PARALLEL IMAGE BLURRING WITH FORK/JOIN FRAMEWORK

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IMAGE PROCESSING

- Image processing involves the manipulation and analysis of digital images using algorithms to extract useful information or enhance visual properties.
- Common techniques used for this are:

1. Blur: Smoothing the image to reduce noise or enhance features.
2. Sharpening: Increasing the contrast between edges to improve image clarity.
3. Noise Reduction: Removing random variations in pixel values caused by sensor or transmission errors.

OBJECTIVE

1. Enhance the efficiency and speed
2. Distribute the workload
3. better utilization of available hardware resources

NEED FOR PARALLELISM

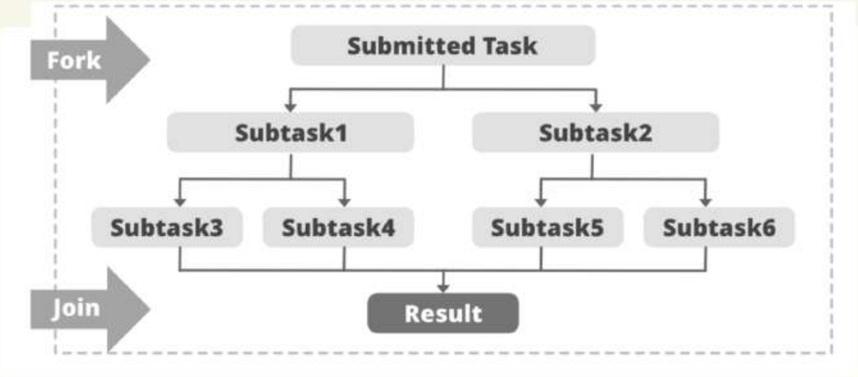
- Handling Large-scale Problems
- Scalability
- Utilizing Multi-Core Processors
- Handling Concurrent Tasks
- Meeting Real-time Requirements
- Enhanced Throughput and Performance

CODE OVERVIEW

- **ForkBlur class:**
  - Implements the blur operation by averaging pixels in the source array and writing results to the destination array.
  - Splits the blur task into smaller subtasks for parallel execution.
- **Main method:**
  - Reads an image file, performs the blur operation, and saves the blurred image to a file.
- **Blur method:**
  - Initializes arrays, determines processor availability, and invokes blur computation.
  - Measures execution time and prints it to the console.

WHY FORKJOIN FRAMEWORK?

- **ForkJoinPool:** . A ForkJoinPool differs from other kinds of executor services by virtue of its work-stealing algorithm, where idle worker threads can "steal" tasks from the queues of busy threads.
- **ForkJoinTask:** . It supports dividing tasks into smaller parts that can be executed concurrently, maximizing computational efficiency and speed.



Fork

Submitted Task

Subtask1

Subtask2

Subtask3

Subtask4

Subtask5

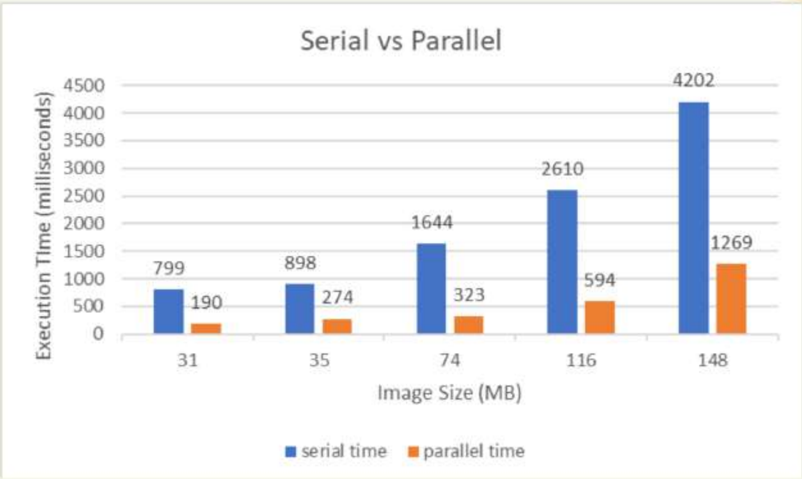
Subtask6

Join

Result

RESULT

- The graph shows serial vs parallel computing for blurring image
- On X-Axis, Images of different sizes are used and Y-Axis is execution time in milliseconds.
- From graph, it is clear that parallel algo makes efficient use of processors by concurrently executing the tasks.


Serial vs Parallel
Execution Time (milliseconds)
Image Size (MB)
serial time
parallel time