Car Detection Using RGB Image Geometry and Semantic Estimations

Yuanfang Wang, Yinghao Xu, Julian Gao

October 20, 2016

1 Introduction

Each working group should prepare a brief proposal describing what they want to do. Please make sure that everyone participates in the discussions and reviews the document. The usual way to do this is to have a principle author, but to pass it around so that everyone can comment and add or edit. Prepare the document using LaTeX because it is good practice and will help you learn the basics. However, note that Google Docs (a.k.a. Google Drive) also allows LaTeX math symbols and is a reasonable alternative except for submissions to journals for professional use. There is help for LaTeX on the class website.

Write a brief introduction in which you outline the scope of your proposed work. Use this space to explain why you are interested in this topic and what you hope to learn. Connect your interest with what is currently known, and include at least two references to related articles in the astronomical literature. You can use ADS `http://adswww.harvard.edu/` and other links on the class website `http://prancer.physics.louisville.edu/classes/308/` to help you find out more. An example citation is this paper [1].

One to two pages should suffice for this part, but use more if you want. Include figures or images if needed. Figure **??** is an example of how to do it in LaTeX.

2 Targets

Identify the targets you want to study. Define their observable characteristics by giving their identifiers (e.g. common name if any, NGC or HD or other catalog entry you can find with AstroCC and Simbad), celestial coordinates, optical magnitudes, and angular size if the object is extended, that is, non-stellar. Please select targets that we have a good likelihood of observing:

- Not fainter than magnitude 19 (18 is better)
- Not larger than $0.5°$, but see below

- Above the horizon at either observatory for several hours this fall

A single 100 second exposure with the 0.5 meter telescopes will reach magnitude 18 on a clear night. Accurate quantitative measurements require a little brighter, or longer total accumulated exposures. The telescopes resolve 1 arcsecond in two pixels and have a field of view of 0.6°. Larger fields must be mosaics of several exposures. These factors will affect your choices.

For planetary imaging the CDK20's can take exposures as short as 0.01 seconds. The longest practical single exposure is about 300 seconds, but typically we take 100 second exposures and add them in order to make small guiding corrections between exposures. Use AstroCC with Stellarium to assure that the targets are observable this season.

3 Filters, exposures, and special requests

Assuming that the best telescope for your work is one of the two 0.5 meters (CDK20N at Moore Observatory, CDK20S at Mt. Kent), you will have a choice of filters: Sloan filter set (g, r, i, or z), Johnson-Cousins (U, B, V, R, or I), color imaging (B, G, R, or clear), and narrow band (S [*II*], red continuum, Hα, O[*III*]. Identify which filters are of interest.

A typical exposure time for a magnitude 12 star to about half saturation is 100 seconds, but it depends on the filter choice. Based on this, estimate how many exposures you will need, and what total time you require. In some cases, for example studying an eclipsing or variable star, or an exoplanet transit, you would use only one filter and make many measurements over a night. In others, you may make only a few exposures in each filter, and try many different filters. Changing filter sets takes an operator and several minutes, but changing filters within one set (e.g. a different Sloan filter) takes only a few seconds.

We have other telescopes that may be available at Moore Observatory this season. There is a wide field astrograph that has a field of view of 4° and is a fast $f/4$, especially good for large nebula, comets, or surveys. A 14-inch (0.36 meter) Celestron telescope can be equipped with a fast camera for planetary imaging. A 27-inch (0.7 meter) corrected Dall-Kirkham is scheduled to be be delivered to Australia this fall, although we are unsure of the actual date it could see light yet.

References

[1] Jonay I. González Hernández, Pilar Ruiz-Lapuente, Hugo M. Tabernero, David Montes, Ramon Canal, Javier Méndez and Luigi R. Bedin, No surviving evolved companions of the progenitor of SN1006, Nature, **489**, 533-536 (2012).