *height + NumMushrooms*. Mushrooms drastically increase the capacity in the first six months of the year but do not make any difference in the last six months since the temperature and humidity don't help much. Aaand remember, deers consume mushrooms first.

I put the graph and the table at the end of the document.

Commentary

Precipitation: It is cyclic and always between 0 and 38 centimeters. First 6 months have the highest precipitation. Because the sine wave gives positive values for the first 6 months and negative for the later months.

Temperature: This is also cyclic and between 0 and 32 degrees. Cosine wave is used for calculating the temperature and it is actually a quarter shifted version of sine wave. That means months 3-9 have the highest temperatures and others with the lowest.

Height: Height is proportional to precipitation and the temperature. From the first two variables we can conclude that the maximum height should be in the 6-9 months of each year. Graph also confirms this argument.

Initial Number = 18.5 inches / 47 cm

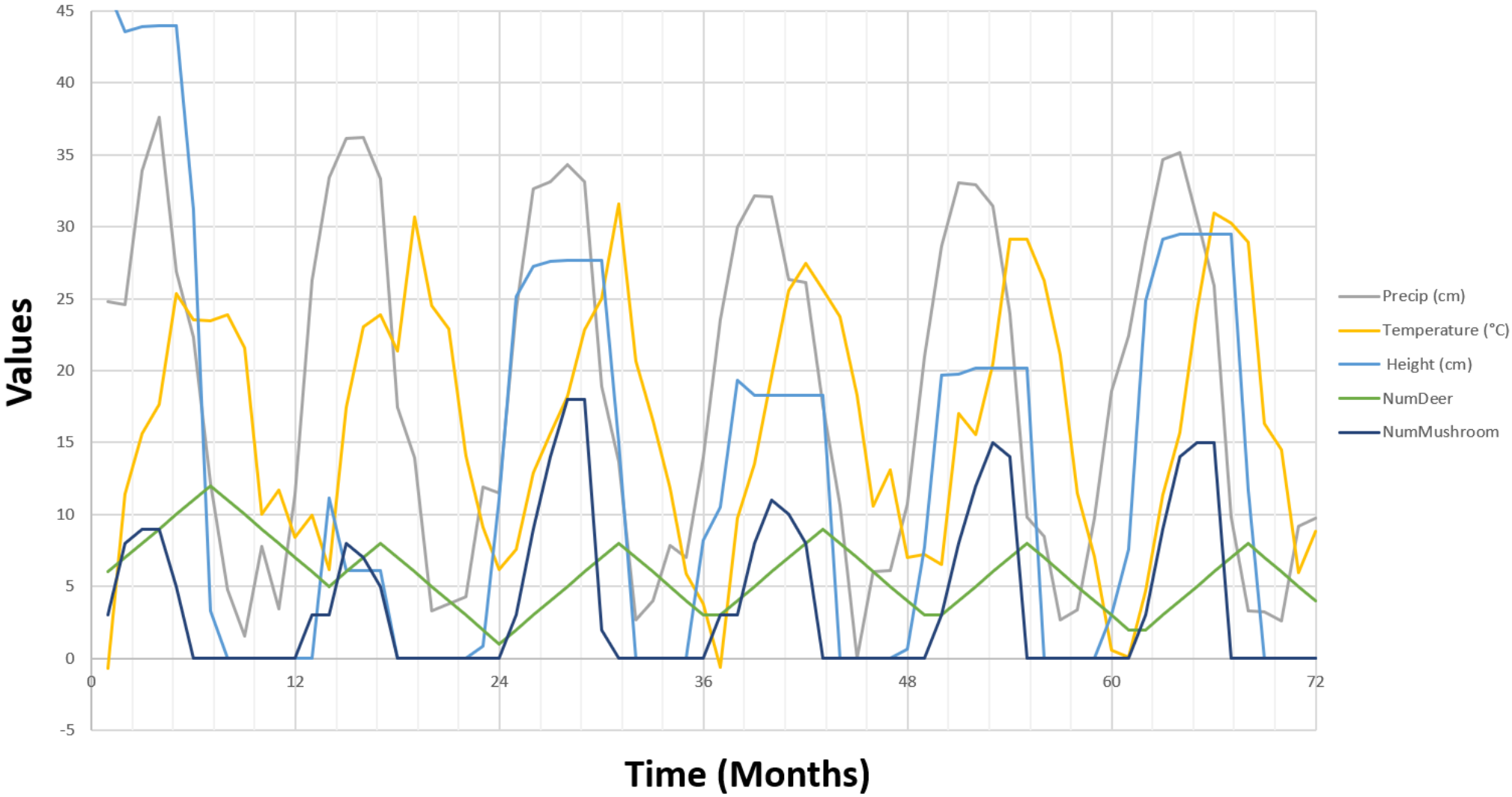
NumMushroom: Mushrooms grow in humid and warm environments. Any temperature or precipitation abnormalities decrease the growth rate. If the temperature is high and the humidity is low, some mushrooms dry out. Also, deers favor magic mushrooms to grain. If there are some mushrooms, deers first eat all the mushrooms then eat the grain. This extends the life of the grain, increases the carrying capacity and increases the deer population. Deers first consuming mushrooms mean that if the grain height is zero, we know for sure that there are no mushrooms. This can be observed on the graph. Dark blue lines *(mushroom)* become zero always before the light blue lines *(grain)*.

Initial Number = 3

NumDeer: Deer population increases if the carrying capacity is bigger than the current population. Else, it decreases. In the graph, population increases in the first half of each year and decreases in the second half. Because, both grain and mushroom amount reaches zero in the sixth or seventh month of each year.

Initial Number = 5

Functional Decomposition Simulation



Initial values; NumDeer = 5, Height = 47 (cm), NumMushrooms = 3

Month	NowYear	NowMonth	Precip (cm)	Temperature (°C)	Height (cm)	NumDeer	NumMushroom
1	2021	0	24.7675	-0.7273	46.434	6	3
2	2021	1	24.5626	11.4167	43.5409	7	8
3	2021	2	33.868	15.6069	43.9019	8	9
4	2021	3	37.5784	17.6297	43.9669	9	9
5	2021	4	26.8729	25.3249	43.9669	10	5
6	2021	5	22.324	23.5214	31.2671	11	0
7	2021	6	12.1634	23.4382	3.3272	12	0
8	2021	7	4.7465	23.899	0	11	0
9	2021	8	1.5345	21.6019	0	10	0
10	2021	9	7.7764	9.9997	0	9	0
11	2021	10	3.4603	11.6881	0	8	0
12	2021	11	11.3446	8.404	0	7	0
13	2022	0	26.279	9.9622	0	6	3
14	2022	1	33.4182	6.1911	11.1242	5	3
15	2022	2	36.1568	17.4452	6.1242	6	8
16	2022	3	36.1889	23.0139	6.1244	7	7
17	2022	4	33.3646	23.9171	6.1245	8	5
18	2022	5	17.443	21.3916	0	7	0

19	2022	6	13.9284	30.6648	0	6	0
20	2022	7	3.3021	24.5146	0	5	0
21	2022	8	3.7648	22.9132	0	4	0
22	2022	9	4.2658	14.1152	0	3	0
23	2022	10	11.9143	9.1433	0.8129	2	0
24	2022	11	11.4766	6.1718	11.1001	1	0
25	2023	0	24.2438	7.5806	25.1475	2	3
26	2023	1	32.6189	12.8755	27.255	3	9
27	2023	2	33.1195	15.6084	27.6225	4	14
28	2023	3	34.3151	18.2055	27.6662	5	18
29	2023	4	33.0963	22.8103	27.6666	6	18
30	2023	5	18.9393	25.0006	27.6666	7	2
31	2023	6	13.636	31.6077	14.9666	8	0
32	2023	7	2.6857	20.6594	0	7	0
33	2023	8	4.0318	16.5359	0	6	0
34	2023	9	7.8447	11.8669	0	5	0
35	2023	10	7.0138	5.864	0	4	0
36	2023	11	13.9658	3.7545	8.221	3	0
37	2024	0	23.515	-0.6174	10.5127	3	3

38	2024	1	29.9796	9.7628	19.363	4	3
39	2024	2	32.1777	13.5181	18.301	5	8
40	2024	3	32.1024	19.5782	18.3137	6	11
41	2024	4	26.3603	25.5656	18.3138	7	10
42	2024	5	26.0925	27.4885	18.3138	8	8
43	2024	6	17.6044	25.643	18.3138	9	0
44	2024	7	10.6773	23.7556	0	8	0
45	2024	8	0	18.2901	0	7	0
46	2024	9	6.052	10.5825	0	6	0
47	2024	10	6.0726	13.1227	0	5	0
48	2024	11	10.741	6.9739	0.6167	4	0
49	2025	0	20.9267	7.2154	7.7374	3	0
50	2025	1	28.6278	6.532	19.6492	3	3
51	2025	2	33.0306	16.9947	19.7761	4	8
52	2025	3	32.923	15.5172	20.1704	5	12
53	2025	4	31.4333	20.4436	20.1758	6	15
54	2025	5	23.9481	29.1094	20.1758	7	14
55	2025	6	9.8323	29.1138	20.1758	8	0
56	2025	7	8.4566	26.2924	0	7	0

57	2025	8	2.6724	21.0516	0	6	0
58	2025	9	3.3354	11.4665	0	5	0
59	2025	10	9.7736	7.0926	0	4	0
60	2025	11	18.5489	0.5981	3.0016	3	0
61	2026	0	22.4235	0.0893	7.5777	2	0
62	2026	1	28.8978	4.6781	24.8886	2	3
63	2026	2	34.6392	11.3602	29.141	3	9
64	2026	3	35.1397	15.7212	29.4615	4	14
65	2026	4	30.6204	24.1404	29.4616	5	15
66	2026	5	25.8813	30.9508	29.4616	6	15
67	2026	6	9.7986	30.2262	29.4616	7	0
68	2026	7	3.2725	28.8953	11.6816	8	0
69	2026	8	3.2593	16.2875	0	7	0
70	2026	9	2.5955	14.5175	0	6	0
71	2026	10	9.1829	5.9603	0	5	0
72	2026	11	9.7533	8.8094	0	4	0