A cutting-edge system for supporting maintenance and management of infrastructures such as road and bridge structures utilizing GIS (Geographic Information System) and 3D point cloud data
InfraDoctor is a cutting-edge system for supporting maintenance work of road and bridge structures by utilizing GIS (Geographic Information System) and 3D point cloud data. This can improve the time- and labor-saving, high-precision and efficiency of overall maintenance work of infrastructures such as inspection, repair and design work.

InfraDoctor is composed of the following 3 major functions:

I. Basic Function of InfraDoctor:
- Viewing of 3D point cloud data
- Viewing of omnidirectional video image
- 3D dimension measurement

II. GIS-based Ledger Management Function of InfraDoctor:
- Search system for various management ledgers
- Search system for inspection and repair records
- On-site search system using Tablet PC (under development)

III. Advanced Function of InfraDoctor:
- 2D CAD drawing creation function
- 3D CAD model figure creation function
- Damage detection function
- Consultation document creation function (Traffic regulation figure for work safety zone)
- 3D simulation function

Background of development of InfraDoctor

In Japan, deterioration of infrastructure built during the rapid economic growth (1960s) period has been progressed, therefore, the maintenance work of such infrastructure becomes an important social issue because of a decrease in working population due to population decline, low birthrate and aging society and a severe financial status.

Therefore, by utilization and integration of each strength of three companies, Shutoko Engineering, Elysium, and Aero Asahi, as shown in the right figure, the InfraDoctor was jointly developed in order to provide "efficient maintenance work" and "solution to support a shift to preventative maintenance work" for "Metropolitan Expressway Co., Ltd.", an expressway authority in Tokyo, Japan.
High-precision and time- and labor-saving acquisition of roadway condition utilizing 3D point cloud data

InfraDoctor can integratedly manage 3D point cloud data acquired by a laser scanner and other simultaneously acquired data such as video images on the Cloud server. By using various functions such as viewing of omnidirectional video and 3D dimension measurement, the roadway condition can be grasped from work office without any necessity of field survey, leading to a time- and labor-saving management of road infrastructures.

Viewing of omnidirectional video images

3D point cloud data and omnidirectional video images can be viewed synchronously. You can switch between these data as needed to quickly grasp the roadway condition.

3D dimension measurement

The 3D point cloud data has an accurate three-dimensional coordinate (X, Y, Z), allowing the measurement of any dimensions between two points while staying in work office. This can eliminate the required at-site work, for example, the traffic restrictions for site surveying of road intersections or the closure of railway for checking of distance between railway structures and surrounding structures or the confirmation of construction clearance limit.

Intelligent search system for GIS-based ledgers of InfraDoctor

Development of search system of ledgers such as management and inspection records with user-friendly interface according to your needs

Any customization of search system of ledgers related to management and inspection work is available, according to the needs of road authorities. We support the implementation of rational and efficient infrastructure management by using InfraDoctor.

Intelligent search function of various ledgers

Ledger data such as road structures, accessories, and underground buried structures are required in a road maintenance work. InfraDoctor can enable an efficient management of ledger data by linking between GIS and 3D point cloud data.

Search system for inspection, repair record history

By using InfraDoctor, a huge amount of inspection and repair data accumulated in maintenance work can be stored and managed, and establishment of an efficient and effective search system is available.
Advanced management of road infrastructures with extended functions utilizing GIS and 3D point cloud data

High-standard and high-precision maintenance and management work can be achieved by utilizing GIS and 3D point cloud data in InfraDoctor with various functions such as creation of drawings, damage detection of pavement and wall-type surface, traffic regulation diagrams of work safety zone, and 3D simulations.

2D CAD drawing creation function

InfraDoctor can semi-automatically create a plan view or a cross-sectional view drawing from 3D point cloud data. The accuracy of the created cross-sectional view drawing is in millimeters, and the accuracy of the created plan-view drawing can be ensured for a requirement of map at a scale of 1:500 (Depending on the GPS reception status, a supplementary survey may be required to compensate for the point cloud data).

Damage detection function

By using InfraDoctor, a reference plane of pavements and structures can be created from 3D point cloud data, and the difference between 3D point cloud data and the reference plane can be displayed in a tint gradient diagram. This can enable early detection of rutting or pot hole of pavement, flaking or peeling damage of concrete, and can be expected to be applied as a first-stage inspection prior to any detailed inspection (closed-distance inspection).
The integration of CAD data of equipment for traffic regulation work and 3D point cloud data allows you to semi-automatically create a traffic regulated figure for work safety zone. In addition, the regulated safety zone created on 3D point cloud data can be confirmed from driver’s viewpoint by using function of driving simulation, which can enable the preparation of consultation documents concerning the driver’s viewpoint.

InfraDoctor can semi-automatically create a 3D CAD model that reflects the current state of structures from the 3D point cloud data. The 3D FEM analysis model can be easily created from the 3D CAD model, and it is expected to apply for the preparation of CIM (Construction Information Management) data in the near future.

By using the dynamic simulation function of InfraDoctor, 3D models such as bridge inspection vehicles can be integrated with 3D point cloud data to confirm the actual inspection work zone in advance. This enables the selection of suitable inspection vehicle by checking the operation procedure and the interference with any obstacles, hence, the efficiency of field inspection work can be maximized.

**3D Analysis model creation function**

**Consultation document (traffic regulation figure for work safety zone) preparation function**

**Function for simulation of inspection vehicle**

**Check of concrete flaking**

**Check of protrusion of road slope surface**
Engineering consulting service utilizing InfraDoctor

We provide various engineering consulting services to meet the needs of road infrastructure authorities by using InfraDoctor. By utilization of various functions of InfraDoctor such as dimension measurement of 3D point cloud data, establishment of search system for ledgers, and other applications of 3D point cloud data, we can help you to improve the time- and labor-saving, high-precision and efficiency of infrastructure management work, i.e., inspection, repair, and design work.

InfraDoctor software service provided by LLP

The Limited Liability Partnership (LLP) for providing InfraDoctor software service was established on August 25, 2017 by 3 companies: (1) Shutoko Engineering Co., Ltd., (2) Elysium Japan and (3) Aero Asahi Corporation. The data possessed by customers such as 3D point cloud data, video images, various ledgers, etc. are stored in the cloud server, and the viewing and analysis of these data are provided through the InfraDoctor software service by LLP. Since this huge amount of data are managed by LLP on behalf of clients, the required labor and cost of possession and management of server by clients are not necessary and the data assets can be effectively and conveniently utilized with a cost-effective performance.

We (LLP) will develop a core business by focusing on the 3D point cloud service, and will provide innovative solutions for the social problems related to infrastructure maintenance, disaster prevention/mitigation, and local community development.

Registration of NETIS (New Technology Information System by MLIT)

Registration No. KT-170012-A  Remark: MLIT: Ministry of Land, Infrastructure, Transport and Tourism, Japan

In order to promote the utilization of new technologies, NETIS is a database system developed by MLIT for the purpose of sharing and providing information on these new technologies. The InfraDoctor was registered to NETIS on May 10, 2017 to provide information on how to apply the InfraDoctor in the infrastructure maintenance and management work.

Received 1st Annual Infrastructure Maintenance Awards (Minister of Internal Affairs and Communications’s Award)

The InfraDoctor received the Minister’s award for the 1st annual Infrastructure Maintenance Awards, which was founded to honor the outstanding efforts to maintain social infrastructure. The concept of InfraDoctor, “development of a support system for road and structure maintenance using GIS and 3D point cloud data”, was evaluated to be a new innovation that can improve the efficiency, high-precision and cost reduction of infrastructure maintenance work.

Contact Information

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