



CENTIMETRE ACCURACY WITH AUGMENTED REALITY

Mobile GIS solutions have been available for some time, and there are many competing products to select from. However, with the advent of augmented reality, there are now better ways of finding, visualising, comprehending and capturing asset data within GIS applications.

Augmented reality (AR) is the integration of digital information with live video or the user's environment in real time. C.R. Kennedy, SmartNet Aus and Augview, three leading companies in the geospatial industry, have joined forces to provide a comprehensive solution for locating and managing both above and below ground assets with centimetre accuracy. Augview develops and markets an AR GIS product to assist field workers within the utility, telco and local government markets, in capturing, maintaining and comprehending underground infrastructure. AR provides users the experience of mixing the real world with the digital world. With current technologies (tablets and smartphones), that means overlaying a virtual scene over the live video stream provided by the device's rear-facing camera.

The primary advantage of displaying hidden or planned utility assets using AR is comprehension. Those of us that have worked for years in the GIS industry, or are long-term users of GIS map products, take it for granted that everyone comprehends maps, plans and engineering drawings in the same way that we do. For us, the process of interpretation and comprehension is natural and generally automatic. However, converting the lines and symbols on the paper or screen into a mental model of the world is a learned process. With an augmented reality display on a tablet or smartphone however, the image is much closer to our real-world experience, is quicker to comprehend, and is more easily

understandable by an untrained user. In particular, we have better comprehension of the position of the underground assets, with respect to our position, which should lead to fewer collateral damage incidents.

With tablets and smartphones, an augmented reality display is achieved by overlaying the image that a virtual camera sees over the live video. The virtual camera must be at exactly the same position and orientation in the virtual scene, as the real camera is within the real world.

Critical to the solution are sensors that provide highly accurate, real-time inputs of position and orientation. For use outdoors, these sensors include the accelerometer, magnetometer, gyro and GNSS sensor. In particular, the GNSS sensor identifies where the camera is located. Currently, consumer-grade tablets and smartphones do not incorporate a GNSS sensor able to provide centimetre accuracy. For that we need to use a system that supports the GNSS Real Time Kinematic (RTK) corrections provided by a Continuously Operating Reference Station (CORS) network, as provided by SmartNet Aus. The RTK corrections address errors inherent to all GNSS satellites, and thus enables centimetre accurate positioning in real-time. The SmartNet Aus base stations receive positioning signals from GPS/GNSS satellites to calculate extremely accurate RTK corrections (down to +/-2 centimetres) and broadcast them to GPS/GNSS receivers.

The Leica Zeno 20 is perhaps the first commercially available tablet that

incorporates everything required for high quality outdoor AR experience into a single ergonomic package. The Zeno 20 houses high quality sensors, including an integrated, high accuracy GNSS receiver supporting RTK corrections. It is ruggedised, supports a 4.7" screen, runs either Android or Windows embedded, and incorporates an 8MP camera.

The Zeno 20 provides the Augview user with an ergonomic, stable, accurate platform, simplifying field operations and providing excellent alignment between virtual and real worlds.

Much of the data within existing GIS databases is not spatially accurate. Augview provides online and offline data capture and update functionality, allowing the user to correct the geometries of existing GIS features. The Zeno 20 provides survey-quality positioning, allowing high accuracy data maintenance. It is simply a matter of standing over an asset and updating its location, or dragging its GIS geometry into position.

Augview also supports the capture of photos, either freestanding or associated with GIS features. When photographing open trenches showing exposed assets, the application stores not only the GNSS location, but also all orientation and camera details. This allows post processing functions to transform the trench image into an accurately positioned ground plane image, allowing later office-based data maintenance procedures. **U**