

Adaptive Optics

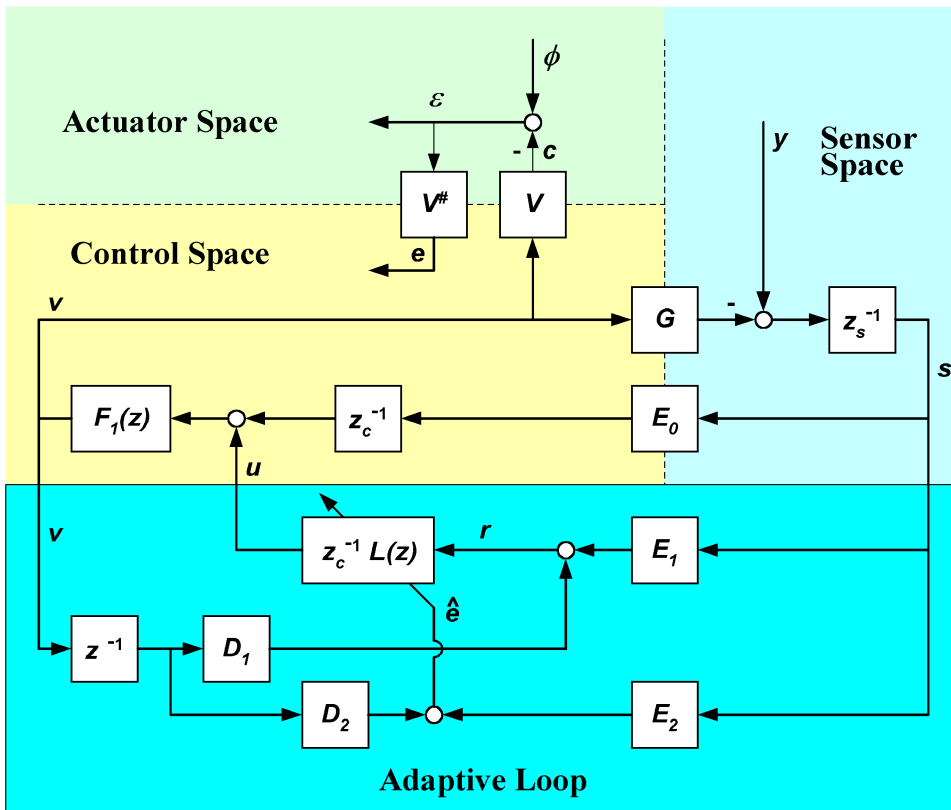
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Current practice in "adaptive" optics:

Non-adaptive feedback loop only

Result of this research:

Truly adaptive control loop based on Multi-channel Lattice Filter



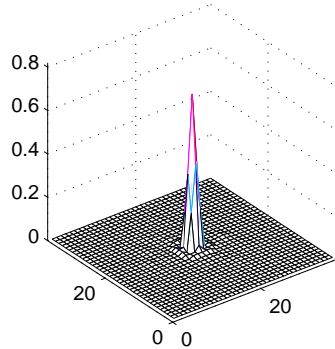
ϕ = uncorrected wave front (phase profile)
 ε = closed-loop wave front error
 c = actuator command vector
 u, v = control command vectors
 y, s = Open-loop, closed-loop WFS vectors

Control Objective: Minimize variance of ε
Optics Objective: Maximize Strehl Ratio

Point Spread Function (Image of Reference Star)

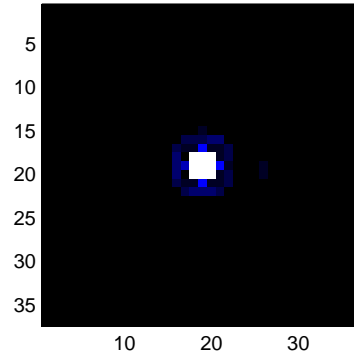
Intensities

With Adaptive Loop

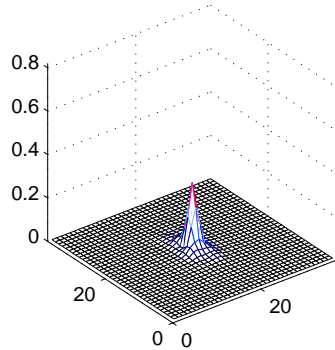


Images

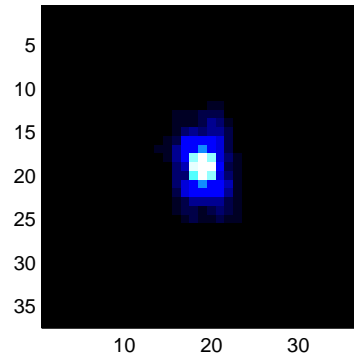
With Adaptive Loop



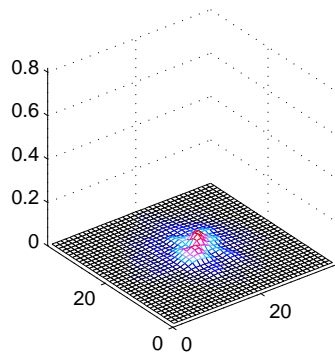
Feedback Loop Only



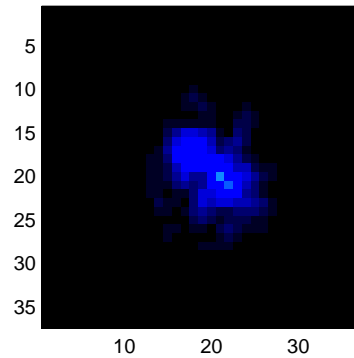
Feedback Loop Only



No Control



No Control



**Strehl Ratio = Peak Intensity of
Point Spread Function**

Green: achievable only with perfect, instantaneous information

Blue: adaptive loop closed at $t = 2000$

Red: feedback loop only

Black: no control

