Technology of IMS3 (Dual Cam) and Its Applications

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Abstract: Mobile mapping system is one of the best automatic methods for acquiring and updating geospatial data, and has strong and wide appliance potential in many fields including field surveying, urban planning, environment simulation, intelligent transport, and numerous others. Therefore, its research and development has been paid high attention in geographic information field. As a cutting-edge technology of Mobile Mapping System (MMS), IMS3 (Dual Cam) has many features and innovative applications compared with the mobile mapping systems using laser and inertial measurement unit (IMU). In this paper, configuration and mechanism of IMS3 (Dual Cam) are explained firstly. Then, some current and prospective applications are introduced separately.

IMS3 is a compact unit with simple composition and robust configuration, which consists of two omni-directional cameras, an accelerometer, a GPS, a PC for acquiring data and a HDD for storing data. IMS3 is easy to be mounted on any type of vehicles and acquire high-resolution 360 degree full spherical geo-referenced imageries on the move.

Camera Vector (CV) is the core technology of IMS3. Without using inertial measurement unit (IMU), instantaneous relative position and angle of cameras when shooting with 16 frames per second can be analyzed based on imagery processing. Thousands of motionless feature points in imageries can be extracted automatically. In that case, relative position and posture of camera can be figured out with the use of the Camera Vector. When a vehicle mounted with IMS3 starts to move, the future points in photograph shot by upper and lower cameras, which, in behalf of motionless objects, can be extracted automatically. Towards to one object, more than 100 triangles for triangular survey can be formed by tracking feature points that was extracted among adjoining frames. This way, accurate measurement can be carried out. The absolute

position of camera can be compensated by geographic coordinate information received by high precision GNSS mounting on fixed station and vehicle from GPS and GLONASS. By analyzing and processing the above data, the 360 degree full spherical video becomes available for three-dimensional measurements. Through the comparison of accuracy between IMS3 and GPS, the result shows accuracy of IMS3 is high enough for accurate measurements.

IMS3 is being applied to many fields such as various maintenance, management, and inspection projects, as well as disaster prevention projects, outdoor advertisement board survey, plan making and 3D CG model making of buildings, etc. By connecting with GIS, IMS3 is being applied to many different types of simulations including sightseeing area, landscape, and flooded area caused by Tsunami. By mounting IMS3 on other moving vehicles, many prospective applications can be realized.

360 degree full spherical video of IMS3 and its colorful applications are going to be developed widely in the near future.

Keyword: Mobile Mapping System, Camera Vector, 3D Mapping Technology, GNSS, Applications of 360 Degree Full Spherical Video