MANAGING POINT CLOUDS AS A FUNDAMENTAL DATA TYPE

RICHARD ZAMBUNI AND BENOIT FREDERICQUE CONCLUDE THIS TWO-PART ARTICLE BY EXPLORING OTHER IMPORTANT USES FOR POINT CLOUDS, AS WELL AS DEVELOPMENTS THAT ARE FURTHERING THEIR PRACTICAL APPLICATION

Point clouds can also be employed in other important ways. First, they can be used as 3D models, defining the field truth in the form of "as-operated" information models. These models can be employed in a hybrid manner using point clouds for the as-operated model, which can then be used as context for a design project touching a section of the model. This is almost the same paradigm, introduced 15 years ago, of combining 2D raster images and vector designs.

For example, a retrofit project may consist of scanning a site (for example, a street), isolating and hiding sections of the point cloud corresponding to existing street furniture (for example, existing street lights, bus stops) and then designing new features corresponding to the new equipment. In Fig.4, a section of a point cloud has been removed using Bentley Descartes' classification editing tool (put in a class to be removed) and replaced by real geometries. The result is a hybrid information model.

Second, point clouds bring the field to everyone's desks by allowing on-demand viewing and measurement of a detailed presentation of the conditions in the field. Again, a parallel with 2D raster can be made by comparing point clouds with 2D ortho-images, which are widely used to support asset management workflows. Having point clouds accessible on-demand to anyone inside an organisation without knowing in advance the question to be answered, is a very powerful capability.

Fig.5 shows a coloured point cloud acquired with a mobile mapping system. The colour of the points allows easy recognition of the street furniture and building façades, while the 3D nature of the point cloud allows 3D measurement. In this figure we see the electricity cables clearly. Such point clouds can be used for the visualisation and measurement of assets including telecommunications or electricity cables.

To the next level

Although there is substantial value in point cloud data, the adoption of point clouds is not yet as broadly based as it could be.

One factor slowing usage has been limitations in the software that handles them. In the past, point clouds have required specialised software used only by experts dedicated to the handling and processing of this data. Bentley's vision is to enable point clouds to be used by all infrastructure practitioners. The challenges involved in making this a reality can be grouped into three categories: enabling access, enabling understanding, and enabling extraction and enrichment of point cloud data.

Bentley has been working on these three challenges since the introduction of point cloud support in MicroStation V8i (SELECTseries 2). Embedding the Pointools Vortex engine in MicroStation allowed access to point cloud data from a large number of file formats and made

Fig.4: The clean-up of point cloud data using Bentley Descartes' classification editing enables the creation of a hybrid information model (*data acquired with RIEGL VMX-250 Mobile Laser Scanning System*)

visualisation and navigation easy, facilitating the exploration and understanding of a point cloud. Moreover, by integrating point clouds as a snappable, native element in MicroStation, it became possible to extract measurements.

Easier access and data integration

However, making point clouds accessible goes beyond interoperability. By nature, the amount of data associated with point clouds is vast. Typically point clouds involve hundreds of millions, and sometimes billions, of points. This means that file sizes can be hundreds of Gigabytes, if not Terabytes. Too frequently, point cloud data is underused and stored on USB hard drives inside the offices of a few point cloud specialists. With the help of the team members from Pointools (who are now Bentley colleagues as a result of Bentley's acquisition of Pointools), Bentley is developing a new point cloud streaming technology to be integrated within the ProjectWise project team collaboration platform. With it, users will be able to determine the location and type of point clouds, as well as to efficiently access point clouds by downloading only the part that is needed for a particular project.

In this article, we have been talking specifically about point clouds. However, it is important to note that frequently – particularly with mobile mapping platforms – point clouds are not acquired in isolation, and other sensors acquire images, thermal images, and other types of information. ProjectWise allows raster images and point clouds to be managed spatially, and will soon enable unified management and access to point cloud data, raster images, and engineering information.

Fig.5: Point clouds enable 3D visualisation as well as the measurement of assets (*data captured by StreetMapper*)

In the pipeline

In addition to the advancements in point cloud processing noted above, Bentley continues to work on visualisation and extraction in its Bentley Descartes V8i image management software. The upcoming release of Bentley Descartes V8i (SELECTseries 3) will introduce new tools dedicated to the advanced processing of point clouds, such as the unique flashlight capability, which aids the understanding of point clouds, the extraction of breaklines, classification editing, and point cloud cleanup. To preview the new point cloud functionality visit www.bentley.com/DescartesAIM

Bentley firmly believes that point clouds have entered a new phase of value to infrastructure professionals. Now, infrastructure design and management software will allow those who design, construct, and operate infrastructure to take full advantage of this fundamental data type.

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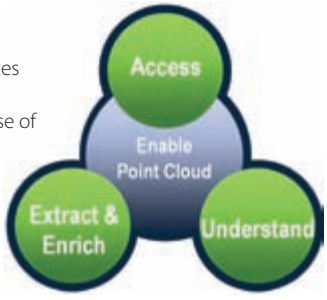

Fig.6: Three axes to enable the widespread use of point clouds