

# LAB 1 (CS23BT013,CS23BT063)

## 1. IMAGE-1

```
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=1 OUTPUT=1_RES
./a.out ../images/1.ppm ../images/1_RES.ppm
Time (read): 41 ms
Time (S1 smoothen): 11 ms
Time (S2 find details): 4 ms
Time (S3 sharpen): 4 ms
Time (write): 29 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=1 OUTPUT=1_RES
./a.out ../images/1.ppm ../images/1_RES.ppm
Time (read): 34 ms
Time (S1 smoothen): 9 ms
Time (S2 find details): 3 ms
Time (S3 sharpen): 4 ms
Time (write): 31 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=1 OUTPUT=1_RES
./a.out ../images/1.ppm ../images/1_RES.ppm
Time (read): 48 ms
Time (S1 smoothen): 5 ms
Time (S2 find details): 4 ms
Time (S3 sharpen): 9 ms
Time (write): 28 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=1 OUTPUT=1_RES
./a.out ../images/1.ppm ../images/1_RES.ppm
Time (read): 41 ms
Time (S1 smoothen): 10 ms
Time (S2 find details): 4 ms
Time (S3 sharpen): 4 ms
Time (write): 33 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=1 OUTPUT=1_RES
./a.out ../images/1.ppm ../images/1_RES.ppm
Time (read): 35 ms
Time (S1 smoothen): 8 ms
Time (S2 find details): 3 ms
Time (S3 sharpen): 3 ms
Time (write): 32 ms
```

**AVG values for:**

**read :- 39.8, smoothen :- 8.6, find details :- 3.6, sharpen :- 4.8, write :- 30.6**

## 2. IMAGE-2

```
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=2 OUTPUT=2_RES
./a.out ../images/2.ppm ../images/2_RES.ppm
Time (read): 137 ms
Time (S1 smoothen): 30 ms
Time (S2 find details): 17 ms
Time (S3 sharpen): 14 ms
Time (write): 82 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=2 OUTPUT=2_RES
./a.out ../images/2.ppm ../images/2_RES.ppm
Time (read): 117 ms
Time (S1 smoothen): 30 ms
Time (S2 find details): 18 ms
Time (S3 sharpen): 14 ms
Time (write): 76 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=2 OUTPUT=2_RES
./a.out ../images/2.ppm ../images/2_RES.ppm
Time (read): 110 ms
Time (S1 smoothen): 26 ms
Time (S2 find details): 17 ms
Time (S3 sharpen): 15 ms
Time (write): 97 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=2 OUTPUT=2_RES
./a.out ../images/2.ppm ../images/2_RES.ppm
Time (read): 119 ms
Time (S1 smoothen): 23 ms
Time (S2 find details): 16 ms
Time (S3 sharpen): 14 ms
Time (write): 93 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=2 OUTPUT=2_RES
./a.out ../images/2.ppm ../images/2_RES.ppm
Time (read): 115 ms
Time (S1 smoothen): 23 ms
Time (S2 find details): 17 ms
Time (S3 sharpen): 15 ms
Time (write): 92 ms
```

**AVG values for:**

**read :- 119.8, smoothen :- 26.4, find details :- 17, sharpen 14.4,**

write :- 88

### 3. IMAGE-3

```
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=3 OUTPUT=3_RES
./a.out ../images/3.ppm ../images/3_RES.ppm
Time (read): 203 ms
Time (S1 smoothen): 48 ms
Time (S2 find details): 33 ms
Time (S3 sharpen): 28 ms
Time (write): 148 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=3 OUTPUT=3_RES
./a.out ../images/3.ppm ../images/3_RES.ppm
Time (read): 216 ms
Time (S1 smoothen): 51 ms
Time (S2 find details): 29 ms
Time (S3 sharpen): 28 ms
Time (write): 189 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=3 OUTPUT=3_RES
./a.out ../images/3.ppm ../images/3_RES.ppm
Time (read): 189 ms
Time (S1 smoothen): 48 ms
Time (S2 find details): 29 ms
Time (S3 sharpen): 22 ms
Time (write): 168 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=3 OUTPUT=3_RES
./a.out ../images/3.ppm ../images/3_RES.ppm
Time (read): 200 ms
Time (S1 smoothen): 51 ms
Time (S2 find details): 32 ms
Time (S3 sharpen): 25 ms
Time (write): 160 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=3 OUTPUT=3_RES
./a.out ../images/3.ppm ../images/3_RES.ppm
Time (read): 208 ms
Time (S1 smoothen): 43 ms
Time (S2 find details): 26 ms
Time (S3 sharpen): 20 ms
Time (write): 169 ms
```

AVG values for:

read :- 203.2, smoothen :- 48.2, find details :- 23.8, sharpen :- 24.6, write :- 166.8

### 4. IMAGE-4

```
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=4 OUTPUT=4_RES
./a.out ../images/4.ppm ../images/4_RES.ppm
Time (read): 438 ms
Time (S1 smoothen): 95 ms
Time (S2 find details): 65 ms
Time (S3 sharpen): 76 ms
Time (write): 331 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=4 OUTPUT=4_RES
./a.out ../images/4.ppm ../images/4_RES.ppm
Time (read): 386 ms
Time (S1 smoothen): 100 ms
Time (S2 find details): 68 ms
Time (S3 sharpen): 58 ms
Time (write): 196 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=4 OUTPUT=4_RES
./a.out ../images/4.ppm ../images/4_RES.ppm
Time (read): 444 ms
Time (S1 smoothen): 109 ms
Time (S2 find details): 67 ms
Time (S3 sharpen): 63 ms
Time (write): 344 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=4 OUTPUT=4_RES
./a.out ../images/4.ppm ../images/4_RES.ppm
Time (read): 380 ms
Time (S1 smoothen): 99 ms
Time (S2 find details): 71 ms
Time (S3 sharpen): 73 ms
Time (write): 329 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=4 OUTPUT=4_RES
./a.out ../images/4.ppm ../images/4_RES.ppm
Time (read): 385 ms
Time (S1 smoothen): 96 ms
Time (S2 find details): 72 ms
Time (S3 sharpen): 65 ms
Time (write): 346 ms
```

AVG values for: read :- 406.6, smoothen :- 99.8, find details :- 68.6, sharpen :- 70.8, write :- 309.2

## 5. IMAGE-5

```
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=5 OUTPUT=5_RES
./a.out ../images/5.ppm ../images/5_RES.ppm
Time (read): 529 ms
Time (S1 smoothen): 112 ms
Time (S2 find details): 84 ms
Time (S3 sharpen): 92 ms
Time (write): 452 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=5 OUTPUT=5_RES
./a.out ../images/5.ppm ../images/5_RES.ppm
Time (read): 507 ms
Time (S1 smoothen): 169 ms
Time (S2 find details): 120 ms
Time (S3 sharpen): 96 ms
Time (write): 444 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=5 OUTPUT=5_RES
./a.out ../images/5.ppm ../images/5_RES.ppm
Time (read): 494 ms
Time (S1 smoothen): 116 ms
Time (S2 find details): 87 ms
Time (S3 sharpen): 90 ms
Time (write): 501 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=5 OUTPUT=5_RES
./a.out ../images/5.ppm ../images/5_RES.ppm
Time (read): 530 ms
Time (S1 smoothen): 121 ms
Time (S2 find details): 92 ms
Time (S3 sharpen): 84 ms
Time (write): 484 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=5 OUTPUT=5_RES
./a.out ../images/5.ppm ../images/5_RES.ppm
Time (read): 479 ms
Time (S1 smoothen): 102 ms
Time (S2 find details): 77 ms
Time (S3 sharpen): 75 ms
Time (write): 409 ms
```

**AVG values for:**

**read :- 507.8, smoothen :- 124, find details :- 92, sharpen :- 87.4, write :- 458**

## 6. IMAGE-6

```
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=6 OUTPUT=6_RES
./a.out ../images/6.ppm ../images/6_RES.ppm
Time (read): 1166 ms
Time (S1 smoothen): 289 ms
Time (S2 find details): 224 ms
Time (S3 sharpen): 192 ms
Time (write): 1126 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=6 OUTPUT=6_RES
./a.out ../images/6.ppm ../images/6_RES.ppm
Time (read): 1100 ms
Time (S1 smoothen): 339 ms
Time (S2 find details): 223 ms
Time (S3 sharpen): 211 ms
Time (write): 1024 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=6 OUTPUT=6_RES
./a.out ../images/6.ppm ../images/6_RES.ppm
Time (read): 1077 ms
Time (S1 smoothen): 311 ms
Time (S2 find details): 217 ms
Time (S3 sharpen): 196 ms
Time (write): 1332 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=6 OUTPUT=6_RES
./a.out ../images/6.ppm ../images/6_RES.ppm
Time (read): 1091 ms
Time (S1 smoothen): 318 ms
Time (S2 find details): 233 ms
Time (S3 sharpen): 224 ms
Time (write): 937 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=6 OUTPUT=6_RES
./a.out ../images/6.ppm ../images/6_RES.ppm
Time (read): 1025 ms
Time (S1 smoothen): 307 ms
Time (S2 find details): 224 ms
Time (S3 sharpen): 199 ms
Time (write): 1263 ms
```

**AVG values for:**

**read :- 1091.8, smoothen :- 312.8, find details :- 224.2, sharpen :- 204.4,  
write-1136.4**

## **7. IMAGE-7**

```
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=7 OUTPUT=7_RES
./a.out ../images/7.ppm ../images/7_RES.ppm
Time (read): 3950 ms
Time (S1 smoothen): 850 ms
Time (S2 find details): 675 ms
Time (S3 sharpen): 641 ms
Time (write): 2009 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=7 OUTPUT=7_RES
./a.out ../images/7.ppm ../images/7_RES.ppm
Time (read): 3853 ms
Time (S1 smoothen): 683 ms
Time (S2 find details): 723 ms
Time (S3 sharpen): 559 ms
Time (write): 3060 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=7 OUTPUT=7_RES
./a.out ../images/7.ppm ../images/7_RES.ppm
Time (read): 3426 ms
Time (S1 smoothen): 725 ms
Time (S2 find details): 522 ms
Time (S3 sharpen): 841 ms
Time (write): 2922 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=7 OUTPUT=7_RES
./a.out ../images/7.ppm ../images/7_RES.ppm
^[[D^[[BTime (read): 2672 ms
Time (S1 smoothen): 745 ms
Time (S2 find details): 529 ms
Time (S3 sharpen): 516 ms
Time (write): 2160 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$ make run-sharpen INPUT=7 OUTPUT=7_RES
./a.out ../images/7.ppm ../images/7_RES.ppm
Time (read): 3128 ms
Time (S1 smoothen): 841 ms
Time (S2 find details): 801 ms
Time (S3 sharpen): 741 ms
Time (write): 2752 ms
jaswika@Sona:/mnt/c/Users/jaswi/.git/lab1/src$
```

**AVG values for:**

**read :- 3411.8, smoothen :- 768.8, find details :- 701.2, sharpen :- 659.6,  
write :- 2580.2**

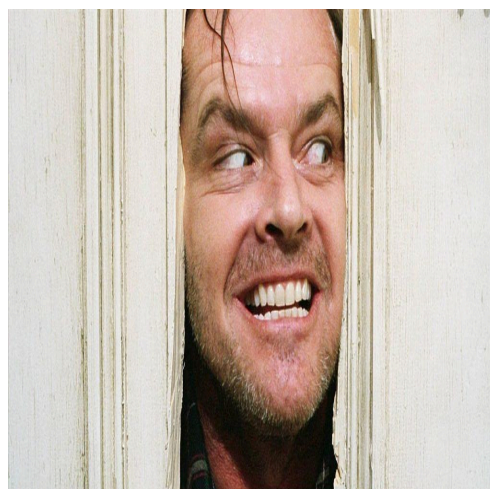
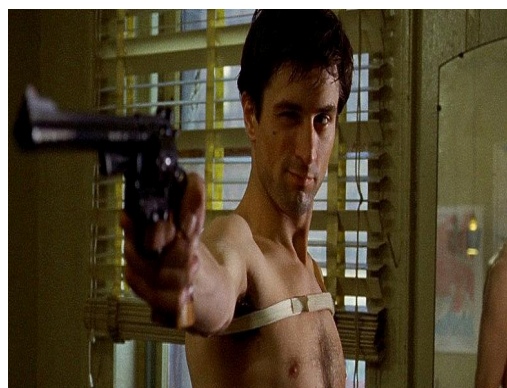
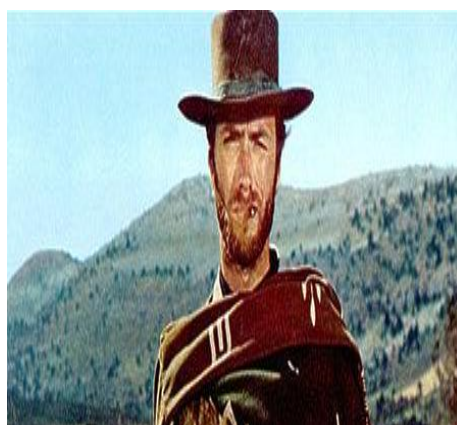
**OBSERVATIONS:**



**ORIGINAL IMAGE:**



**SHARPENED IMAGE:**









1. Sharpened images have stronger outlines, especially around facial features, helmets, clothing edges, and background structures.
2. The sharpened images look slightly more focused or crisp.
3. As the image size increases, the processing time also increases proportionally. That means with the increase in size of image, time is also getting increased.
4. The processing time is also affected by the number of open browser tabs or background applications, as they consume system resources and reduce the performance available for image processing.
5. Higher image resolution leads to more pixels that need to be processed, which directly increases computational load and results in longer processing time.