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Simulation of Transit Method for detection of exoplanets

The transit method is one of the most effective and reliable methods to detect the exoplanets around other stars in our galaxy. As an exoplanet passes in front of its host star along our line of sight, it causes a periodic dimming of the system's brightness. This follows as the exoplanet blocks a portion of the host star's radiant flux. Consequently, light curves of the system are generated, which are then studied in search of periodic dips corresponding to planetary transits. Students only get to read about the theory part of the concept but some of them lack visualization and most importantly the hands-on experience. We present the simulation of a transit method for the detection of exoplanets. Our aim is to explore the easier approach to teach this concept to Undergrad and advanced high school students and also to give them hands-on experience. For simplicity, here we only consider one planet around the target star. We simulate the star-planet system using 'Vpython'and analyse it through 'Tracker'to produce lightcurves and the respective data file in terms of Time and Flux. Light Curves and the Data files are analysed by Tracker and Python algorithms. We then estimate the Radius of the exoplanet and orbital radius using observables such as transit depth, transit duration, and the Orbital period. Finally, these values are compared with the input parameters of the Vpython simulation to calculate the errors and to state the conclusion. We clearly see that both approaches produce similar results and are pretty close to the input values of the Vpython simulation. We also saw huge deviations in orbital radius values from python as well as tracker. We showed these methods to undergraduates and high school students. We found the second-year undergraduates with basic python knowledge were able to follow the python programming approach on the other hand high school students found it confusing and difficult since they don't have a background of OOP.

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