

Automatic observation of Visibility

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Research background and purpose:

Since about 70 years ago, meteorological observation (temperature, atmospheric pressure, humidity, wind speed, rainfall, visibility observation, etc.) has been continued twice a day. Since 1995, the number of missing measurements has increased, but in 2007, automatic observation equipment was introduced to resume non-visibility observations. In 2018, we resumed visual visibility observation, but it was difficult to observe at the same time every day, and the number of missing measurements increased significantly compared to the past. In this study, in order to solve this problem, we have developed a new method of observation by taking a picture of the subject on time with a computer-controlled camera. By using a camera, it is also possible to eliminate the influence of the observer's eyesight.

Manufacture and installation of automatic observation equipment:

Five rooftops were selected as places with more target scan in the city center, and the foundation was attached to the railing to secure the observation device. The container made a sealed case covered with aluminum sheet to protect the equipment from dust and wind and rain, and worked to connect outdoor power cords and LAN cables from the room to supply the power supply. The observation device consisted of an SLR camera and a Raspberry Pi to control the camera. The program wrote an instruction in Python to take a picture on time and automatically upload the captured image to Google Drive. In addition, we have also created a program to control the observation device through Slack so that it can be photographed by operation by Smartphone, so that you can check the state of the sky at that time and the condition of visibility.

Observation methods and results:

In order to make automatic observations, it is necessary to determine in advance the settings for shooting, such as the proper exposure and sensitivity of the camera. I took several photos with different shooting settings at the same time, and repeatedly selected a photo with the right exposure, and decided on the setting. The focal length was fixed to 150mm, and three different shooting settings were set for a single observation. For the building group of the sky tree of 36km ahead and Shinjuku 25km ahead, when the result of the visual observation of the same time and the result of the photographed image of the camera were compared, the one that was able to be seen by visual observation can be confirmed in three photographed images, it was found that there is no difference in the observation results visually and the camera. It is necessary to further consider the difference between the identification in the visual and the image by increasing the observation.

Considerations:

Comparing the data obtained from this automatic observation with the data from the same period (winter) in the 1950s and 60s of the previous study, the visibility is much better now. In the past, there were many days with visibility of less than 4km, and previous studies mentioned that winter mornings and air pollution were a factor in visibility, but now the weather has made visibility worse, and there are few occurrences in the morning. In the future, we will investigate the relationship between visibility and

weather, and seasons, yellow sand and air pollution.

Keywords: Meteorology, Visibility, Visibility observations

