Practical Optical Design Seminar, pt. I

Wednesday, February 12, 2020 11:05 AM

Project Proposal:

- Novel
- Intensive
- Design
- Cool shit

Business:

- File sharing
    - GitHub to share
        - Push/pull, version control
        - .SEQ file upload
    - Google Drive
- Slack to talk

PROJECT:

- Vision: 2 weeks to next meeting; think about 2 projects you want to propose and come with prepared material
- Vote on proposals
- Considerations
    - How novel?
    - Sequential design code
    - Zemax preferred
    - Ask various professors you're connected to
- Inspiration
    - Design Group at RIT
    - Anthony Vela at LLNL
        - 3D printed, index-varying optics
    - Zoom Lenses
        - Afocal zoom
            - Minimize pupil walk (aberration)
        - Python script to generate optimal first-order power solutions
        - Freeze ray for Megamind
    - Project submissions to Intl. Design competitions
    - Bat Signal
        - Real application, develop specs
- Want a progress update at the end of the semester showing what PODS is up to

Thoughts:

- Talk to Koshel about hosting a FRED workshop to introduce folks to stray light analysis
- Day of knowledge transfer between members of PODS
- Inviting PODS members to join the

CubeSat:

- Optical design trade-study
- Combo of a couple papers
- 2018 paper, comparison of objectives for CubeSats
    - 1 U = 10 cm^3 volume
    - Propose 3 U CubeSat with 2 U for optics and 1 U avionic, instruments
    - Build spec out of target
    - Considered 3 element refractive systems

    - Freeform, reflective TMA
        - "Gold leaf on a donut"
    - Not particularly complex designs, but a lot of them
- Lots of subdivisions of optical objective
- Design space mapped to cost function, constrained to CubeSat volume
- Jaren's advisor knows his shit about CubeSats
- Could even use Joel's
- CREATE: Design space for CubeSat
- Re: Non-Seq.
    - Reasonable to assemble in mech software and do stray light
- Affie's undergrad project is EUV solar telescope on a CubeSat
- Instrument suites may be explored as well
    - Mini-spectrographs
    - Jaren @ JPL
        - Spectrograph w/ HiRISE resolution (interferometric), optimized for space-based applications
        - Balanced on his nose in a photo
            - You should ask to see the photo
            - It's pretty sick
            - I'm jelly

Non-Sequential Design : Scatterometer

- Find a good, high-resolution scatterometer
- Hard to
- Scatter measurement unit 5D CNC system, instead of a goniometer
    - Current tech uses fibers on goniometer; limiting
    - 5D CNC would allow for more precise measurement of BSDF and BRDF
- Joel: Lot's of companies in LIDAR really want to know polarization dependent BSDF, BRDF
    - Could use polarization-maintaining fibers to enable polarization measurement
    - Currently, polarization-maintaining fiber at LIDAR wavelengths do not exist
- Often in LIDAR, output is left hand circular, return right hand circular
- In LIDAR, don't want specular reflections
    - There are companies who would kill to see this info
- May not be primarily focused on sequential modeling
    - Jaren: worried about the learning curve for non-sequential for everyone

Visible Spectrum Startracker:

- Sara has worked on this at SpaceMicro
- Two purposes
    - High-contrast 4K sensor to look at earth as well as stars

OUTREACH IDEA: Corn syrup suspended on water forms a grin lens, which will deflect a laser downwards on a curve

WOOD LENS: Radial GRIN

- See Duncan Moore's group at RIT