|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Benchmark | Type | Resource Utilization | | | | Latency | | Major  Optimizations |
| LUT | FF | DSP | BRAM | Absolute | Clock Cycles |
| Morphing  **Speed Up**: **40** | Base  Model | 437 | 148 | 0 | 0 | 242.1ms | 24211824 | Nil |
| Performance  Optimized | 15962 | 6163 | 0 | 0 | 6.1ms | 611075 | VA, LU, BO, ILP |
| Warping  **Speed Up**: **22.5** | Base  Model | 7694 | 4161 | 25 | 0 | 65.55us | 6555 | Nil |
| Performance  Optimized | 7059 | 4765 | 25 | 0 | 2.92us | 292 | VA, PSC, ITM, ILP |
| Run length  Encoding  **Speed Up: 8.2** | Base  Model | 329 | 146 | 0 | 0 | 1.316ms | 131586 | NIL |
| Performance  Optimized | 1227 | 401 | 0 | 0 | 0.16ms | 16395 | BA, LDM, ILP |
| Performance  Optimized | 405 | 119 | 0 | 0 | 0.12us | 12 | ILP-L(2) |
| Histogram Equalization  **Speed Up: 5.4** | Base  Model | 400 | 116 | 0 | 1 | 2.63ms | 263684 | Nil |
| Performance  Optimized | 6997 | 888 | 0 | 8 | 0.49ms | 49551 | VA, LU, LDM, ITM, ILP |
| DCT  **Speed Up: 629.7** | Base  Model | 9438 | 5870 | 101 | 8 | 13.223s | 1322332993 | Nil |
| Performance  Optimized | 13198 | 15701 | 45 | 0+PCM | 21ms | 2097249 | VA, ITM, LDM,  PSC, ILP |
| Hough Transformation  **Speed Up: 195.4** | Base  Model | 15580 | 8927 | 193 | 144 | 8227ms | 822675715 | Nil |
| Performance  Optimized | 20632 | 7992 | 0 | 64+PCM | 42.1ms | 4210695 | VA, PC, LDM BO, POI, ILP |
| Otsu’s  Segmentation  **Speed Up: 12.9** | Base  Model | 11646 | 8280 | 29 | 1 | 5.345ms | 534463 | Nil |
| Performance  Optimized | 26354 | 11228 | 35 | 4 | 0.413ms | 41280 | VA, ITM, LDM, ILP, POI |

**Speed Up**: (Performance of Optimized model / Performance of base model)

VA: Variable Analysis LU: Loop unrolling

ITM: Instruction Translation and Migration POI: Power on Initialization

BO: BRAM Optimization ILP: Instruction level pipelining

PC: Pre synthesis computation LDM: Loop dependency minimization

PCM: Pre-Computation Memory