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CS 475 – Parallel Programming

Project 4 – Functional Decomposition – Commentary

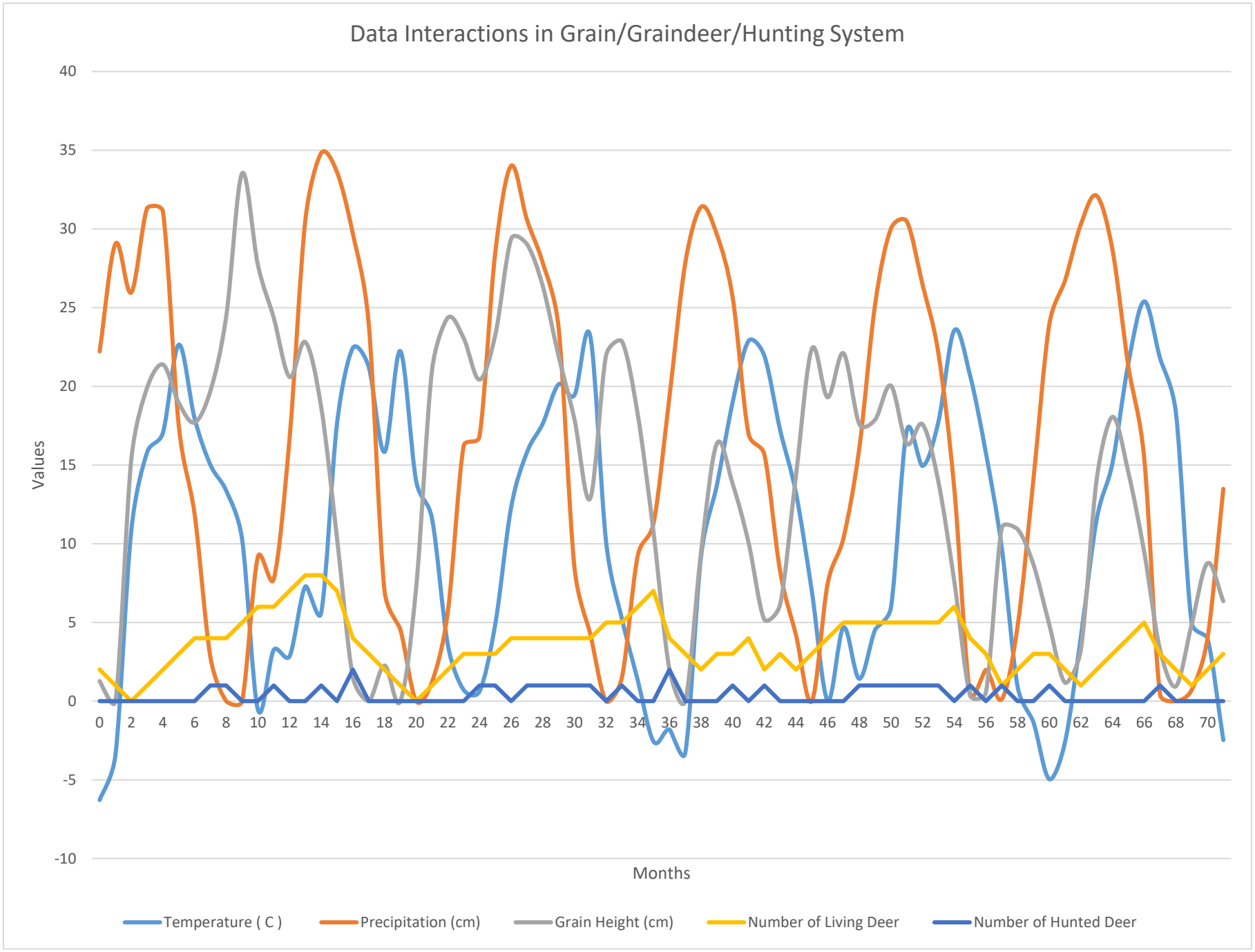
1. I chose to make my own-choice quantity “graindeer hunted”.
   This was calculated with a “conservation limit” set to 3.0. This meant that no graindeer could be hunted if there were 3 or fewer graindeer remaining.
   Each month, I chose a random number between 0 and “current number of graindeer – 1”, and did a division by the globally defined conservation limit, casting the resulting number to an integer. This corresponds to the number of graindeer that were hunted for a given month. This allowed both for randomness in the hunting behavior, but also allowed the amount hunted to possibly scale to larger values in the event that there were a large number of living graindeer. For instance, if there were ever 7 living graindeer, and a 6 was chosen, then 2 graindeer would be hunted that month, but if a 5 was chosen, only one would be hunted.

2. The following pages contain the data collected for temperature, precipitation, grain height, hunted deer, and living deer as a function of the number of months passed.

Months	Temperature (C)	Precipitation (cm)	Grain Height (cm)	Number of Living Deer	Number of Hunted Deer
0	-6.283333333	22.225	1.27	2	0
1	-3.405555556	29.0576	0	1	0
2	10.84444444	25.9588	15.3416	0	0
3	15.80555556	31.3182	19.9136	1	0
4	17.05555556	31.0896	21.3868	2	0
5	22.64444444	17.5006	18.9484	3	0
6	17.96666667	11.8872	17.7038	4	0
7	15.00555556	2.794	19.7104	4	1
8	13.36111111	0	24.4602	4	1
9	10.29444444	0	33.528	5	0
10	-0.538888889	9.1694	27.7114	6	0
11	3.255555556	7.747	24.3586	6	1
12	2.85	16.6878	20.5994	7	0
13	7.283333333	30.5816	22.8092	8	0
14	5.616666667	34.8234	18.669	8	1
15	17.63888889	33.6042	10.3378	7	0
16	22.43888889	29.6926	1.524	4	2
17	21.23888889	24.003	0	3	0
18	15.83333333	7.0104	2.2606	2	0
19	22.23333333	4.5466	0	1	0
20	13.97777778	0	7.2136	0	0
21	11.60555556	1.2192	21.0058	1	0
22	3.577777778	5.6642	24.3586	2	0
23	0.711111111	16.2052	23.0632	3	0
24	0.616666667	16.8148	20.4216	3	1
25	4.9	28.5242	23.2664	3	1
26	12.3	34.0106	29.3624	4	0
27	15.80555556	30.5816	29.0322	4	1
28	17.63333333	27.8384	26.3652	4	1
29	20.12777778	23.7236	21.9202	4	1
30	19.44444444	8.509	17.907	4	1
31	23.17777778	4.2672	12.8778	4	1
32	10.12222222	0	21.971	5	0
33	5.227777778	1.4986	22.86	5	1
34	1.327777778	9.2456	18.2118	6	0
35	-2.566666667	11.303	10.6934	7	0

36	-1.8	19.304	2.032	4	2
37	-3.294444444	27.813	0	3	0
38	9.188888889	31.3944	9.4742	2	0
39	13.71666667	29.6418	16.3576	3	0
40	19.00555556	25.6286	13.7922	3	1
41	22.88333333	16.9926	10.0838	4	0
42	21.93333333	15.6718	5.1816	2	1
43	17.21111111	8.2296	6.1468	3	0
44	13.21666667	4.191	14.351	2	0
45	6.983333333	0	22.3774	3	0
46	0.044444444	7.4676	19.304	4	0
47	4.688888889	10.3632	22.098	5	0
48	1.416666667	16.0782	17.6022	5	1
49	4.533333333	25.2222	17.8816	5	1
50	5.955555556	30.0228	20.0406	5	1
51	17.18888889	30.48	16.3576	5	1
52	14.94444444	26.4414	17.5768	5	1
53	17.76111111	22.0726	13.9192	5	1
54	23.55555556	13.5128	7.62	6	0
55	20.68333333	0.4572	0.3556	4	1
56	15.75555556	1.9812	0.5588	3	0
57	9.744444444	0.127	10.9982	1	1
58	0.927777778	4.7498	10.922	2	0
59	-1.338888889	14.0716	8.6868	3	0
60	-4.955555556	23.9014	4.8768	3	1
61	-2.588888889	26.7208	1.1684	2	0
62	4.105555556	30.3022	3.2766	1	0
63	11.55555556	32.1056	14.097	2	0
64	15.14444444	28.6512	18.0594	3	0
65	21.46111111	21.2598	14.5288	4	0
66	25.39444444	15.4432	9.4742	5	0
67	21.79444444	0.4318	3.2766	3	1
68	18.36111111	0	0.9398	2	0
69	4.977777778	0.7112	4.8768	1	0
70	3.983333333	3.9878	8.763	2	0
71	-2.472222222	13.4874	6.35	3	0

3. Below is a table of the data graphed in number 2.



4. The cyclic nature of Temperature and Precipitation can be clearly seen in my graph.
   To a certain degree, the growth of grain follows periods of high temperature and precipitation, but there is an additional inverse relationship with the number of living deer.

   Peaks in numbers of living deer seem to immediately follow higher values for grain height. These typically provoke a “crash” in the grain height values, because the deer are consuming the grain at a more rapid pace.

   We note that hunting only occurs in a month when there are 3 or more deer alive in an immediately preceding month, as per the design of the hunting interaction with the living deer (due to the implementation of DEER_CONSERVATION_LIMIT). Furthermore, spikes of 2 deer hunted can be seen on rare occasion (months 16 and 36) and are preceded by an abnormally high deer population; this provided the conditions for a random number to be selected that was high enough that it exceeded 2 when divided by DEER_CONSERVATION_LIMIT.

   We know that there are several ways that hunting effects the system, but these are not immediately visible. Sometimes, a deer is hunted and we can see no change in the number of living deer; in this case, the grain height was sufficiently large that we saw a new deer arrive at the same time as a deer was hunted, which offset each other. However, if the grain level was not sufficiently large to support an additional deer, a hunted deer caused a sharp decrease in the number of living deer; in this case, a deer (or two) was hunted in additional to a deer that died off due to lack of sustenance. It is these points of sharp decrease that clearly exhibit that hunting is influencing the system.

   The mechanic of hunting is indirectly promoting increased grain height. However, this is not very pronounced from the graph, as hunting isn’t creating an inordinately low number of deer altogether; indeed, we see that the number of deer reach a maximum around 8 deer, which can consume 4 inches of grain a month between them. If we lowered DEER_CONSERVATION_LIMIT to 2.0 or 1.0, we would see a lower average value of living deer, which may result in a much higher value of grain height. I decided to keep the value of DEER_CONSERVATION_LIMIT set to 3.0, because this value preserved a clear and visible seasonal fluctuation between grain height and number of deer.