CVP Project Report-1

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1. Identified Infant Vision Property

1.1 Visual Acuity

i. **Visual Acuity Types:** Visual acuity measures clarity of vision, categorized into recognition acuity (smallest recognizable detail) and resolution acuity (smallest separable details like dots or bars).[4]

ii. **Infant Visual Acuity:** Poor visual acuity in infants, due to retinal and cortical immaturity, might adaptively support cortical development for broad spatial analysis.[1]

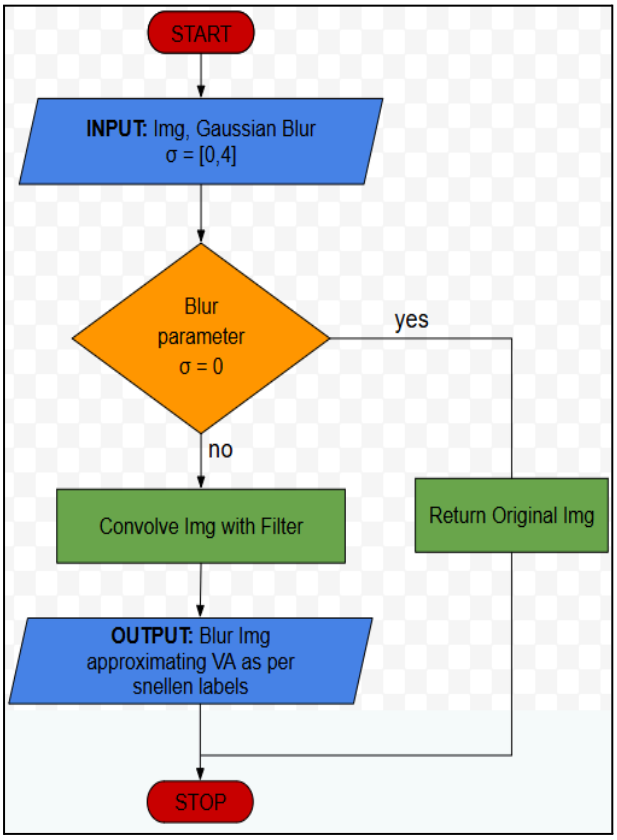
1.2 Contrast Sensitivity

i. **Contrast Sensitivity:** Measures the ability to detect differences in luminance, focusing on broader patterns and gradients, unlike visual acuity.[4]

ii. **Assessment:** Contrast sensitivity is assessed using sweep Visual Evoked Potential (sVEP), where contrast thresholds are determined by extrapolating to zero amplitude.[2][4]

2. Implementation of Infant Vision properties

2.1 Flowchart for Visual Acuity (VA)



We know that[1], for 20/20 acuity, 450 cycles are resolved in a 15° field at 60 cm; for 20/600, 15 cycles are resolved.

The Snellen fraction for each σ is derived by linking σ to spatial frequency:

$$resolvable\ cycles = \frac{450}{\sigma}$$

2.2 Flowchart for Contrast Sensitivity (CS)

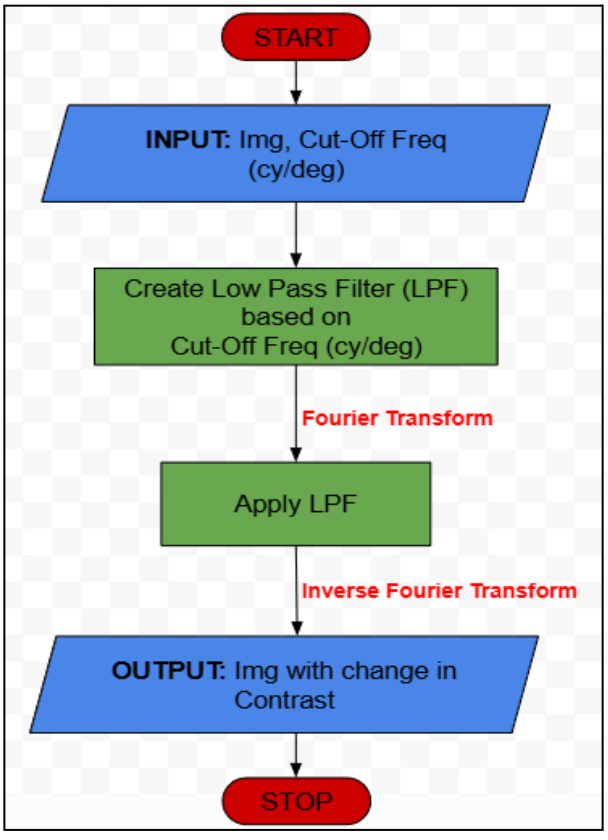


Table 1: Various Cut-off Spatial Frequencies used to create LPF[5] for respective age category.[2][3][4]

Age (in months)	Cut-off Spatial Freq (c/deg)	Peak Contrast Sensitivity
1	2.4	9
2	2.8	12.5
3	4.0	30-160
6	10-20	20-400
Adult	31.9	450

3. Performance Evaluation

The final performance evaluation for Data Loader was done on MacBook Air (Apple M1 Chip) with 8GB memory.

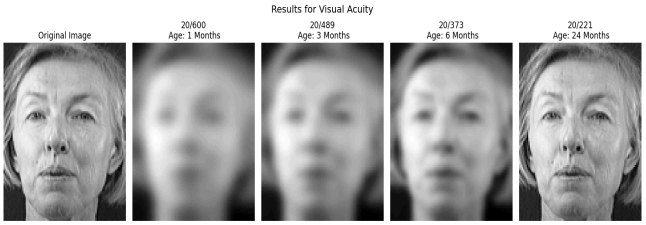


Fig 1

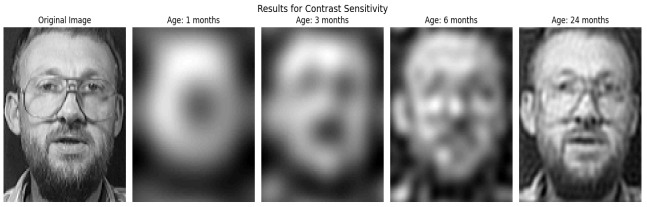


Fig 2

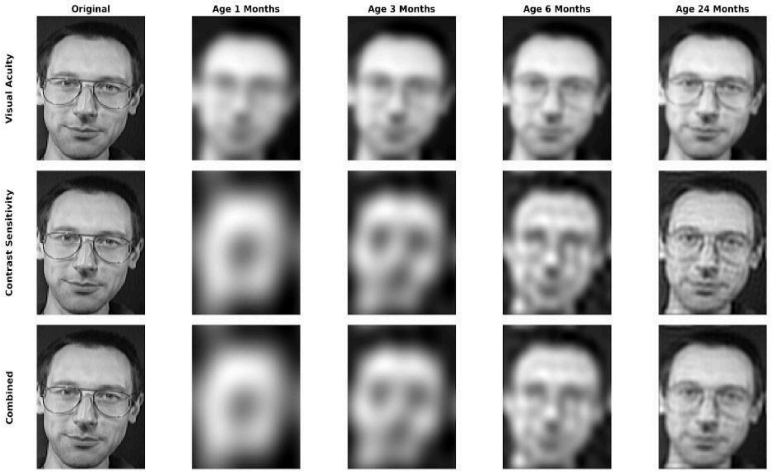


Fig 3: Plot of Comparison (VA, CS, Combination)

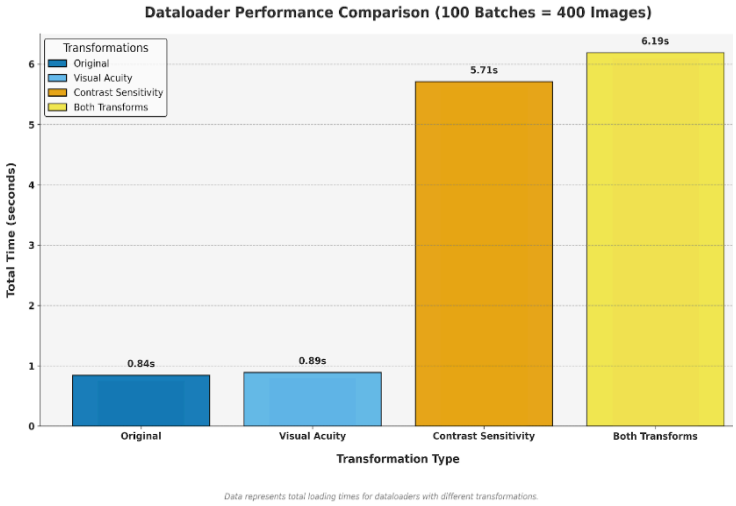


Fig 4

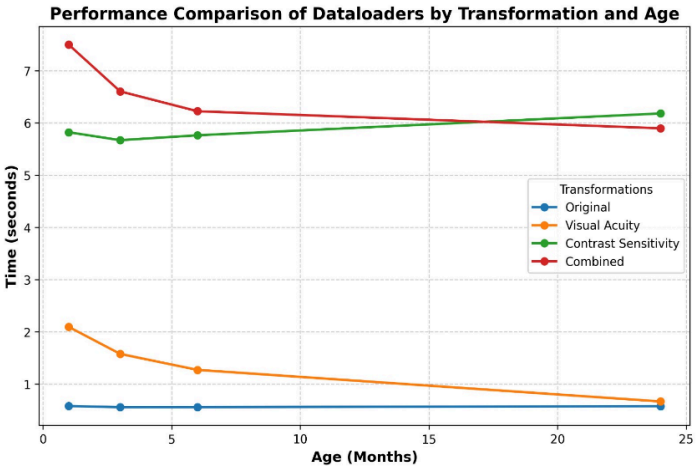


Fig 5

References

1. Vogelsang, L., Gilad-Gutnick, S., Ehrenberg, E., Yonas, A., Diamond, S., Held, R., & Sinha, P. (2018). Potential downside of high initial visual acuity. *Proceedings of the National Academy of Sciences of the United States of America*, *115*(44), 11333–11338. https://www.jstor.org/stable/26532451

2. Banks MS, Salapatek P. Acuity and contrast sensitivity in 1-, 2-, and 3-month-old human infants. Invest Ophthalmol Vis Sci. 1978 Apr;17(4):361-5. PMID: 640783.

3. Norcia AM, Tyler CW, Hamer RD. Development of contrast sensitivity in the human infant. Vision Res. 1990;30(10):1475-86. doi: 10.1016/0042-6989(90)90028-j. PMID: 2247957.

4. Development of Visual Acuity and Contrast Sensitivity in Children Susan J. Leat, Naveen K. Yadav and Elizabeth L. Irving

5. Essays, UK. (November 2018). Development of Vision over the First 12 Months of Life. Retrieved from https://www.ukessays.ae/essays/medical/development-of-vision-over-the-first-12-months-of-life?vref=1