Asset Inventory and Topographic Data Collection with GeoAutomation

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GeoAutomation is a mobile digital imagery camera system, providing near 360°, survey-enabled, georeferenced imagery capable of mapping accuracies ranging from GPS quality through to the high accuracy survey requirements demanded in Engineering Road Design. With 14, 2MP, digital cameras, this totally optical system is an excellent tool for: Asset Inventory Collection and Management; Pavement Condition Assessment; Topographic mapping data collection; Engineering quality surveys; and 3D modelling.

(Readers are encouraged to examine the "Introduction to GeoAutomation" White Paper before reviewing this document.)

This Paper describes how GeoAutomation imagery can be used in Asset Inventory and Management. With the GeoAutomation system and its high resolution, georeferenced imagery, you can locate, identify, virtually tag, inspect the condition of, and map, virtually all above ground assets – all from the comfort and safety of your office workstation. These include:

- Electric utilities (poles, light standards, wires, pole attachments, etc.)
- Manholes, culverts, valves, hydrants, etc.
- Bridge decks and superstructures
- Overpasses and underpasses (including clearances)
- Signage and furniture
- Traffic control systems
- Urban forestry
- Pavement and road condition (subject of a separate White Paper)

Traditional field asset collection and attribution efforts can take up to 5 – 30 minutes per feature to complete, depending on the feature and required attributes. Sitting at your office work station, the same assets and attributes can be collected in a fraction of that time. GeoAutomation feature collection times are typically less than a minute.

GPS Concerns

Field collection has always had issues with GPS signals. Urban canyons and tree-lined streets play havoc with signals and often prevent collection of a feature to the accuracies desired. GeoAutomation eliminates GPS problems in several ways:

- GPS data is not used in image processing. As the technology behind GeoAutomation is basically terrestrial Photogrammetry, existing or targeted ground control can be used to georeference the imagery, eliminating the GPS problem entirely. Very often a municipality will have existing photo ID ground control that can be used.
- When a GPS solution is required, or necessary, a local base station can be set up eliminating most of the GPS signal problems.

- The GeoAutomation cameras take oblique images, and as such, are often able to look ‘under’ a heavily leafed tree for instance to get a coordinate, eliminating some of the issues.
- Before processing the imagery the total GPS solution is examined to find weak areas. Once identified, additional ground control is obtained in those weak areas to ensure that the processed imagery meets accuracy requirements.
- ‘Virtual’ ground control points can be created photogrammetrically wherever the paths of the survey vehicle travel over the same location.

Using any combination of the above, the delivered imagery has no locational issues and any feature seen on the imagery can be collected with confidence that it meets the accuracy of the contracted accuracy statements.

Quality Assurance

McElhanney performs several Quality Control and Assurance procedures before delivery of imagery to any client. These include:

- Accuracy requirements are discussed and Accuracy Statement content and measuring criteria are agreed to, with the client, before collection.
- Prior to route collection blind control points are identified and maintained by the client for post delivery accuracy inspection.
- GPS solution review for weak areas and subsequent addition of survey control, if required.
- Pre-delivery check of known control along route to verify accuracy. Any deficiencies are noted and imagery reprocessed with additional control, if needed.
- Post delivery training.

On-Screen Survey

Users have three options when surveying data from the GeoAutomation software interface.

- Utilize an existing track point generated by the pixel correlation process. These track points often fall exactly where you want them to (along the edge of pavement, for example). One click of the track point and the point is surveyed and entered in to your CAD or GIS.
- Find the location of the feature to be surveyed, and again you are just one click away from entering the data into your CAD or GIS. The GeoAutomation system automatically selects the same point in eight different images, triangulates each point and provides the user with an average x, y and z value for input. Here is a link showing the collection using this method: http://blip.tv/file/4633602/
- A feature of GeoAutomation allows users to select for themselves 3 or more images interactively and calculate the coordinate values. This is generally used where higher accuracies are demanded or the feature is in a location that is suspect. Here is a link showing the collection of a corner of building using this method. http://blip.tv/file/3918921

Regardless of the method chosen for ‘survey’ the accuracy of the surveyed point is guaranteed to the Accuracy Statement definitions provided with the delivery of the imagery and software.

Additional benefits in using survey-enabled imagery from GeoAutomation include:

No Weather Delays

Users are able to access imagery around the clock, every day of the year - eliminating downtime and greatly improving productivity.

GIS Data Verification

Municipal GIS databases have been built up over time from a variety of sources, many with unknown or questionable accuracies. GeoAutomation imagery provides the verification tool needed to update and improve the accuracy of that suspicious data.

Plug-ins

GeoAutomation has plug-in linkages to ArcGIS, MicroStation and AutoCAD.

Auto Feature Recognition

Large field collection projects may find the Auto Feature Recognition feature of GeoAutomation to be very cost effective. Once ‘learned’, GeoAutomation can automatically process and populate your CAD or GIS database with a features coordinates, elevation and learned attributes. Outliers or suspicious points are flagged for manual review and completion, before delivery.

Accuracy Expectations

Accuracy	Control	Application
Dependent on ortho	Ortho Photo	Video reviews; on-line street views; asset management
20-30cm (8”-12”)	On Board DGPS	Asset management, data collection
10 cm (4”)	100–200m (330-660 ft)	Forensics – Preliminary engineering design
5 cm (2”)	50m (165 ft)	Detailed Design mapping – Public works infrastructure – Curb and gutter
2 cm (.8”)	20m (65 ft)	Engineering survey design, pavement and volume calcs - tie–ins

About McElhanney Consulting Services Ltd.

For over 100 years, McElhanney has provided innovative engineering solutions to municipal, provincial, federal, transportation, and construction clients. With offices in BC, Alberta and Indonesia, we are a multi-discipline consulting firm, offering a complete range of integrated services to answer all your engineering, surveying, planning, mapping and environmental needs.

McElhanney – proud of our success. Proud to help build our communities.

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Additional White Papers on GeoAutomation from McElhanney:

- Introduction to GeoAutomation
- Asset Inventory and Topographic Data Collection
- 3D Modeling
- Engineering Survey
- Pavement Condition Assessment
- Virtual As-Builts