**Lands Department**

The Government of the Hong Kong Special Administrative Region

# Suggested Specifications of Mobile Mapping System (MMS) Data

(Version 1.0)

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# Suggested Specifications of Mobile Mapping System (MMS) Data

## A. Introduction

1. MMS is a system to collect geospatial data from a mobile platform, for example, vehicle or backpack. It is typically fitted with a range of photographic, laser scanning or any remote sensing sensors, and integrated with an array of time-synchronised navigation sensors.

2. This set of specifications generally apply to most of the MMS, which is usually equipped with mobile laser scanning sensor, camera systems as well as positioning sensors. Some position sensors of MMS can provide absolute position fixing that usually includes Global Navigation Satellite System (GNSS) receivers, Inertial Navigation System (INS) and Distance Measurement Indicator (DMI) as optional. On the other hand, some MMS applies simultaneous localization and mapping (SLAM) technology based on either mobile laser scanning data or imagery data, resulting in relative position fixing.

## B. General requirements for deliverables (For reference)

3. The deliverables of MMS data generally include:-
   (i) Geo-referenced Point Cloud Data
   (ii) Geo-referenced 360˚ Panoramic Images and/or Individual Images
   (iii) Trajectory
   (iv) Metadata

4. Detailed suggestions are summarised in the tables below.

| Deliverable | Description of requirements |
|---|---|
| Geo-referenced Point Cloud Data | • To meet the general purpose, the data shall be geo-referenced and the suggested accuracy is horizontally ±0.15 m and vertically ±0.30 m.<br><br>• The coordinate reference system (CRS) shall be referenced to the Hong Kong 1980 Grid System (EPSG: 2326) and can be indicated in the metadata.<br><br>• The height value of all data shall be within the range of -60m to 1000 m in reference to the Hong Kong Principal Datum (HKPD).<br><br>• LAS version 1.2 format or a newer version, containing coordinates, elevation, intensity values and RGB values. GNSS time shall be indicated as applicable if the MMS is equipped with GNSS receiver.<br><br>• The point data record format, a LAS format definition, is suggested to be restricted to the "point data record format 3". This type of point data record format accommodates the RGB value (Blue, Green, Red) in the point cloud, which enables the representation of colorized point clouds. The point data record format 3 also records GNSS time, where applicable<br><br>• Intensity value shall be represented in terms of the amplitude of the signal return pulse.<br><br>• Point density and number of returns are recommended to be kept in original when converting the data from project file to LAS format.<br><br>• Data type: intensity value in terms of each echo signal shall be capable to be displayed with 16 bit value, range from [0,65535]<br><br>• Point cloud noise is recommended to be eliminated as much as possible in the post-processing stage. |

| Deliverable | Description of requirements |
|---|---|
| Geo-referenced 360˚ Panoramic Images and/or Individual Images | • To meet the general purpose, the data shall be geo-referenced and the suggested accuracy is horizontally ±0.15 m and vertically ±0.30 m.<br><br>• The coordinate reference system (CRS) shall be referenced to the Hong Kong 1980 Grid System (EPSG: 2326) and can be indicated in the metadata.<br><br>• The height value of all data shall be within the range of -60m to 1000 m in reference to the Hong Kong Principal Datum (HKPD).<br><br>• The interior orientation (I.O.) of each camera sensor shall be provided. The content shall include the lens size, optical center, focal length in pixels, etc.<br><br>• The exterior orientation (E.O.) of each project or route shall be provided. The E.O. shall contain the position and orientation data of each imagery data associated with the file name of each imagery data and time stamp, if applicable. A basic E.O. file shall contain, for example, Time Stamp (unix time), File name, Easting, Northing, Height, Roll, Pitch, Yaw.<br>[Note: unix time represents the time elapsed since 00:00:00 on 1 January 1970.]<br><br>• In order to safeguard privacy, it is necessary to blur the identifiable faces of individuals and license plate numbers on the images.<br><br>• The imagery data shall not be compressed and its original resolution shall be maintained.<br><br>• The required format shall be either GeoTiff or JPEG. |

| Deliverable | Description of requirements |
|---|---|
| Trajectory | • The trajectory should accurately represent the position of the imagery at a minimum. It is also recommended to include a time stamp to indicate the trajectory.<br>• The output file in either SHP or DXF format shall be provided. |
| Metadata | • Metadata for each Deliverable shall be provided.<br>• Metadata standards shall include but not be limited to be in compliance with ISO 19115: Geographic information - Metadata standard.<br>• Metadata contents shall be created, formatted and exported as XML output files in compliance with the corresponding ISO/TS standards, styles and schemas, such as ISO/TS 19139.<br>• The metadata in machine readable format containing the following information shall be provided.<br>  • Data identification: e.g. date of survey / data captured<br>  • Equipment used<br>  • Attributes: e.g. format, accuracy, length of routes, number of images taken, GSD if applicable, etc.<br>  • Spatial representation<br>  • Time stamp of surveyed data/object<br>  • Geographic extent<br>  • Producer |