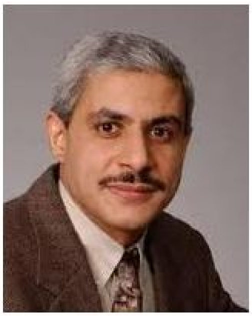
Optimising Quality Control for Lidar Data Processing



Lidar systems on terrestrial and airborne mapping platforms have been proven to be an effective tool for generating highly accurate, dense point clouds for a variety of applications. However, satisfying the needs of those applications requires rigorous quality control (QC) of the point cloud.

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To date, most QC activities have focused on checking the positional quality of the point cloud (ensuring that the coordinates of the derived point cloud are free from systematic errors), which is justifiable given the relative maturity of Lidar compared to image-based mapping. Nevertheless, end users are mainly interested in derived products from such data (e.g. DTMs, segmented features, classified features and identified objects).

Currently, the development of standardised techniques for quantitative QC of such products is rarely addressed. Therefore, we should establish such techniques while considering their practicality and promoting their use by the Lidar community. What would make a QC procedure more appealing to all stakeholders (i.e. data providers, end users, and regulatory organisations)? QC activities are traditionally regarded as a process of either acceptation or rejection based on a set of specifications. To accelerate the adoption of QC activities, such tools should yield higher productivity and cost savings. To increase appeal, the following should be borne in mind:

1. The QC should identify whether the delivered products meet the set specifications
2. Quantitative QC is more appealing than qualitative QC
3. If the delivered product does not meet the set specifications, the following actions need to be undertaken:
    1. Identify the origin of the deviation
    2. Fix the data to meet the set specifications.

One possible approach could be to identify the different problem scenarios that could occur depending on the data processing at hand, to devise a procedure for detecting the frequency of such a problem, and devise a procedure for fixing the data product. As an example, if the data processing under consideration is the segmentation of planar features, one could identify the following problems that might affect the segmentation results:

1. Wrongly non-segmented points (i.e. some of the non-segmented points should have been incorporated in identified segments)
2. Over-segmentation (i.e. a single planar surface has been segmented into more than one segment)
3. Under-segmentation (i.e. more than one planar surface have been wrongly segmented as one segment)
4. Invading/invaded segments (i.e. some of the segments are invading or being invaded by other segments).

In addition to quantifying the outcome of the data processing activity and delivering a better product, the proposed QC strategy will make the quality of the delivered product less sensitive to the utilised tools. In other words, the results will be consistent regardless of the processing algorithm. In summary, the Lidar community should realise the need to develop a quantitative QC procedure for Lidar data processing that should appeal to data providers and end users alike, both from practical and financial perspectives.

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