Retrieving Ground Truth Data from GPS Photos

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1.Background

The crop and land cover classification requires a large amount of ground sample data with the location information in support of the supervised classification of remote sensing images and the accuracy evaluation.

Due to the limitation of operating efficiency and cost, the traditional sampling method is not sufficient to support the crop classification at large scale.

This study proposed an approach of retrieving the ground truth data from GPS photos taken as the vehicle is moving.

2.Key Elements

There are 4 key elements in the study.

(1). Checking and restoring the photo location information

Due to the failure connecting to the GPS signal, the GPS camera sometimes was not able to record the position information in the photo. Another set of GPS recorder may be used to record the position as a complementary. The photos without GPS position may be added the position information later on. The photo and GPS records may be matched according to the observed time but the time difference of two sets of equipment should be taken into account. The time difference may be calculated using the photos with the position information (Fig.1). In case that all photos do not have the position information, a few of typical photos should be checked and the position may be identified with the Google Earth image. An averaged time difference was further calculated and used as an offset to match both photos and the GPS recorder data (Fig.2).

Fig.1

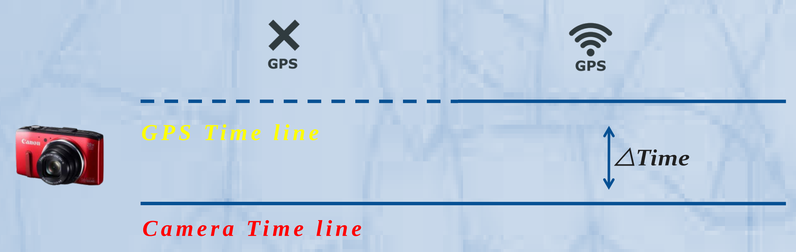
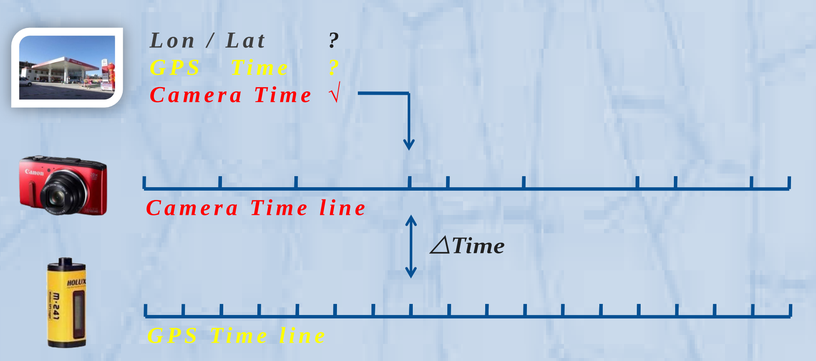


Fig.2



(2). Determining the observing azimuth

Many GPS cameras cannot record the observing azimuth. The observing azimuth may be 0-360 degree for one single sample point. When there are two sample points, the moving direction can be determined by the positions of two points(Fig.3). Adding the angle between the moving direction and the observing direction (close to 90 degree), the observing azimuth is available. The observing direction, left or right should be recorded as well.

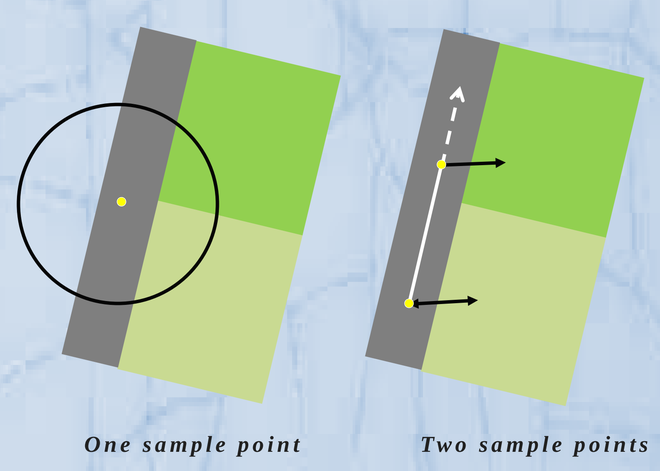


Fig.3 Two points determining the observing azimuth

(3) Shifting the photo taken location to the object location

The position of the photo file is recorded as the position of photo taken and not the position of the object in the photo. The difference of the position should be compensated when the ground truth data is retrieving. The observing azimuth is available after the previous steps, and then the offset may be calculated with an estimated distance between the photo taken and the position of the object in the photo.

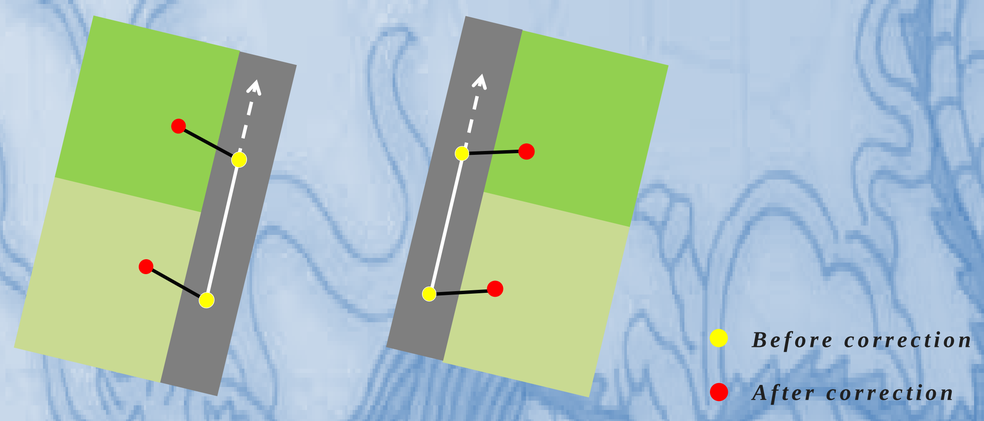


Fig.4 Shifting the photo taken location to the object location

(4) Interpreting the photos and outputting the data set with the crop type, code and the position information

A software was developed to display the photo and select the preset crop types. And finally, a text file with all these information was output as the ground truth dataset.

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The key laboratory of Typic Agro-Meteorological disaster monitoring, early warning and risk management of CMA.