Sample Sort

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CptS 483

For this project I implemented parallel sample sort, fed by a parallel congruential number generator. The results show that scaling is reasonable. The hardware that I used was an 8 node cluster each with 8 hardware threads, that is why the number of processors goes up to 64. The results show essentially what is expected, scaling gets better as the size of the input increases. Note that the times shown are actually a bit under-representative of actual run time, in that much of the time taken to complete program runs was spent in local disk I/O recording sorted results and this time is not included in the timings as it is not relevant to the actual runtime. This data is was simply used to verify correctness of results.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Computation (time in milliseconds)** | | | | | | | |
|  | 1 | 2 | 4 | 8 | 16 | 32 | 64 |
| 2^12 | 4.634 | 5.361 | 4.92 | 6.014 | 11.469 | 23.626 | 59.683 |
| 2^16 | 31.035 | 33.164 | 24.162 | 25.172 | 21.548 | 31.612 | 38.691 |
| 2^20 | 420.05 | 445.558 | 292.519 | 333.15 | 208.27 | 140.029 | 127.704 |
| 2^24 | 6417.17 | 7062.56 | 5063.6 | 5097.86 | 3145.36 | 1989.71 | 1529.95 |
| 2^28 | 117147 | 130100 | 97962.5 | 117272 | 60124.6 | 47394.3 | 24419.4 |
|  |  |  |  |  |  |  |  |
| **Communication (time in milliseconds)** | | | | | | | |
|  | 1 | 2 | 4 | 8 | 16 | 32 | 64 |
| 2^12 | 0 | 0.746 | 1.882 | 0.565 | 8.974 | 15.453 | 48.902 |
| 2^16 | 0 | 0.604 | 1.098 | 0.245 | 5.976 | 21.574 | 25.47 |
| 2^20 | 0 | 0.831 | 4.008 | 22.539 | 17.786 | 18.958 | 35.018 |
| 2^24 | 0 | 174.448 | 13.005 | 114.138 | 226.146 | 211.38 | 183.507 |
| 2^28 | 0 | 572.99 | 1013.7 | 3941.33 | 3788.14 | 5354.69 | 3722.53 |
|  |  |  |  |  |  |  |  |
| **Speedup (ratio to single proc performance)** | | | | | | | |
|  | 1 | 2 | 4 | 8 | 16 | 32 | 64 |
| 2^12 | 1 | 0.864390972 | 0.941869919 | 0.770535417 | 0.404045688 | 0.196139846 | 0.07764355 |
| 2^16 | 1 | 0.935803884 | 1.284454929 | 1.232917527 | 1.440272879 | 0.981747438 | 0.802124525 |
| 2^20 | 1 | 0.942750439 | 1.435975099 | 1.260843464 | 2.016853123 | 2.999735769 | 3.289247009 |
| 2^24 | 1 | 0.908618121 | 1.267313769 | 1.258796828 | 2.040202075 | 3.225178544 | 4.194365829 |
| 2^28 | 1 | 0.900438125 | 1.195835141 | 0.998934102 | 1.948403815 | 2.471752932 | 4.797292317 |