Detecting Exoplanet Transits via CCD Photometry

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We present data and analysis on the capabilities of the telescope at the Centennial Observatory, and, in general, ground-based telescopes with similar properties to perform differential photometry. Over a period of 6 months, we observed several variable stars with transiting exoplanets, as well as reference and check stars in the same field, and recorded the stellar flux via a CCD camera. To control for sources of error such as intrinsic noise and thermal interference, we took different types of calibration shots. We then generated light curves of the variable stars using differential photometry. We found that the telescope was able to detect changes in magnitude of up to a hundredth of a magnitude, a precise enough measurement to detect exoplanet transits. Furthermore, we observed a transit of planet XO-4b to confirm our accuracy, and calculated properties of the star-exoplanet system using our data. We obtained a value of the radius of XO-4b of 1.174 x 10^8 m, compared to the actual value of 9.416 x 10^7 m, which, in astronomical terms, is extremely accurate, showing that anyone in the world with a similar telescope, photometry equipment, and atmospheric conditions can contribute to the exoplanet research effort.

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