

Centrum Astronomiczne im. M. Kopernika PAN

Practical Observational Astronomy Lecture 5

Photometry

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History

- Hipparchos 190 120 B.C.
 visible stars divided into 6 magnitudes
- John Hershel 1792- 1871 → Norman Robert Pogson A.D. 1829 - 1891

$$\frac{I_m}{I_{m+5}} = 100 \qquad m_1 - m_2 = -2.5 \log\left(\frac{I_1}{I_2}\right)$$

Visual Observations



- •Argelander method
- Cuneiform photometer
- Polarimetric photometer



Visual Observations



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Photographic Plates



Blink comparator

Scanning Micro-Photodensitometer





Photographic plates



Liller, Martha H.; 1978IBVS.1527....1L

Photoelectric Photometer

- Photomultiplier tubes
 - Single star measurement
 - Individual photons





Photoelectric Photometer

- 1953 Harold Lester Johnson UBV system
 - telescope with aluminium covered mirrors,
 - detector is photomultiplier 1P21,
 - for V Corning 3384 filter is used,
 - for B Corning 5030 + Schott CG13 filters are used,
 - for U Corning 9863 filter is used.
 - Telescope at altitude of >2000 meters to allow the detection of sufficent amount of UV light.

UBV System Extensions: R,I

- William Wilson
 Morgan
- Kron-Cousins



CCD



Types of photometry

- Aperture
- Profile
- Image subtraction

Aperture Photometry



Aperture Photometry



Profile Photometry



Profile Photometry



DAOphot

- Find stars
- Aperture photometry
- Point Spread Function
- Profile photometry



- Construct a template image
 - Select a number of best quality images
 - Register all images into a selected astrometric position
 - Find common stars
 - Calculate astrometric transformation
 - Calculate photometric scale transformation
 - Stack images
- Subtract template from the science image(s)

- Subtract template image from a science image
 - Find common stars
 - Calculate astrometric transformation
 - Calculate photometric scale transformation
 - Find PSF transformation kernel
 - Convolve template image with PSF transformation kernel
 - Subtract template



- Detect variable stars
- Aperture or profile photometry on subtracted image
- Profile photometry with aperture corrections on the template image
- Photometric calibration of the light curves

