

**Project Title:** Functional Decomposition

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I compiled and executed my program on the Rabbit server. The output I obtained shows that the temperature and precipitation values were varied in a pattern resembling a cosine and sine wave, respectively, with some degree of randomness added in. Additionally, the number of rabbits varied in relation to the carrying capacity, which was determined by rye-grass height.

In this simulation, I have incorporated fertilizer as my agent and have chosen rabbits as the source of this fertilizer. After the rabbits consume the grass, their poop act as a natural fertilizer that enhances the growth of the grass. This integration of the fertilizer agent aligns seamlessly with the simulation.

To implement the fertilizer agent, I have designed it to regulate the growth of rye grass, depending on the amount of fertilizer generated every month. The quantity of fertilizer produced is directly proportional to the number of rabbits in the environment. Thus, as the rabbit population increases, so does the amount of fertilizer generated, ultimately leading to increased grass growth.

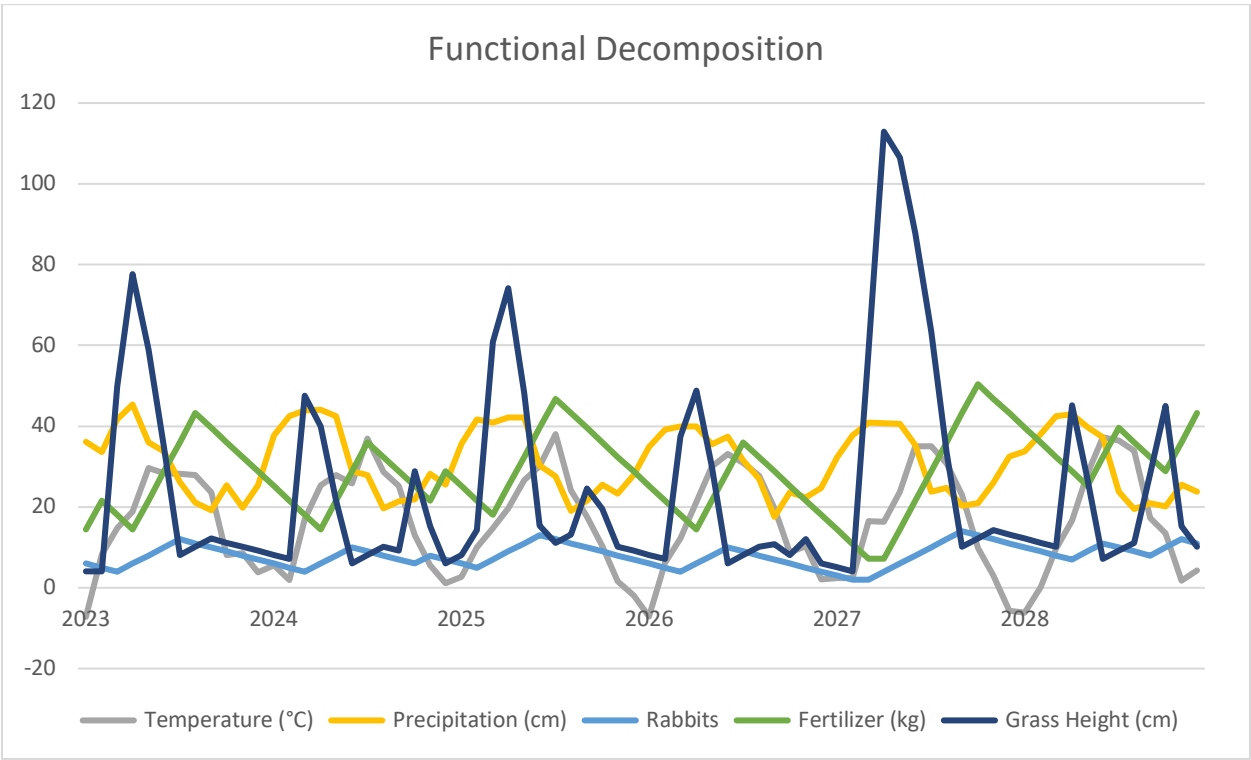
Output results after execution:

Year	Month	Temperature (°C)	Precipitation (cm)	Rabbits	Fertilizer (kg)	Grass Height (cm)
2023	0	-7.20359	36.152723	6	14.4	4.064
2023	1	8.231896	33.670522	5	21.6	4.064
2023	2	14.754469	41.661091	4	18	49.816552
2023	3	18.907276	45.371451	6	14.4	77.666461
2023	4	29.635777	35.980842	8	21.6	58.973503
2023	5	28.334283	33.709197	10	28.8	34.907709
2023	6	28.23452	26.178213	12	36	8.128
2023	7	27.924682	21.038648	11	43.2	10.16
2023	8	23.673871	19.141372	10	39.6	12.192
2023	9	8.025759	25.383281	9	36	11.176
2023	10	8.557614	19.752433	8	32.4	10.16
2023	11	3.753921	25.35937	7	28.8	9.144
2024	0	5.623798	37.664205	6	25.2	8.128
2024	1	1.961242	42.526145	5	21.6	7.112
2024	2	16.96035	43.949895	4	18	47.567838
2024	3	25.368245	43.982044	6	14.4	39.920485
2024	4	27.946421	42.472495	8	21.6	21.53207
2024	5	25.778609	28.828214	10	28.8	6.096

2024	6	36.906425	27.94321	9	36	8.128
2024	7	28.663428	19.594211	8	32.4	10.16
2024	8	25.247476	21.371707	7	28.8	9.144
2024	9	12.964359	21.872698	6	25.2	28.812696
2024	10	5.503799	28.206391	8	21.6	15.276032
2024	11	1.07524	25.491412	7	28.8	6.096
2025	0	2.765865	35.628964	6	25.2	8.128
2025	1	9.982524	41.726775	5	21.6	14.264829
2025	2	14.756294	40.912643	7	18	60.80827
2025	3	19.598211	42.108234	9	25.2	74.208242
2025	4	26.618275	42.204187	11	32.4	48.154788
2025	5	30.109355	30.324477	13	39.6	15.452447
2025	6	38.037927	27.650841	12	46.8	11.176
2025	7	24.037213	18.977793	11	43.2	13.208
2025	8	17.594759	21.638742	10	39.6	24.586234
2025	9	10.266418	25.451586	9	36	19.557524
2025	10	1.56862	23.305869	8	32.4	10.16
2025	11	-1.82548	27.980608	7	28.8	9.144
2026	0	-7.071743	34.900164	6	25.2	8.128
2026	1	6.247228	39.087488	5	21.6	7.112
2026	2	12.247838	39.970838	4	18	37.381982
2026	3	21.245465	39.895535	6	14.4	48.827582
2026	4	29.924639	35.468228	8	21.6	30.11056
2026	5	33.0948	37.477705	10	28.8	6.096
2026	6	30.880258	31.619211	9	36	8.128
2026	7	27.752635	26.969422	8	32.4	10.16
2026	8	19.699724	17.558436	7	28.8	10.851899
2026	9	8.725204	23.658924	6	25.2	8.128
2026	10	10.279045	22.364684	5	21.6	12.049955
2026	11	2.037794	24.755812	4	18	6.096
2027	0	2.327658	32.311904	3	14.4	5.08
2027	1	2.370288	37.735722	2	10.8	4.064
2027	2	16.419826	40.823652	2	7.2	58.868224
2027	3	16.3722	40.716066	4	7.2	112.914183
2027	4	23.77828	40.541217	6	14.4	106.540202
2027	5	35.039885	35.333296	8	21.6	87.744489
2027	6	35.045242	23.847142	10	28.8	63.360721
2027	7	30.796797	24.748722	12	36	33.41726
2027	8	23.013501	20.279264	14	43.2	10.16

2027	9	9.786017	20.942273	13	50.4	12.192
2027	10	3.042984	26.065696	12	46.8	14.224
2027	11	-5.613136	32.56372	11	43.2	13.208
2028	0	-6.223687	33.808716	10	39.6	12.192
2028	1	0.14555	38.005747	9	36	11.176
2028	2	9.658375	42.432279	8	32.4	10.16
2028	3	16.617042	42.932786	7	28.8	45.100561
2028	4	28.214361	39.728302	9	25.2	26.902309
2028	5	37.249608	37.2665	11	32.4	7.112
2028	6	36.380124	23.813435	10	39.6	9.144
2028	7	33.920309	19.564566	9	36	11.176
2028	8	17.296609	20.866212	8	32.4	28.234934
2028	9	13.447105	20.202441	10	28.8	45.045211
2028	10	1.684278	25.474969	12	36	15.179589
2028	11	4.240369	23.768135	11	43.2	10.16

Graph generated using the output data:



Upon analyzing the graph, it is evident that various factors such as Temperature, Precipitation, number of rabbits, and Fertilizer (rabbit poop) play a significant role in influencing Rye grass height. The temperature seems to have a substantial effect on the grass height, with an increase in temperature leading to an increase in grass height. However, there appears to be an optimal temperature range, beyond which the grass growth is not favored.

The precipitation levels also seem to play a crucial role in determining the grass height. A positive relationship between precipitation and rye grass height is observed, implying that higher precipitation levels contribute to increased rye grass height.

The population of rabbits grazing on the grass also affects the grass's height. As the number of rabbits increases, the grass height tends to decrease due to the grazing pressure. On the other hand, when the rabbit population is low, the grass height increases, as there is less grazing pressure.

In this simulation, the fertilizer agent (rabbit poop) is considered, and it has a positive impact on the grass height. As the amount of fertilizer generated increased, the grass height tended to increase.

To sum up, all the factors included in the simulation played a significant role in affecting grass height. The optimal temperature range and higher precipitation levels contributed to increased grass height, while the rabbit population and grazing pressure led to decreased grass height. The rabbit poop (fertilizer) has a positive impact on the grass's height, as it provided necessary nutrients for growth.