A Specialized Searching Algorithm Towards the Improvement in Detection of Single-Transit and Long-Period Exoplanets in Brightness Time-Series Data

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The advent of space telescopes such as TESS and Kepler has led to transit photometry becoming the most prolific method for finding exoplanets. However, it tends to have a bias towards short period exoplanets (P < 27.4 d), as it is those planets that have the largest signal strength and highest frequency in time-series data. Finding long-period planets allows for a more complete picture of planet population, however, the transits of these planets are often lost in noise. In this paper, a specialized searching algorithm for single-transit and long-period planets is created through a modified version of a basic searching algorithm. Subsequently, the specialized searching algorithm is tested against the original algorithm on a dataset of randomly-generated lightcurves mimicking TESS data, in order to determine the effectiveness of each algorithm for finding single-transit and long-period planets. It is found that the specialized searching algorithm has nearly double the effectiveness of the original algorithm, making it a powerful new method to find single-transit and long-period planets. This finding will help advance our understanding of planet and system formation through an increased ability to detect single-transit and long-period planets in brightness time-series data.

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