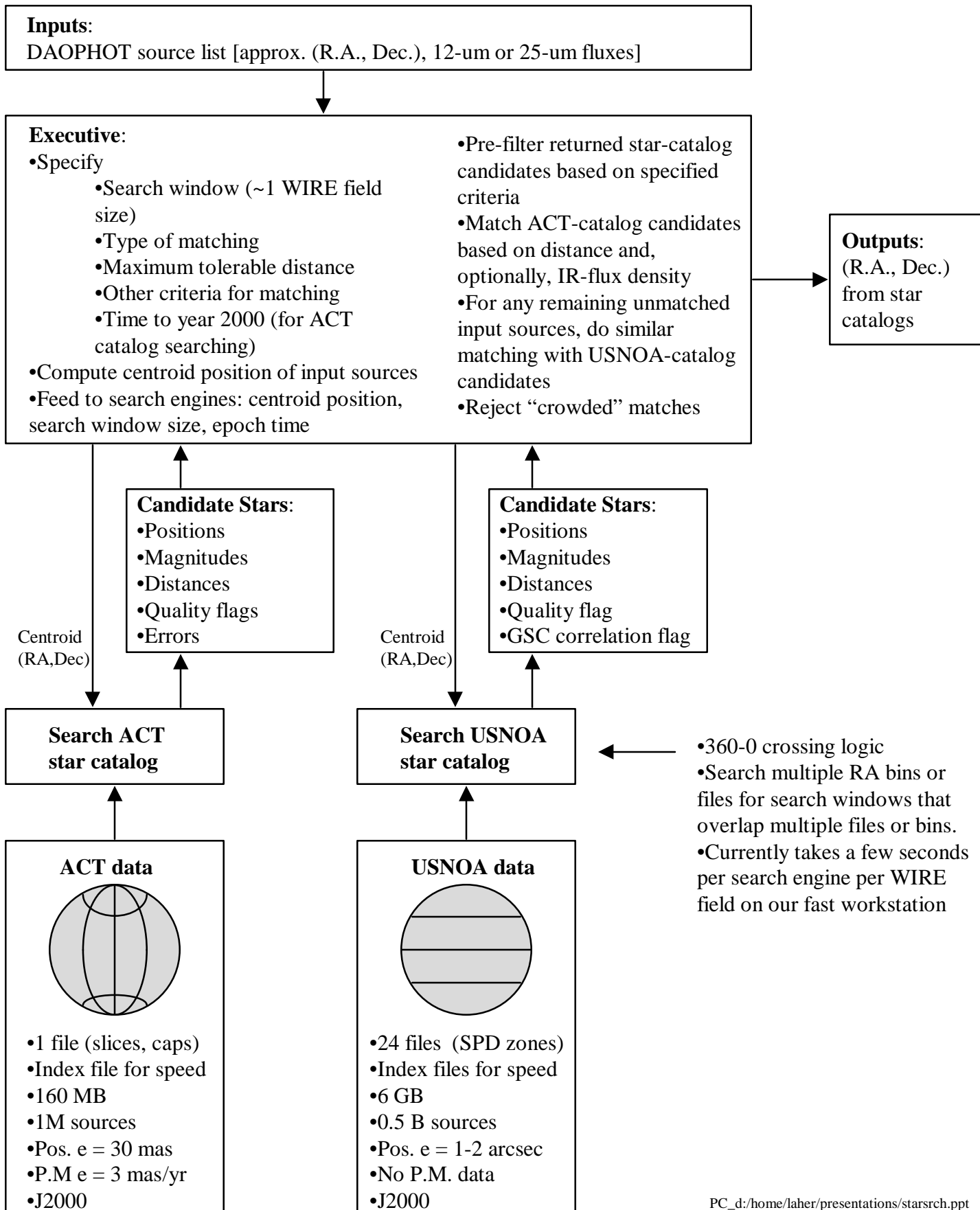


Automatic Star-Catalog Matching for Position Refinement



Optional IR-Flux Matching

- Requires conversion of star-catalog blue and visual magnitudes into WIRE IR-band magnitudes
- The Herter Model
 - B-V color index gives effective temperature
 - Assume black-body radiation spectrum

$$B_l = \frac{2hc}{l^3} \frac{1}{\exp(hc / l kT) - 1}$$

$$F_l = F_o 10^{-V/2.5} \frac{B_l}{B_o}$$

$$\text{IR Magnitude} = -2.5 \log F_l$$

Band	Visible	WIRE 1	WIRE 2
Lambda	0.555 um	12.661 um	23.411 um
Zero Mag.	3540 Jy	33 Jy	9 Jy

- ACT catalog: use Johnson B-V magnitude
- USNOA catalog: compute B-V

Pre-Filtering Star-Catalog Candidates

- **ACT Star Catalog**
 - Reject if outside R.A. and Dec. standard deviation tolerances (default is 1 arcsec)
 - Reject if outside astrometric quality factor tolerance (default is 5)
 - If this option is enabled, reject if flag indicates poor astrometry
 - If IR-flux matching and this option is enabled, reject if variability is indicated
- **USNOA Star Catalog**
 - Reject if neither of the following are true:
 - Both blue and red (visible) magnitudes are in specified range
 - Blue magnitude is in specified range and red (visible) magnitude is 99.9 and not IR-flux matching
 - Blue magnitude is 0 and red (visible) magnitude is in specified range and not IR-flux matching
 - If IR-flux matching, reject if large magnitude error is indicated
 - Do we want to pre-filter based on GSC correlations?

Facts and Features

- Input source list in IPAC table format
- Script to create input file from DOAPHOT outputs (Olga)
 - Re-index sources (1, 2, 3, ...)
 - Compute (RA, Dec) from image pixel coordinates
 - Convert instrumental magnitudes to absolute magnitudes
 - Expand IPAC table with additional relevant quantities from DAPHOT outputs
 - Filter out bad sources
 - magnitude cutoff
 - fit error cutoff
 - chi2 cutoff
 - sharpness cutoff (double-sided)
 - Sort source list from brightest to dimmest
- Diagnostic output file in IPAC table format
- Output file for position refinement software:
 - ACT stars are assigned confidence weight = 1000
 - USNOA stars are assigned confidence weight = 1
 - Filename suffix is “-match”
- Detailed standard output

Additional Work Needed

- More sophisticated matching algorithm?
- Modify input weights to include star-catalog accuracy?