The Yale/ODI Survey: Variability

- Repeated images allow exploration of the time domain
  - Photometric variability (periodic, aperiodic, transient)
  - Astrometric variability (including solar system)

- Depth of individual images comparable to LSST – exploration of variability parameter space

- Deep “pencil beam” (more properly: “broad felt tip”) survey
  - Not ideal for very rare kinds of sources
  - Pushes to much greater distance or fainter limits

- **Challenge: most effective cadence?**
The Yale/ODI Survey: Variability Examples

- RR Lyrae stars (see Bob Zinn)
  - Excellent standard candles (7% in distance)
  - Little contamination from other sources
  - Effective probes of galactic halo substructure
  - ODI survey probes distances to 500 kpc (current limits 120 kpc)
  - BUT statistics may be quite small

- Faint CVs
  - SN Type Ia precursors – evolution/demographics poorly understood
  - periodic and aperiodic variability on many timescales
  - color selection also very helpful (and Halpha)
  - faint end of luminosity function poorly probed
  - evolution predicts pileup P>=81m (not confirmed!)
  - survey will probe white dwarf + red dwarf binaries out to 1 kpc

- Astrometry (Terry Girard will discuss)
The Yale/ODI Survey: Variability Challenges

- Specific timescales favor specific, possibly mutually incompatible cadences (SNe, RR Lyr, microlensing)

- General “variability” searches should sample all available timescales (not typical approach)

- Relatively small area loses statistics

- Transients requiring turnaround <~ 2 days not easily handled
The Yale/ODI Survey: Strawman Cadence

- Individual exposures ~2m (high efficiency, comparable depth to LSST)

- Main overhead is setting on field – efficient to take multiple images

- "Good seeing" visit (10 per field over survey)
  - 12 x 2m i, 3 x 2m r, 6 x 2m g (dark) or z (bright)

- "Median seeing" visit (20 per field over survey)
  - 3 x 2m i, 6 x 2m r, 12 x 2m g (dark) or z (bright)

- Total: 6 hrs i, 5 hrs each g,r,z

- 26 visits in one season (separated by hours, days, weeks)

- 2 visits in each of the other two years