**Program Structures & Algorithms**

**Spring 2022**

**Assignment No. N4**

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* **Task**
* **Output screenshot**
* **Relationship Conclusion**
* **Evidence / Graph**
* **Unit tests result**
* **Task**

1. A cutoff (defaults to, say, 1000) which you will update according to the first argument in the command line when running. It's your job to experiment and come up with a good value for this cutoff. If there are fewer elements to sort than the cutoff, then you should use the system sort instead.
2. Recursion depth or the number of available threads. Using this determination, you might decide on an ideal number (t) of separate threads (stick to powers of 2) and arrange for that number of partitions to be parallelized (by preventing recursion after the depth of lg t is reached).
3. An appropriate combination of these.

* **Output screenshot**

1. **Experiment with different cutoff**

图形用户界面, 文本

描述已自动生成图形用户界面, 文本

描述已自动生成

**Picture 1 & 2- Runs the experiment for Size 0.5M & 1M**

图形用户界面, 文本

描述已自动生成图形用户界面, 文本

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**Picture 3 & 4- Runs the experiment for Size of 1.5M & 2M**

**电脑屏幕的照片上有文字

描述已自动生成**

**Picture 5- Runs the experiment for Size 3M**

1. **Experiment with different degrees of parallelism**

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**Picture 6 & 7- Runs the experiment for degree 1 & 2**

图形用户界面, 文本

描述已自动生成图形用户界面, 文本, 应用程序

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**Picture 8 & 9- Runs the experiment for degree 3 & 4**

图形用户界面, 文本

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描述已自动生成

**Picture 10 & 11- Runs the experiment for degree 5 & 6**

图形用户界面, 文本

描述已自动生成图形用户界面, 文本, 应用程序

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**Picture 12 & 13 - Runs the experiment for degree 7 & 8**

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**Picture 13 & 14- Runs the experiment for degree 7 & 8**

* **Relationship Conclusion**

1. experiment and come up with a good value for this cutoff.

From the Evidence of running time on different array sizes and cutoffs (picture 15), we can see that:

1. ***The suitable cutoff for the array with a size of 500000 is between 150000 and 250000***
2. ***The suitable cutoff for the array with a size of 1000000 is between 250000 and 550000***
3. ***The suitable cutoff for the array with a size of 1500000 is between 350000 and 750000***
4. ***The suitable cutoff for the array with a size of 2000000 is between 500000 and 1000000***
5. ***The suitable cutoff for the array with a size of 500000 is between 700000 and 1500000***

So, we conclude that the suitable cutoff of one array is between 25% and 50% of its size.

1. The ideal number (t) of separate threads

From the Evidence of Running Time in different parallelisms and cutoffs (picture 16), we can find that:

***The running time has no obvious change after degree = 6 (thread number is 64)***

* **Evidence / Graph**

**图表, 折线图

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**Picture 15-** running time on different array sizes and cutoffs

**图表, 折线图

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**Picture 15-** Running Time in different parallelisms and cutoffs