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J Astrophys Aerospace Technol 2016, 4:3(Suppl)
http://dx.doi.org/10.4172/2329-6542.C1.006

International Conference on
Astrophysics and Particle Physics
December 08-10, 2016 Dallas, Texas, USA

Removing dust impact for visual navigation in Mars landing

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Visual navigation has received more and more attention in Mars landing. However, dust devils are active on Mars. The dust will make a great influence on visual navigation during the landing phase. So we proposed a simple but effective approach to remove the dust impact for visual navigation in Mars landing. This method was based on a model which was widely used to describe the scene radiance that was affected by different weather conditions. First the calculation method of transmission parameter was deduced from this model. Then the value of the global atmospheric light was estimated through the detection of most dust-opaque region. After all unknown variables were determined; the clear image was recovered by the corresponding formula and calculation method. For it was difficult to obtain the decent images that appear while the Mars rover enters the landing phase, a simulated dust environment was created in the lab and some images affected by dust were obtained to check the validity of this method. From the results of the experiments, the proposed approach can effectively eliminate the dust influences and provide clearer pictures. The clear images help to provide more precise data for visual navigation.

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Implications of the study of galaxy clusters and cosmic large-scale structure on neutrino masses and dark matter

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Galaxy clusters are sensitive probes of the large-scale structure of the matter density distribution of the Universe and they allow to obtain observational constraints of the masses if neutrinos. X-ray observations provide currently the best means to detect and characterize galaxy clusters. Using a statistically complete sample of galaxy clusters detected in the ROSAT All-Sky X-ray survey, we constrain cosmological parameters, specifically the matter density and the amplitude of the large-scale matter density fluctuations. A comparison of these results with the measurements of cosmic microwave background anisotropies with the Planck satellite show some tension, which implies less pronounced fluctuation amplitude of nearby large-scale structure as compared to the predictions based on Planck and a pure LCDM model. Damping of fluctuations by neutrino dark matter provides a plausible explanation for this discrepancy. We discuss the constraints on the neutrino mass from these findings and from other measurements of the nearby large-scale structure of the Universe.

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