Companion Frequency and Mass Ratio Distribution of M Dwarfs

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Abstract

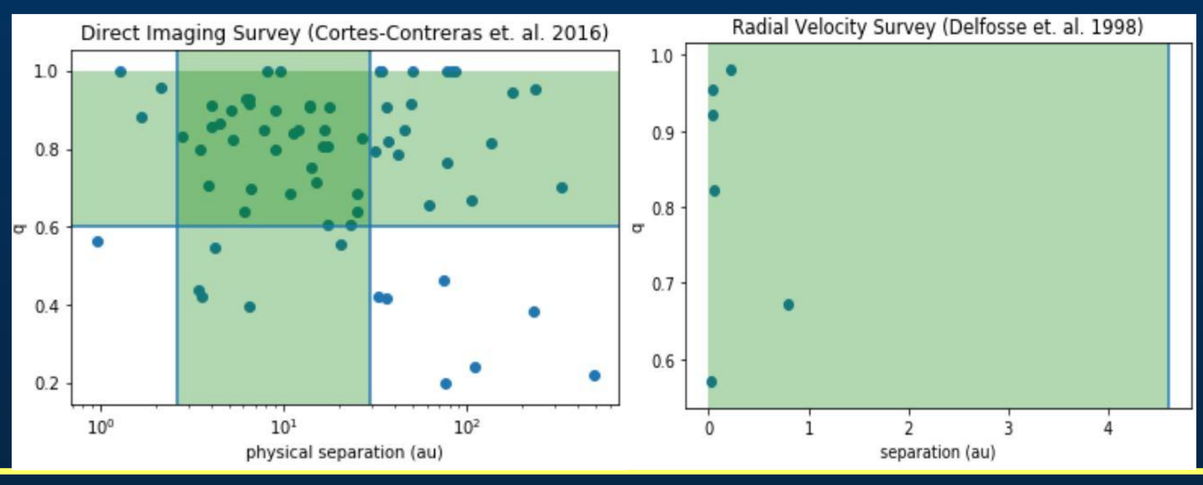
The focus of this research is the companion mass ratio distribution (CMRD) of M dwarfs. This research first began with a literature search for direct imaging and radial velocity surveys of M dwarf binary systems with well defined sensitivities to the companion mass ratio, q (companion mass / primary mass), and orbital separation (a). Next, the KS test was used to test whether the surveys were consistent with each other. Finally, a model was fit over the point estimates of the companion frequency from each survey to estimate the total frequency of companions over q = [0.1, 1.0] and a = [0,infinity]. This showed...

Introduction

This research is a response to Reggiani & Meyer 2013, which claims that the CMRD appears to be independent of separation. However, the authors state that a larger sample size would be needed in order to confidently assert this claim. By using data from two different types of surveys, the research presented here serves as an answer to this call for closer analysis. The nature of the CMRD is important to constrain because it allows insite into the formation of binary star systems. This research expands our knowledge in this area to include M dwarfs in a greater capacity.

Survey Data

The data used in this research is drawn from two surveys of M Dwarf Binaries: direct imaging (Cortes-Contreras et. al. 2016) and radial velocity (Delfosse et. al. 1998) . The ranges to which the surveys are completein q and a had to be taken into careful consideration. Fundamentally, these survey are representative over different ranges of separation. This is done to check whether the CMRD is consistent over different ranges of separation.



Results

The first result of this research is the KS test, which was conducted over the two samples to check whether they are consistent over the ranges of q and orbital separation for which they are complete. This test returned a statistical value of .48 and a p value of .19, which allows us to accept the null hypothesis that the two samples are drawn from the same distribution. Next...

Next Steps

References

Cortes-Contreras et. al. 2016, Delfosse et. al. 1998, Reggiani & Meyer 2013