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SENSOR++: SIMULATION OF REMOTE SENSING SYSTEMS FROM VISIBLE TO THERMAL INFRARED

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Abstract. During the development process of a remote sensing system, the optimization and the verification of the sensor system are important tasks. To support these tasks, the simulation of the sensor and its output is valuable. This enables the developers to test algorithms, estimate errors, and evaluate the capabilities of the whole sensor system before the final remote sensing system is available and produces real data. The presented simulation concept, SENSOR++, consists of three parts. The first part is the geometric simulation which calculates where the sensor looks at by using a ray tracing algorithm. This also determines whether the observed part of the scene is shadowed or not. The second part describes the radiometry and results in the spectral at-sensor radiance from the visible spectrum to the thermal infrared according to the simulated sensor type. In the case of earth remote sensing, it also includes a model of the radiative transfer through the atmosphere. The final part uses the at-sensor radiance to generate digital images by using an optical and an electronic sensor model. Using SENSOR++ for an optimization requires the additional application of task-specific data processing algorithms. The principle of the simulation approach is explained, all relevant concepts of SENSOR++ are discussed, and first examples of its use are given, for example a camera simulation for a moon lander. Finally, the verification of SENSOR++ is demonstrated.

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