***JPEG Compression***

***Hardware and Software requirements***

* Operation system Ubuntu
* Hardware Jetson nano 4 core,I7
* GPU Jetson nano internal GPU

***Method***

* Compression with GPU
  + ~~Fast video SDK~~ 
    - Easy to use best way but it’s not free
  + ~~NVJPEG~~
    - Nvidia jpeg compression but not support arm architecture
  + ~~CNET/GPUJPEG~~
    - C++ lib but abandon and not work on CUDA 10
* Compression with CPU
  + Opencv
    - Little bit slower but smaller file size
  + TurboJpegLib
    - Faster than opencv plus bigger file size
  + ~~Wand(imagemagick API) for python~~
    - Two method upper are better
* Compression with OpenCL(GPU+CPU)
  + ~~Imagemagick~~
    - OpenCL not support for Compression

***Benchmark for Jpeg Compression on Jetson nano***

**JpegTurbo 4k image 24 bit 41MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 125.31 | 178.62 | 7.98 |
| 20 | 123.27 | 207.79 | 8.11 |
| 30 | 125.89 | 238.47 | 7.94 |
| 40 | 129.53 | 274.04 | 7.72 |
| 50 | 129.61 | 322.01 | 7.72 |
| 60 | 134.39 | 390.79 | 7.44 |
| 70 | 138.03 | 522.89 | 7.24 |
| 80 | 146.25 | 780.09 | 6.84 |
| 90 | 161.83 | 1434.2 | 6.18 |
| 100 | 293.48 | 7848.49 | 3.41 |

**Opencv (JpegTurbo built-in) 4k image 24 bit 41MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 135.5 | 147.46 | 7.38 |
| 20 | 133.89 | 176.56 | 7.47 |
| 30 | 137.44 | 205.3 | 7.28 |
| 40 | 137.67 | 237.76 | 7.26 |
| 50 | 140.23 | 281.08 | 7.13 |
| 60 | 142.06 | 340.83 | 7.04 |
| 70 | 146.36 | 454.62 | 6.83 |
| 80 | 151.25 | 667.45 | 6.61 |
| 90 | 162.84 | 1206.22 | 6.14 |
| 100 | 248.99 | 5751.87 | 4.02 |

**JpegTurbo 2k image 24 bit 18MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 54.55 | 82.02 | 18.33 |
| 20 | 55.49 | 98.61 | 18.02 |
| 30 | 56.87 | 114.58 | 17.58 |
| 40 | 57.54 | 129.22 | 17.38 |
| 50 | 58.07 | 145.5 | 17.22 |
| 60 | 59.34 | 167.22 | 16.85 |
| 70 | 61.25 | 211.71 | 16.33 |
| 80 | 64.32 | 305.22 | 15.55 |
| 90 | 70.21 | 569.76 | 14.24 |
| 100 | 127.77 | 3339.75 | 7.83 |

**Opencv (JpegTurbo built-in) 2k image 24 bit 18MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 59.05 | 68.28 | 16.93 |
| 20 | 59.71 | 84.87 | 16.75 |
| 30 | 60.66 | 100.14 | 16.49 |
| 40 | 61.33 | 113.91 | 16.3 |
| 50 | 61.83 | 128.82 | 16.17 |
| 60 | 63.1 | 148.19 | 15.85 |
| 70 | 64.24 | 187.62 | 15.57 |
| 80 | 66.18 | 266.31 | 15.11 |
| 90 | 71.2 | 487.56 | 14.04 |
| 100 | 109.11 | 2420.25 | 9.16 |

**JpegTurbo 1920x1080 image 24 bit 10 MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 31.03 | 47.43 | 32.23 |
| 20 | 32.27 | 58.51 | 30.99 |
| 30 | 32.89 | 69.01 | 30.4 |
| 40 | 34.05 | 78.08 | 29.37 |
| 50 | 35.28 | 87.14 | 28.34 |
| 60 | 34.6 | 98.11 | 28.9 |
| 70 | 35.47 | 119.06 | 28.19 |
| 80 | 36.72 | 164.33 | 27.23 |
| 90 | 39.9 | 299.97 | 25.06 |
| 100 | 70.73 | 1797.98 | 14.14 |

**Opencv (JpegTurbo built-in) 1920x1080 image 24 bit 10 MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 33.12 | 39.99 | 30.19 |
| 20 | 33.82 | 51.01 | 29.57 |
| 30 | 35.74 | 61.11 | 27.98 |
| 40 | 36.24 | 69.65 | 27.6 |
| 50 | 36.52 | 78.03 | 27.38 |
| 60 | 36.47 | 87.84 | 27.42 |
| 70 | 36.21 | 106.66 | 27.62 |
| 80 | 37.7 | 145.41 | 26.52 |
| 90 | 40.03 | 260.54 | 24.98 |
| 100 | 59.95 | 1306.41 | 16.68 |

**JpegTurbo 1280x720 image 24 bit 4 MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 14.13 | 22.22 | 70.78 |
| 20 | 14.56 | 28.3 | 68.68 |
| 30 | 14.79 | 33.83 | 67.63 |
| 40 | 15.04 | 38.6 | 66.47 |
| 50 | 14.99 | 43.37 | 66.7 |
| 60 | 15.2 | 48.68 | 65.81 |
| 70 | 15.54 | 57.57 | 64.36 |
| 80 | 16.08 | 75.05 | 62.19 |
| 90 | 17.53 | 127.88 | 57.03 |
| 100 | 31.12 | 746.38 | 32.13 |

**Opencv (JpegTurbo built-in) 1280x720 image 24 bit 4 MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 15.02 | 18.82 | 66.58 |
| 20 | 15.37 | 24.78 | 65.06 |
| 30 | 15.52 | 30.06 | 64.45 |
| 40 | 15.72 | 34.56 | 63.62 |
| 50 | 15.55 | 38.97 | 64.3 |
| 60 | 16.05 | 43.73 | 62.31 |
| 70 | 16.01 | 51.75 | 62.48 |
| 80 | 18.78 | 66.94 | 53.25 |
| 90 | 17.55 | 112.97 | 56.99 |
| 100 | 26.49 | 546.52 | 37.75 |

**JpegTurbo 640x480 image 24 bit 1 MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 5.23 | 8.59 | 191.35 |
| 20 | 5.38 | 11.22 | 185.91 |
| 30 | 5.56 | 13.59 | 179.84 |
| 40 | 5.58 | 15.64 | 179.34 |
| 50 | 5.65 | 17.69 | 176.94 |
| 60 | 5.76 | 19.91 | 173.73 |
| 70 | 5.81 | 23.46 | 172.24 |
| 80 | 5.97 | 29.61 | 167.4 |
| 90 | 6.65 | 46.2 | 150.42 |
| 100 | 10.52 | 230.71 | 95.05 |

**Opencv (JpegTurbo built-in) 640x480 image 24 bit 1 MB**

|  |  |  |  |
| --- | --- | --- | --- |
| Qualilty | Duration(ms) | File Size (KB) | FPS |
| 10 | 5.34 | 7.38 | 187.32 |
| 20 | 5.37 | 9.84 | 186.25 |
| 30 | 5.53 | 12.09 | 180.94 |
| 40 | 5.55 | 13.97 | 180.21 |
| 50 | 5.62 | 15.86 | 177.95 |
| 60 | 5.98 | 17.85 | 167.09 |
| 70 | 5.97 | 21.08 | 167.38 |
| 80 | 5.9 | 26.56 | 169.46 |
| 90 | 6.17 | 41.11 | 162.19 |
| 100 | 8.66 | 173.39 | 115.51 |

***Test image***

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