A Bayesian Multi-planet Kepler Periodogram for Extra-solar Planet Detection

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Abstract

A Bayesian nonlinear model fitting algorithm has been developed which employs a parallel tempering Markov chain Monte Carlo algorithm with a novel statistical control system (Gregory, Cambridge University Press, 2005a). The control system automates the selection of efficient Gaussian proposal distributions for the model parameters.

When the signal model is described by Kepler's laws the algorithm becomes a Bayesian multi-planet Kepler periodogram, ideally suited for the analysis of precision radial velocity data (Gregory, 2005b and 2005c). In addition to orbital periods, the algorithm provides full marginal parameters distributions for all the orbital elements that can be determined from radial velocity data. Improvements to the control system and the use of a more orthogonal reparameterization have resulted in significant improvements in the periodogram performance. These improvements and recent results will be discussed.

References:

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