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IDI QUARTERLY

Infrastructure Development Institute—JAPAN

Laser measurement with backpack at Mt. Fuji

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D Mobile Mapping Technology

–NAKANIHON SLAM QUICK SCAN

1. Introduction

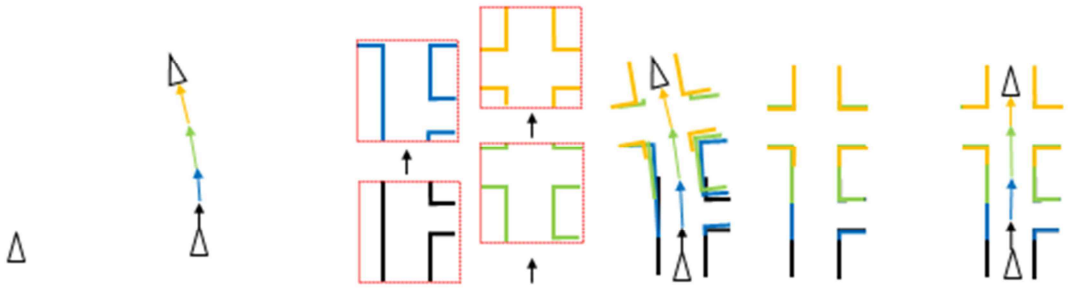
Nakanihon Air Service Co., Ltd., based in Nagoya Airport Japan, has been mainly engaged in Aerial Surveying, digital mapping, and GIS (Geographic Information System). We have also experienced the 3D measurement project called LIDAR (Light Detection and Ranging) not only in Japan but also International.

Photo1：headquarters

Nowadays, new measurement technologies for automated driving systems and indoor positioning have been progressing, so we have been working on a GPS-free 3D mapping system using an omnidirectional laser unit and SLAM technology since 2015.

2. What is SLAM?

Do you know what SLAM is? SLAM (Simultaneous Localization and Mapping) is a technology that simultaneously performs self-localization and environmental mapping. The SLAM technology has also been using for automated driving systems that we often hear recently.



Initial position	Self position estimation from sensor data	Shape preparation for each measurement	Create a map (Overlapping)	Estimation of self-position

Figure1: Description of SLAM

3. Features of NAKANIHON SLAM QUICK SCAN

NAKANIHON SLAM QUICK SCAN features a GPS-free 3D mapping system using Velodyne Lidar's omnidirectional laser unit and 3D-SLAM technology.

This mainly has the following six specifications.

1. Moving measurement that can be used indoors or in forests without GPS

2. Built-in 16 laser sensors, high-density scanning of 300,000 points / second

3. Maximum reach 100m, ranging accuracy about 3cm

4. SLAM responds up to a maximum mounting angle of 45 degrees

5. Measurement results with less scan-data missing by scanning 360 degrees in all

directions / 30 degrees (± 15 degrees) in vertical viewing angle

6. In addition to X, Y, Z coordinate values, also obtains reflection intensity values

Photo2 : Laser unit (Velodyne)

4. Apply to

-Urban environment survey: high-precision mapping of not only streets but also structures and interiors

-Forest survey: Detailed measurement in the forest

-Archaeological survey: Detailed measurement for archaeological prospection

-Facility survey: reliable measurement even for complex objects, and short measurement time

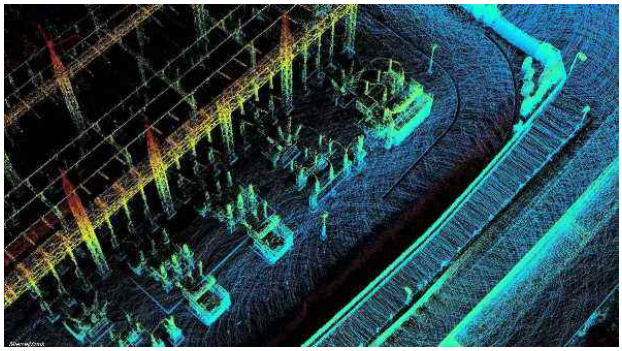


Figure2: Case1(Facility)

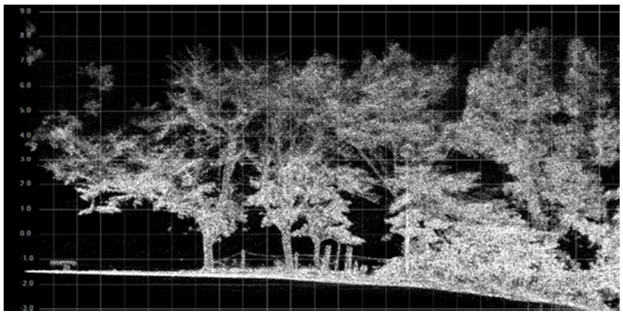


Figure3: Case2(Forest)

5. Gain Experience in the Field:Mount Fuji Challenge Platform

The Mount Fuji area of Fuji Hakone Izu National Park is centered on Mt. Fuji, the highest peak in Japan, and is characterized by the surrounding mountains and lakes, and primeval forests such as Aokigahara Jukai. In particular, Mt. Fuji has many climbing users, and there are mountain trails from the four mountain entrances to the summit.

Mt. Fuji summit circuit road (climbing road) has raised concerns about possible dangers which are likely to occur due to its topographical characters and unpredictable weather conditions.

Photo2 : At Mt. Fuji

For the purpose of ensuring the safety of mountain trail users during the opening of Mt. Fuji, we've measured the topographic point cloud data around the mountain trail and created a precise 3D topographic map of the mountain trail.

Through creating this topographic map, it is possible to grasp places where rockfalls are dangerous and extract places that are hardly to walk, which can be used for the maintenance of mountain trails. In addition, we plan to analyze the traffic congestion due to the recent increase in the number of climbing Fuji from the acquired data.

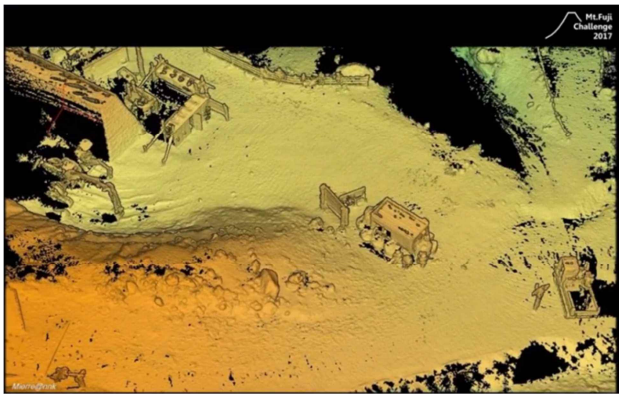


Figure4: Display acquired data

See Website:
https://www.fujisanchallenge.or.jp/ (Website in Japanese)
https://www.youtube.com/watch?v=OpUuolnTA9c&t=43s (Social media)

6. Future development of our technology

We have been conducting boulder blasting surveys, archaeological stone wall surveys, underground facility measurements, and underground tunnel surveys so far. In the future, we plan to make the following developments.

- Examination of change extraction method by repeated measurement
- Acquire data in real time, visualize and extract changes
- Data acquisition platforms such as drones and vehicles
- Data fusion of SLAM and image measurements for 3D tracking
- Underwater mapping with SLAM technology by Green-laser for bathymetry

Inquiry

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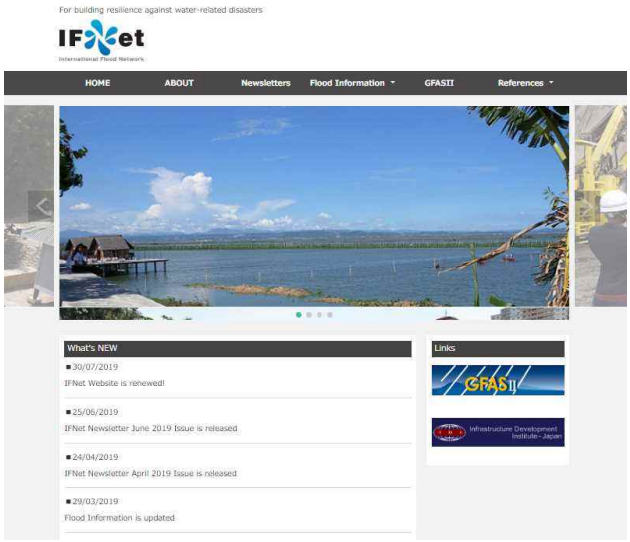
IFNet Website Renewed

IFNet website has just been renewed with more user-friendly design for both PCs and smartphones.



IFNet website
http://www.internationalfloodnetwork.org/index.html

1.About IFNet

IFNet (International Flood Network) was established during the 3rd World Water Forum held in Kyoto in March 2003 for the following purpose:

-To facilitate international cooperation in flood management so as to reduce the loss of life and damage caused by floods

-To promote flood mitigation activities in the world to lead to the safe and sustainable future

Currently 319 members from various organizations in 66 countries are registered.

2.Contents of IFNet Website

IFNet website is open to the public and provides the following contents on water-related disaster information around the world.

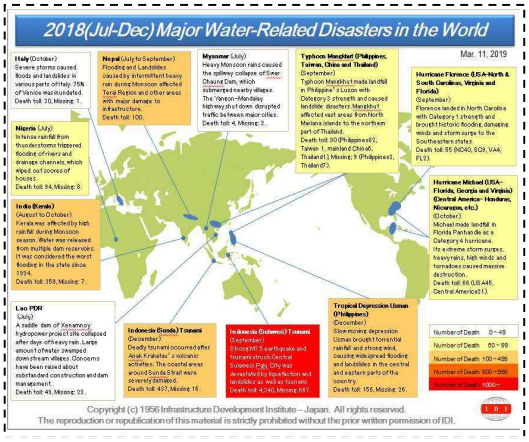
- IFNet Newsletters

Issued every two months and provides latest water-related disaster news and conferences/ forums/programs/information/surveys assisted by IDI-Japan.

IFNet Newsletter, June 2019 Issue

- Flood Information:

Provides maps of major water-related disasters and brief summary reports of specific disasters.



Jul to Dec 2018 Map of Major Water-related

3.Visit IFNet Website

Building disaster-resilient society is a common purpose throughout the world. Assuming that disaster in other countries could occur in our own country, the flood information by IFNet would give you knowledge and ideas for flood damage mitigation as well as raise awareness of disaster prevention.

We expect more individuals and organizations to visit our site

Please feel free to contact IFNet secretariat if you have questions:
IFNet secretariat e-mail:
info@internationalfloodnetwork.org

About IDI and IDI-quarterly

Infrastructure Development Institute (IDI)-Japan is a general incorporated association operating under the guidance of Ministry of Land, Infrastructure, Transport and Tourism of Japanese Government.
IDI provides consulting services for mobilizing International Assistance to developing countries, promoting international exchange of information and human resources, and supporting globalization of project implementation systems targeting both developed and developing countries in the field of infrastructure.

IDI has been publishing the free quarterly journal “IDI Quarterly” since1996 for the purpose of introducing information relating to public works and construction technologies developed in Japan to foreign countries. We have distributed the journal to administration officials in more than 90 countries around the world by e-mail.

It is highly appreciated if you would send us your opinions, impressions etc on the articles.
We are also welcoming your specific requests on articles to pickup for the following Quarterly issues.