ViaNova road designer Johan Ivarsson (front) and bridge designer Bjørnar Hofstad (rear) at the Falkenborg Bridge site

MAKING AUGMENTED REALITY REAL

AUGMENTED REALITY HAS MOVED PAST THE PHASE OF TANTALISING POSSIBILITY TO REAL-WORLD APPLICATIONS. **JODIE HARTNELL** REPORTS ON HOW A NORWEGIAN DESIGN FIRM PUT A NEW, LOW-COST, REAL-TIME 3D FIELD SOLUTION INTO PRACTICE AND REAPED IMMEDIATE BENEFITS

ViaNova road designer Hege Bjerka Pedersen uses SiteVision to view the design model projected over the landscape

ViaNova deployed SiteVision on smartphones, with the companion Catalyst GPS system providing the precise position and orientation. Shown on the display are the proposed bridge model projected in real-time over the landscape

Designers for architecture, engineering and construction (AEC) projects large and small face pressing questions, such as "How will all the elements fit together and look when completed?" and "How best can the designers anticipate potential conflicts and avoid costly change orders?" Digital Twins and 3D augmented reality (AR) visualisation are touted as the answer but are often difficult to implement.

But after several years of searching for a 3D AR solution, an award-winning design firm found the right fit. ViaNova Plan og Trafikk AS in Sandvika, Norway, is at the leading edge of building information management (BIM) designs for 4D construction and asset information modelling to support post-construction operations. According to 3D designer Andreas Haugbotn, the company operates a fully 3D design environment.

"We first build the 3D model, creating a Digital Twin of the site and the design, and then produce any required 2D drawings later," he says.

Haugbotn and ViaNova have been looking at various 3D AR solutions for many years. They had seen demos for and evaluated several systems, but none had met their needs.

AR shows that the bridge access ramp passes behind the nearby residential structure. ViaNova used this discovery to inform design changes

When they learnt about Trimble's SiteVision, they decided to test it see if it was the solution that would finally meet their requirements. SiteVision can import nearly any standard AEC model types, including BIM IFC, SKP, CAD, LandXML, Revit and more. It then uses the powerful onboard processors and fast displays of today's consumer smartphones to superimpose an interactive view of the design model over the real-time view of the site captured by the on-board camera.

Haugbotn found the system to be a sharp, but welcome departure from existing solutions he had explored. In particular, he was attracted by its simple design.

"It is handheld, low-cost and does not require special training for our people," he says. "We were able to run it on a Galaxy 10+ phone."

Wrong place, wrong time

Another problem ViaNova had encountered with other AR systems it had evaluated was that they mostly came up short in terms of their spatial precision. If a model is not precisely positioned and oriented with the real-world view, mismatches may lead to erroneous analyses and conclusions.

With Sitevision, a high-precision GNSS antenna sits atop the handle that holds an Android-based phone. The GNSS software, Trimble Catalyst, runs on the processors of the phone alongside SiteVision. The resulting real-time high-precision positions

and on-board MEMS motion sensors enable geo-registration and orientation of the 3D model to the site coordinates.

"It is quite good – we get about 3cm precision in the horizontal," says Haugbotn. The high precision and orientation also enable a cut/fill feature for evaluating project earthworks' progress in real-time.

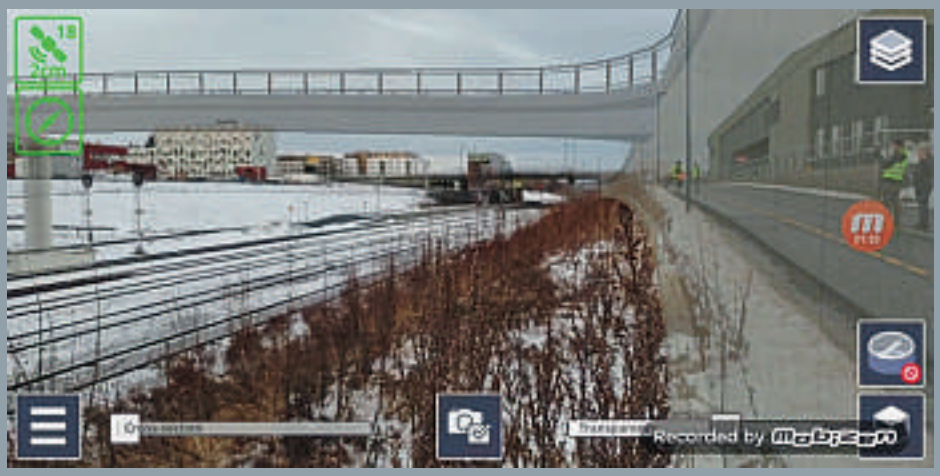
From theory to practice

Based on the results of its tests, Haugbotn decided last November to order a pair of SiteVision field units and to deploy them in earnest for a major railway bridge project. Norway is investing substantial sums in improving its transport system. This includes the InterCity initiative, a slate of projects that not only encompasses road and rail elements, but affects utilities, the landscape, vehicle and foot traffic, and adjacent built and natural systems.

The new Falkenborg Bridge crosses over a railway line at Leangen Station near Trondheim. Haugbotn deployed both the units at the site, as this enabled more team members to view the same model, at the same time, from different vantage points. There the teams made a major discovery.

"With SiteVision, we could see quite clearly that the bridge as designed was too big for the site," says Haugbotn.

A simulated walkthrough while carrying the SiteVision units of the proposed pedestrian traffic routes to the bridge access ramps also revealed pinch points and a mismatch with expected flows. "The access approaches were not where the pedestrian traffic would be concentrated," he says.



The accuracy, number of satellites used and orientation of a proposed ramp are shown in the upper left, with cross-section controls at the bottom. With the transparency set at 50%, a second team can be seen along the existing roadway evaluating the site from different vantage points

Within a few weeks of implementing SiteVision, it proved to be the catalyst for making crucial design decisions. "We immediately gained an understanding of what would be built, and from this we changed the original design," says Haugbotn.

Its value now proven, Haugbotn intends to use SiteVision as a standard tool in day-to-day operations for all future ViaNova projects, large and small – and will use it to continue to inform many more design decisions for the Falkenborg Bridge project until its completion. ViaNova has finally found the AR system it has long been looking for.

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Haugbotn also found the system ideal for a zoning project in Trondheim. "We can visualise what the roads and structures will look like at each site," he says. "Everyone involved – designers, local people, authorities – we can show them how it will really look, something we cannot do with [2D] drawings."

Jodie Hartnell is a freelance geographer and technology writer (@HartnellJodie)

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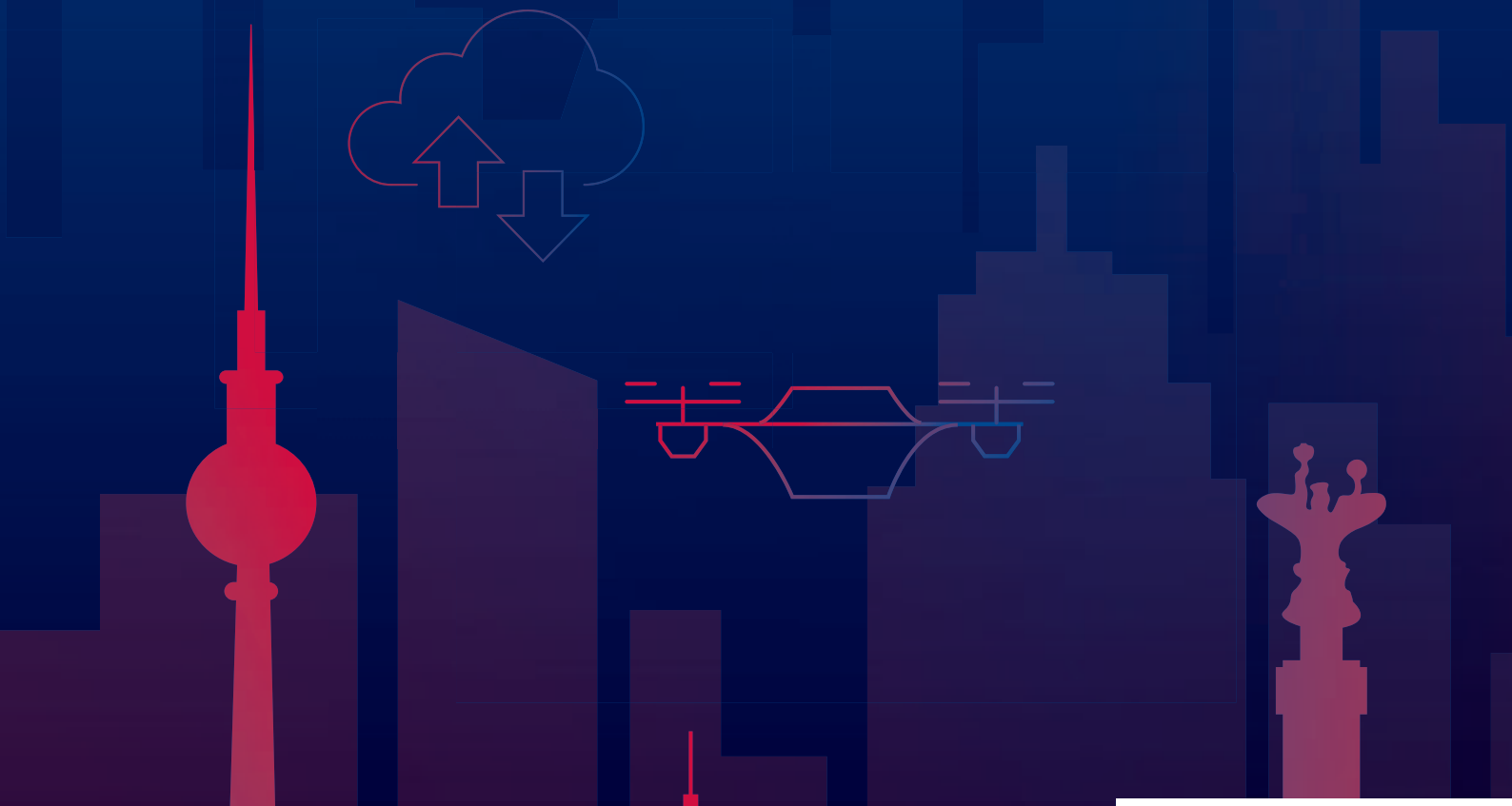

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