CPE 369 LAB 7 INVESTIGATION RESULT

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Implementations:

Sequential

Sequential implementation reads in the JSON objects one at a time and look for the location field. All locations are then parsed into strings and stored as the key in a standard Java Treemap. The choice of Treemap over standard Hashmap is because we wanted to replicate the sort property of Hadoop. The use of Treemap is O(log N) instead of O(N) for Hashmap.

Pseudo-code:

Read in JSON object
Get location field information
Translate location information into string with format: (x, y)
Perform lookup and insert into Treemap
Print out entire Treemap's key value pair to file.

Hadoop

Hadoop implementation is rather straight forward. Pseudo-code is provided below.

Pseudo-code:

Map:

Read in JSON object
Parse location information into string with format: (x, y)
Emit location information string as key and 1 as value

Reduce:

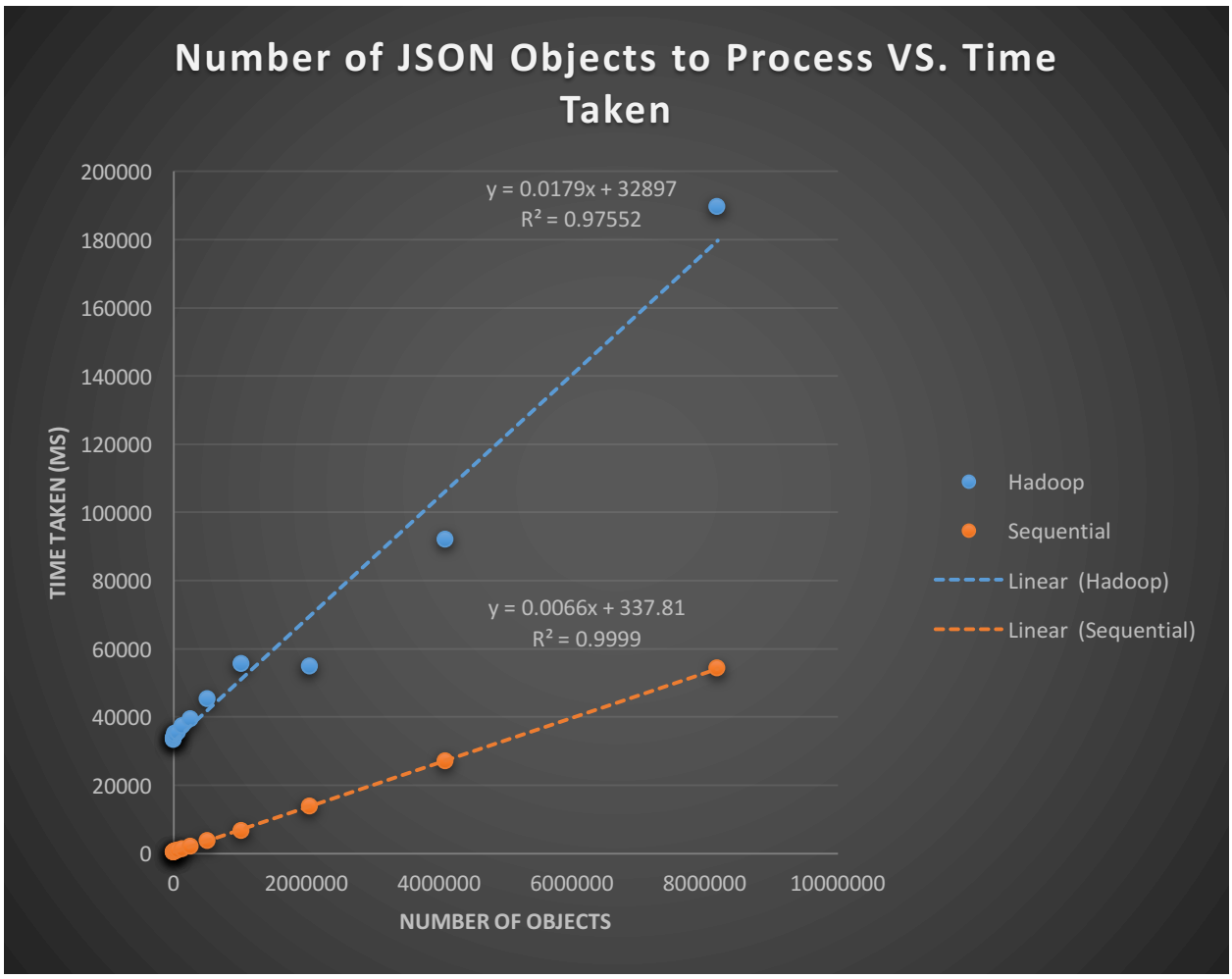
For every values in the key, sum up the values.
Emit the key (location) as key and sum as value.

Result

The test was conducted with 1000 to 8 million objects. Each file was ran for five times with each implementation and the average time was used in the analysis.

Num Objects	Seq1	Seq 2	Seq3	Seq 4	Seq 5	Avg	Std Dev
1000	288	295	324	289	288	296.8	15.4822479
2000	323	325	350	343	346	337.4	12.50199984
4000	372	381	409	391	398	390.2	14.41180072
8000	435	437	411	414	421	423.6	11.90798052
16000	528	539	534	537	529	533.4	4.827007354
32000	640	642	654	626	631	638.6	10.80740487
64000	905	925	942	847	885	900.8	36.89444403
128000	1286	1347	1292	1261	1287	1294.6	31.67491121
256000	2030	2087	2092	2050	2058	2063.4	25.97691283
512000	3626	3680	3712	3767	3692	3695.4	51.15466743
1024000	6575	6775	6557	6628	6710	6649	92.16561181
2048000	14041	13812	13573	13730	13730	13777.2	170.9932747
4096000	27145	26927	27599	26459	26940	27014	412.4487847
8192000	57957	52353	52241	55479	53379	54281.8	2431.078197

Num Objects	Hadoop 1	Hadoop 2	Hadoop 3	Hadoop 4	Hadoop 5	Avg	Std Dev
1000	34215	31697	33634	32346	34321	33242.6	1167.740682
2000	37742	33602	32339	32525	32665	33774.6	2270.666928
4000	33841	33592	34373	33371	33350	33705.4	422.808822
8000	34433	34859	33434	34498	33584	34161.6	619.7203402
16000	35467	34576	35305	35545	34565	35091.6	483.5253871
32000	34448	34439	34342	34544	35604	34675.4	524.0026717
64000	36408	35457	35619	35372	34730	35517.2	601.7222781
128000	37504	36617	37485	37458	37489	37310.6	388.0892938
256000	39520	39534	39620	39606	38451	39346.2	502.3247953
512000	44655	45579	45834	44556	45640	45252.8	599.3785949
1024000	56663	55657	54691	54511	56028	55510	906.656495
2048000	54528	54716	53753	55587	55509	54818.6	757.886733
4096000	88929	95830	92891	88734	93830	92042.8	3118.506004
8192000	184471	193426	183606	189300	197360	189632.6	5856.091683



Analysis

The sequential implementation beat Hadoop's implementation for every test conducted. Through regression analysis, the sequential implementation is following a linear growth time, with R being .9999. Hadoop implementation is following almost a linear growth time with R = .97552. A little bit of online research did show that unless we are working with multiple terabytes of data, we will see no benefits of using Hadoop rather than a straightforward implementation.