MK Classification of Spectra Using an Automated Classification Algorithm

1. Abstract
2. Introduction
   1. Classifying Stars
      1. Spectral Type
         1. Early/Late
      2. Luminosity Class
      3. HR Diagram
      4. OBA Stars
   2. Peculiar stars
      1. Emission
      2. Line Broadening
      3. Metallicity
         1. Weak
         2. Strong
         3. General
      4. Binary Systems
   3. MK classification system
   4. Human spectral typing methods ---------------- It is possible that this should go in methods
      1. Sequence humans go through
         1. Broad look at shape
         2. Narrow down to approximate type
         3. Look for luminosity class
   5. Current attempts at computer automated spectral typing
      1. Why it’s useful
      2. MKCLASS
         1. Weaknesses
            1. Just gives up
         2. Strengths
            1. Can classify stars of any type
      3. The Cannon
3. Research Methods
   1. Original program
   2. Wavelength Calibration Changes
      1. Automated wavelength calibr
      2. ation
      3. Identifies location of hydrogen lines
      4. Flags stars that cannot be spectral typed----NOT IMPLEMTED YET
   3. Continuum Rectification Changes
      1. Automated continuum rectification—NOT IMPLEMETED YET
      2. Comparison bar—NOT IMPLEMENTED YET
      3. Side by side comparison of continuum
   4. Spectral typing
      1. No changes as of yet, but plans are explained in the discussion section
4. Results
   1. Statistics
5. Discussion
   1. Two possible approaches to spectral typing
   2. Automated Spectral Typing Ideas
      1. Decision Forest
         1. X^2 comparison
         2. Strengths of specific lines
         3. Separate into three groups: Normal, Peculiar, and Unclassifiable
            1. Normal stars go through the standard classification algorithm
            2. Peculiar stars go through a specialized classification algorithm
         4. Provide confidence rating
         5. Strengths
            1. Conforms more closely to the MK classification method
            2. Does not require a large set of pretyped spectra
         6. Weaknesses of my program
            1. Can only effectively type OBA stars
      2. Modifying The Cannon to be used for spectral typing
         1. Strengths
            1. Could easily be expanded to type stars of any type
            2. Computationally efficient
         2. Weaknesses
            1. Requires a large set of pretyped spectra
            2. Does not conform completely to the MK classification method
      3. Maintain database of confidently typed stars
         1. Database can be used as part of the X^2 comparison compare to a group of “B5IV” stars instead of just the standard
         2. Keep track of stars that have already been spectral typed and mark the differences in spectra over time
   3. Outline of goals for the fall
      1. Correctly spectral type normal stars that fit nicely with spectral standards
      2. Correctly spectral type normal stars that are in between spectral standards
      3. Correctly identify stars that cannot be spectral typed
      4. Correctly identify peculiar stars that fit within spectral standards (roughly)
      5. Correctly identify peculiar stars that are in between spectral standards
6. References
   1. Stellar Classification – Gray and Corbally CR: 2009
   2. <http://www.appstate.edu/~grayro/mkclass/mkclass.pdf>
   3. The Cannon
   4. LAMOST with MKCLASS
   5. http://astronomy.swin.edu.au/cosmos/H/Hertzsprung-Russell+Diagram