



Lick AO Control System PSF Data Gathering

PSF Workshop – 5/11/04

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Upgrade Overview



- upgraded ~10 year old AO Control System on Lick Shane 3M telescope to replace aging, no longer supported hardware
- benefits:
 - combined 3 computers into 1
 - transformed experimental control system into facility-grade system
 - improved maintainability and usability
 - provided the ability to ‘easily’ experiment with new things, such as PSF reconstruction...



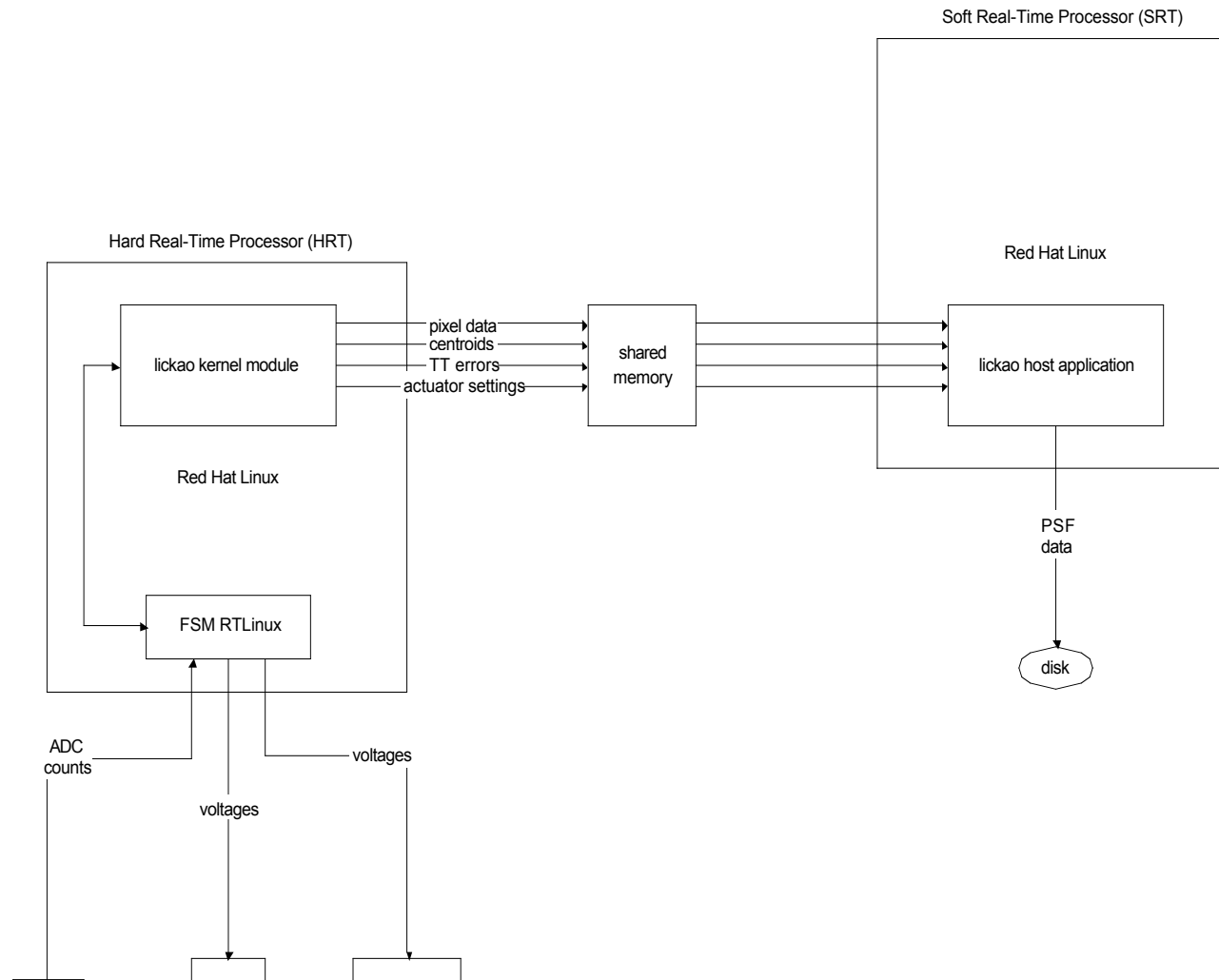


PSF Introduction

- the ability to collect PSF data has been incorporated into the upgraded Lick AO Control System
- PSF data collection can be started and stopped with commands affectionately called pon and poff
- these commands are generally executed automatically when an exposure is started and stopped
- when data collection is in process, various data are accumulated, as described in the following
- when data collection is stopped, means and covariances are computed and stored to disk
- these means and covariances are then post-processed to determine the PSF



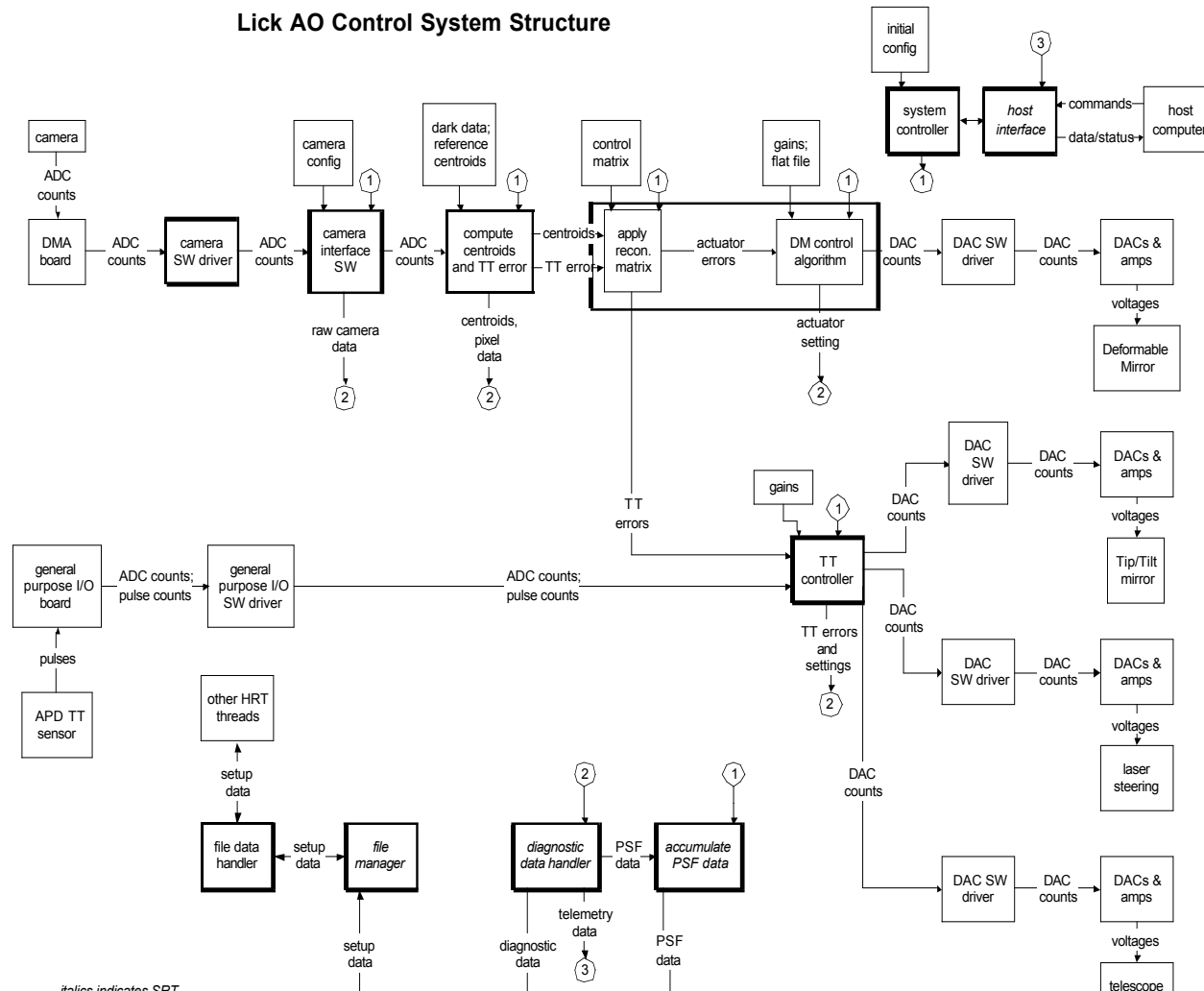
Data Flow, Physical





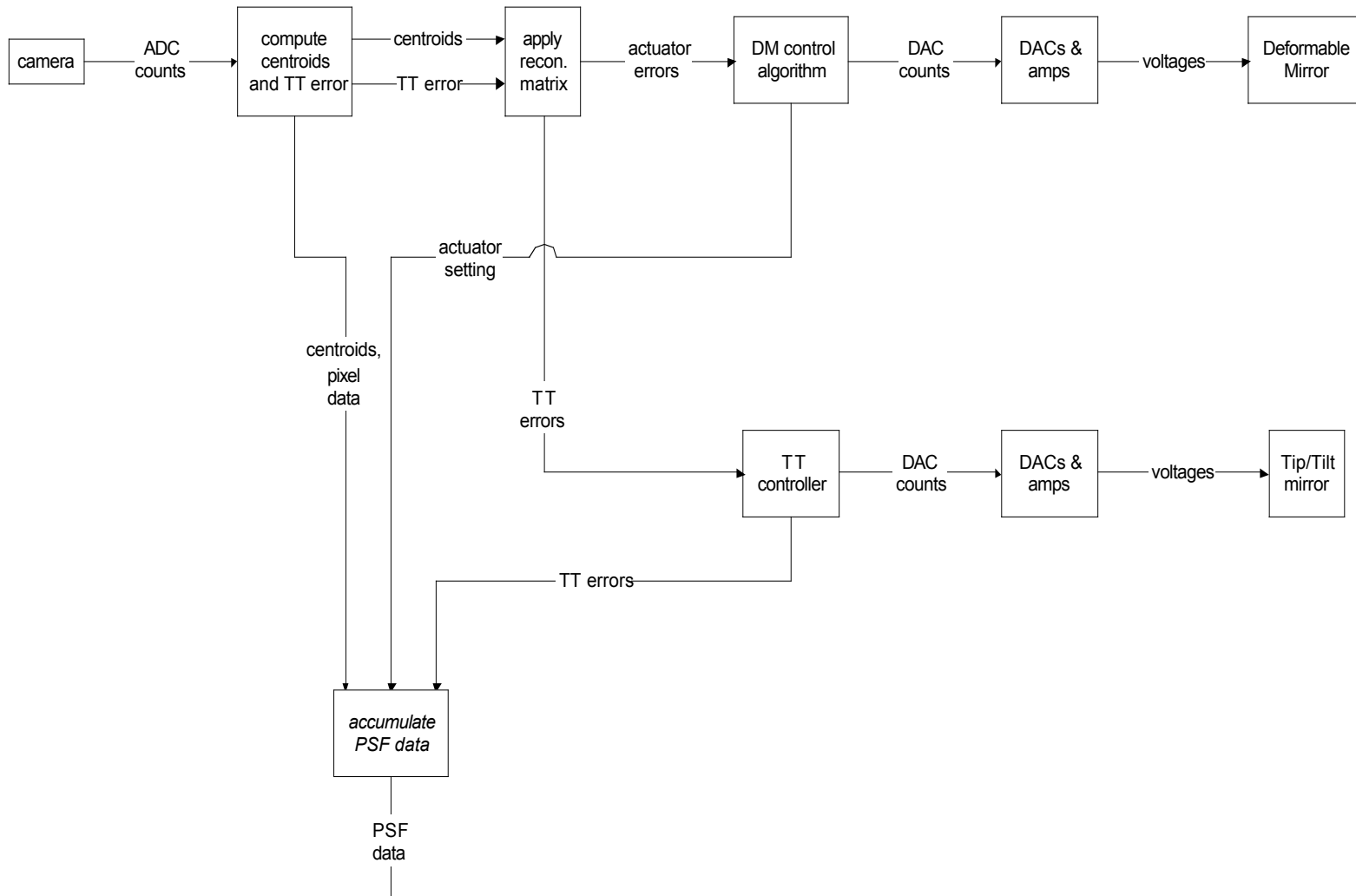
Control System Structure

Lick AO Control System Structure





Data Flow, Logical





PSF Data

Inputs	Description	Units
pixel data	raw camera data minus background and clipped to zero if less than zero (this is the input to the centroider)	ADC counts
centroids	result of centroider algorithm (e.g., quad cell) minus reference centroids, image-sharpening centroid offsets, and tip/tilt errors	pixel units (-1 to 1)
TT errors	average centroid results in the X and Y directions	pixel units (-1 to 1)
actuator settings	voltages being applied to the DM actuators (results of VMM with control law applied, piston removed, and clipped to -5 to +5 Volts)	Volts

Intermediate Data	Description
accumulated pixel data	pixel data, accumulated over an exposure
accumulated centroid data	centroids with TT errors added back in accumulated over an exposure
accumulated actuator data	actuator settings with 'sharp' DM shape subtracted accumulated over an exposure
accumulated pixel data, 2 ^d order	each element of pixel data multiplied by all elements, accumulated over an exposure
accumulated centroid data, 2 ^d order	each element of centroids with TT errors added back in multiplied by all elements, accumulated over an exposure
accumulated actuator data, 2 ^d order	each element of actuator settings with 'sharp' DM shape subtracted multiplied by all elements, accumulated over an exposure

Outputs	Description
1 st order pixel data	means of accumulated pixel data
1 st order centroid data	means of accumulated centroid data
1 st order actuator data	means of accumulated actuator data
2 nd order pixel data	covariances computed using accumulated pixel data, 2 nd order
2 nd order centroid data	covariances computed using accumulated centroid data, 2 nd order
2 nd order actuator data	covariances computed using accumulated actuator data, 2 nd order