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Installation and Validation of multiple Skycameras for Solar Forecasting

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Solar forecasting in very short spatial and time scales is a difficult task that cannot be accurately achieved by satellites or by numerical weather prediction. Sky imaging analysis using cameras (so-called “skycams”) has been widely used in recent years to deal with the high spatial and temporal variability of solar irradiance caused by the movement and evolution of clouds and it provides the current and forecasted solar irradiance (Kazantzidis et al., 2017). These features can be converted to power output for the area covered by the skycams, including photovoltaic power plants as well as rooftop installations. Another important aspect of skycams is that they can provide local information of cloud coverage and cloud heights as inputs for solar forecasting algorithms based on satellite and NWP models, thus enhancing their predictions. For this purpose, in the PV-go-Smart project several skycams have been installed in the region of Upper Austria. A meteorological high-quality skycam is in operation in Wels since 2015, taking images on a 30 second interval. In 2018 several low-cost fisheye cameras have been installed in Wels in different locations and tested. Voronych et al. (2018, this conference) presents the latest results on algorithm improvements for global solar irradiance and PV power forecasting and validation as well as error sources for irradiance forecasting. This paper focuses on the hardware and software development of different skycams in the PV-go-Smart project with the aim to make low-cost solar forecasting possible, containing important information regarding camera features, data management strategies, calibration of the cameras and optimization of image capture algorithm variables. The cameras evaluated are two high resolution fisheye surveillance cameras from different price ranges and a Raspberry Pi camera module coupled with a wide angle lens. A comparison between the results obtained from each skycam setup concerning several aspects of image quality, such as resolution, low-light behaviour and the use of automatic infrared filters, and their overall impact on the image processing analysis are presented. Also, the possibility of merging the images taken from the installation locations and under different weather scenarios is evaluated.