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Radiometric modelling of a satellite remote sensing system used for image generation

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**Abstract content
 (Max 300 words)**

A mathematical model that defines the signal output of passive sensors, used to view the surface of the Earth, is developed. The mathematical model describes the different solar and self-emitted thermal energy paths that contribute to the radiance reaching the sensor of an Earth observation satellite. The different solar and self-emitted thermal energy paths were defined by identifying the radiometry pertaining to image generation of optical satellites viewing the surface of the Earth. This was done by studying the physical real world model of a satellite remote sensing system used in image generation. It was found that the mathematical model must include expressions to describe the sensor to be mounted on satellites, the target that is being viewed by the sensor and the effects of the medium through which the sensor views the target. The total radiance reaching the sensor must therefore include thermally emitted radiance, atmospheric path radiance and reflected radiance terms. The reflected radiance terms are due to sources such as the target, sun, sky and ambient environment. A mathematical model which includes these terms describes the signal output of sensors used in satellite remote sensing systems. This mathematical model aids in the prediction and study of the output of a multi-spectral space remote sensing image generation system, before the actual system is manufactured. The mathematical model can be implemented in software in order to develop a detailed image simulation process that is capable of producing an accurate representation of the image data obtained from a satellite remote sensing system. The capability to simulate the signal output of these sensors is of great value, as it reduces the dependency on extensive field tests when developing, testing and calibrating space remote sensing cameras.

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