

A novel spectral analysis method for detection of exoplanets

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Abstract:

Exoplanet search is a very active area of research interest of late. Several methods for detection of exoplanets have been proposed. Here a novel method, based on spectral analysis of the orbit of the host star to detect the existence of exoplanets, is proposed. From the knowledge of the first two orbital elements, namely, the Semi-Major Axis and the eccentricity of the star orbit, the existence of exoplanets in the system can be inferred. Using these two observed elements, the orbits of the entire star planet system is generated by numerical simulation of the orbital dynamics. As a case for demonstration of the concept, the method is applied to the case of β -Pictoris system which has 2 known exoplanets.

1. INTRODUCTION:

The twinkling stars in the skies, the various heavenly spectacles that Nature has put up for the humanity to marvel at, have generated great curiosity in human societies across the world, perhaps, since the evolution of the *homo sapiens*. In the 16th century AD renowned astronomers like Copernicus propounded his Heliocentric Hypothesis and later Tycho Brahe, Kepler and Galileo developed it. Galileo's observations conclusively proved the Heliocentric Hypothesis. The size of the Solar System was a revelation to the Mankind. Galileo's later observations of the Milky Way Galaxy showed existence of innumerable stars and threw open the possibility of "infinite number of worlds" as remarked by Giordano Bruno. Later, Newton also expressed similar speculations. However, it was not until in 1995, that the *observation* of the exoplanet 51 Peg b, a "Hot Jupiter" planet orbiting its host star 51 Pegasi in a hitherto unknown close orbit was announced by Mayor and Queloz [1]. These results clinched the question of existence of "exoplanets" and earned Mayor and Queloz the Physics Nobel of 2019. "Exoplanets" or "Extra Solar Planets" are planets orbiting other stars, just like the Earth and other members of the Solar System orbit the Sun.

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At present, more than two decades down the history of Astronomy and Astrophysics, we have more than 4000 confirmed exoplanets and more than a thousand candidate planets