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Retrieval of the sea ice optical properties from satellite optical measurements

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Satellite remote sensing is an important tool for monitoring the sea ice state, particularly in the difficult-to-access Polar Regions. The snow grain size, the soot contaminants concentration, the melt pond fraction (during the summer melt), and the surface albedo are the key characteristics for various problems regarding the climate changes, monitoring the ice melt process, particularly regarding the drastic changes in the Arctic environment, observed in the recent years. The common approach to retrieve the sea ice characteristics uses *a priori* reflection spectra of the sea ice surface components: Snow, white ice, blue ice, melt pond, and so on. Here another technique is presented based on models of the optical properties of sea ice. Algorithm MPD (Melt Pond Detector) considers the summer ice as consisting of white ice (high reflective) and melt ponds. The MPD input is the MERIS data. The algorithm retrieves the surface characteristics in an iterative procedure with the Newton-Raphson method. It uses the simple optical model of ice, take into account the bidirectional reflection, and include the atmospheric correction. It was verified with the *in situ* measurements. The output is maps of the melt pond fraction and the pixel spectral albedo. The produced maps allow monitoring the long-time global changes of the Arctic ice state. These retrievals provide the historical data on the process of Arctic ice melting, which is so important for understanding the climate changes in the Arctic. It is planned to implement it for processing the data of the OLCI on Sentinel-3.

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Intelligent Ziegler-Nichols-based fuzzy controller design for mobile satellite antenna tracking system with parameter variations and hysteresis effects

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This research applied both the traditional, Ziegler-Nichols-based and Ziegler-Nichols-based fuzzy control methods to the design of mobile satellite antenna tracking system. Firstly, the antenna tracking and the stabilization loops were roughly designed according to the traditional bandwidth and phase margin requirements. However, the tracking performances would be degraded if the tracking loop gain is reduced due to parameter variations. On the other hand, both Ziegler-Nichols-based PID-type and Ziegler-Nichols-based fuzzy controllers were also applied in the tracking loop to improve the performance. But, only the performances obtained by the fuzzy controllers were better for both the antenna tracking loop with low and high gains, and to reduce the effect of tracking loop gain parameter variations. In addition, the backlash hysteresis effect of gimbals are also taken into consideration for both cases; one can see that the systems obtained by using Ziegler-Nichols-based P, PI, PD and PID type fuzzy controllers are more robust to parameter variations even with the hysteresis effect.

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