AO System Design

Class Projects

Intro and Overview

January 28, 2016

Project in brief

1. Choose a science question that AO can help answer

2. Decide on an AO system that will best address your science question

We are starting the class projects earlier this time

- A trade-off

- If we wait till you know a great deal about AO, the project ends up due at the end of the quarter, the same time as all your other projects and term papers

- If we start now, you know less (so far) about AO, but as the class proceeds you will be able to connect the lectures to your project

Class project learning goals

- ## Content Goals:

  - Using AO to achieve specific science goals

  - Relation between image quality and residual wavefront error

  - Understanding error budgets: specific contributors; AO as a system

- ## Process Goals:

  - Systems thinking

  - Requirement-driven design

  - Optimization

  - Tradeoffs

What you will actually be doing during your project

1. Choose collaborator(s) and a <u>general area of science</u> that you are interested in using AO for

2. Within your collaboration, come up with a <u>specific "science case"</u> (an investigable science question within your general topic) that benefits from AO

3. Decide upon specific "<u>science requirements</u>" needed in order for a new AO system to address your science case

4. Flow-down science requirements to performance requirements for your AO system

5. Given your performance requirements, design an AO system (on paper) that meets these requirements

6. Present your design to your peers in class ("Conceptual Design Review")

7. Synthesis discussion of what we all learned from this process

Tentative schedule for class project on AO System Design

- Intro (today)

- Starters (February 4th) in class
  - An example of how to choose key AO parameters

- Focused Investigation (Feb 9th)
  - Group work during class time

- Rest of February: continue working together with periodic check-in on progress

- Sharing (Mid-March)
  - "Conceptual Design Review"

- Synthesis (Late March)

First tasks: Choose Collaborators, Science Topic, Specific Science Case

Item	Due date	Explanation	Example
General Science Topic and Collaborator(s)	By Feb 9th (or sooner if you wish)	Choose broad science area which interests you; find collaborator(s)	Extrasolar planetary systems
Specific Science Case	In class on Feb 11th	Frame a specific question that AO can help answer	What are spectra of planets in outer parts of other solar systems (distance > 5 AU from parent star)
Science requirements for AO system design	February 16th	Develop AO system performance requirements for your science case	Angular resolution Contrast ratio between planet and parent star Wavelength range Enclosed energy Spectral resolution

Send e-mails to me
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1. Today or by Feb 9th at the very latest
   - What broad science area are you interested in?
   - Who is (are) your collaborator(s) ?
   - Put Astro289 in subject line

2. After end of class on Feb 9th (each group together)
   - What specific science question do you want to analyze?
   - How will AO help answer this question?