Lens Project

Prior Work

Deep learning-enabled framework for automatic lens design starting point generation

Data

- Source: lens-designs.com
- Chose photographic primes for simplicity (no moving elements[1])
- 1022 Zemax lens designs (more are available for Code V if we need, but we don't have access)
- Spreadsheet with all designs tabulated
- Columns in spreadsheet show:
  - Origin of design [2]
  - 1/2 diagonal sensor size
  - F/# f-ratio
  - Focal Length
  - Notes and Comments
- Python Zemax ZOS-API
- MATLAB Zemax ZOS-API
  - This one works.
  - Saves Lens Data window to CSV file

Extraction Problems

First failed analysis: [US02126126-1](C:\Users\User\OneDrive - Massachusetts Institute of Technology\Documents\MIT\Grad School\Classes\2.156\Lens Project\Prime Lenses\AnalysisExports\US02126126-1)
Last failed analysis: [US02991696-1](C:\Users\User\OneDrive - Massachusetts Institute of Technology\Documents\MIT\Grad School\Classes\2.156\Lens Project\Prime Lenses\AnalysisExports\US02991696-1)
Thus far amended for most, still missing Field Curvature / Distortion

Lenses

What goes into a lens design?

- Curvatures[3]
- Thicknesses
- Refractive Indices
- Diameter

ToDo

- What performance metrics do we want?
  - [x] ~~Vignetting~~[4]
  - [x] ~~Field Curvature / Distortion~~
  - [ ] Spot Diagram
  - [x] ~~RMS vs. Field~~
  - [x] ~~Longitudinal Aberration~~
- What ML architecture are we looking for?

- [x] ~~Rip Lens Data for all Lenses in Dataset~~

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1. Focus Elements Move ↩
2. Patent, Lens Basics ↩
3. Even Coefficients for Aspheric Lenses ↩
4. via Relative Illumination. This is the same except it considers both physical blocking of rays (vignetting) and radiometric darkening of the beams at the edges (roll-off). ↩