CASE STUDY

Bridge maintenance management using Veesus Arena4D

Challenge	Solution	Results
▶ Creation of 3D reports, presentation material and videos ▶ Existing point cloud software unable to create high-quality videos that can contain all relevant information	▶ Veesus Arena4D software ▶ Enables users to create high-quality videos from point cloud data, with the advantage of being able to add files and annotations	▶ All the information needed was consolidated into one place ▶ Videos used to create immersive 3D reports gained positive response from stakeholders

株式会社補修技術設計 IRE Infrastructure Renewal Engineering Co. Ltd.
調査、診断、設計、工事支援、建築リフォーム

About the company

Infrastructure Renewal Engineering Co., Ltd. is a company which provides repairing and reinforcement designing works for management of civil engineering structures, particularly management of bridges. While 2D documentation survey reports are still common in Japan, we actively make the survey reports by using 3D animation software. We provide the reports, by creating 3D models of ageing bridges and presenting them in high-quality and realistic videos, that can be easily understood by local governments, survey and inspection companies, construction companies, and other parties involved in management of the bridges.

The Challenge

Creating accurate 3D maintenance reports

In Japan, bridges over 2 m in length are required to be inspected every five years.
Japan has over 730,000 bridges over 2m in length, of which 540,000 are less than 15m in length.

After each inspection of the bridges, damage diagrams and photographs are taken, and the soundness of each component of the bridge is evaluated and recorded in a report.
However, there are the following difficulties when creating the reports -

Firstly, 2D documentation is limited in its ability to describe all damage conditions, and as a result, it is easy to miss or overlook key details.

Secondly, damage diagrams created by 2D-CAD or sketches do not accurately represent the shape of the structure and damage conditions and therefore lack a sense of reality.
Thirdly, as the progression of the damage can only be confirmed by comparing the limited quantity of the photographs in the historical records with the actual visual check at the site, it is impossible to grasp the overall picture of damage and its changes over time.

Maintenance management of the bridges requires the consolidated information, such as previous inspection results, specifications of the objects, repair works reports etc. Although this information is usually managed in bridge ledgers, inspection reports, repair and reinforcement diagrams, etc., these documents are often stored individually for each year. Therefore, it is not easy to centralise the information.

We tried at first to make reports which have a sense of reality, as if the structures in the field were brought directly to the computer, rather than the current hand-drawn sketch-like reports, and second, create reports by which everyone can easily understand the status of the damages of the bridge. However, this can be extremely difficult without the right software.


メ　モ

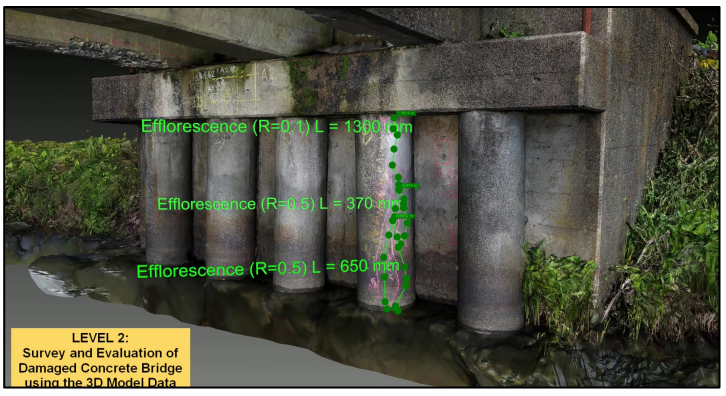
損 傷 名 称 ：剥離・鉄筋露出

損 傷 程 度 ：e
対 策 区 分 ：C2
健　全　度 ：Ⅲ
コメント：主桁に鉄筋露出、著しい腐食も見られる。
※前回点検から進行あり（写真判定）

写真番号	2
径間番号	1
部材名称	主桁
部材番号	03
損傷発生位置	—

メ　モ

A traditional damage diagram.



Arena4D 3D model damage diagram.

The Solution

Veesus Arena4D

Infrastructure Renewal Engineering Co learnt about Arena4D and it's ability to handle large volumes of point cloud data, and considered it a tool that could solve the problems of conventional bridge maintenance management methods.

Jimenez April Rose the Engineer in charge of Arena4D at IRE says, "We were not satisfied with the current maintenance methods in order to conduct surveying and designing repair works of the ageing structures, and though it was important to present the maintenance management information in a new form, rather than a 2D documentation report.

While various measurement devices and technologies for obtaining 3D data of the infrastructures exist in the Japanese market, there are almost no tools that can support 3D data which is extremely large in volume and in diverse formats.

The ability to deploy a variety of 2D and 3D data on the point cloud data made it possible to consolidate multiple pieces of information for each bridge, which had previously been dispersed by year and storage location.

3D data represented by Arena4D is of such high quality that you would think that the actual bridge is projected directly on your computer. It is such high quality It is almost as if you are there in the field, and you may even feel as if you are able to inspect the bridge as it is!

Photographs taken during the inspections, and annotations on the damage can be added to 3D data. Information about the damage quantities which are required for the repair work can be linked with spreadsheet software to enhance the information value of the inspection. These are the advantages of 3D reports in comparison with 2D document reports".

Veesus Arena4D makes it possible to centralise maintenance and management information of the entire bridge, by adding various data and information based on the point cloud data, and it is useful for the inspection and repair work in future.

It is also a very useful tool for creating 3D animations and presenting data to the highest standard.

> "Veesus Arena4D enables us to create accurate and informative 3D management and maintenance reports, presented as high quality, immersive videos"
>
> **Jimenez April Rose**
>
> Engineer in charge of Arena4D

The Results

Visually captivating 3D reports that deliver crucial information of large datasets

Videos which were created by Arena4D attracted many attentions and were accessed by many maintenance management companies as well as municipalities that manage the civil engineering structures. Also Arena4D's videos were of interest to engineers and researchers in other industries as well.

Animations created by Arena4D are often presented at technical demonstrations and trade shows, and the close-up animations of the bridges give a strong impression on the viewer.

We received many positive feedbacks from the people who are engaged in bridge maintenance management, such as "it is easy to see the status of the damage", "3D survey is a new idea that I have never seen before", etc.

One time at an exhibition on structural maintenance management, a person saw our video and said in surprise "How can you create this 3D data ?" "How can you produce such a good quality video?" Later we found that, this person was an engineer developing a management system for a large number of robots, and he was wondering how to convert the real world into 3D data in order to utilise the metaverse and digital twin space in his system, and therefore, and Arena4D's high-quality video matched his vision.

Veesus

For more information:

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