

# Possibility of 3D model Collections in paleontology simply, easily, and inexpensively using portable devices equipped with LiDAR -From on-hand to room-

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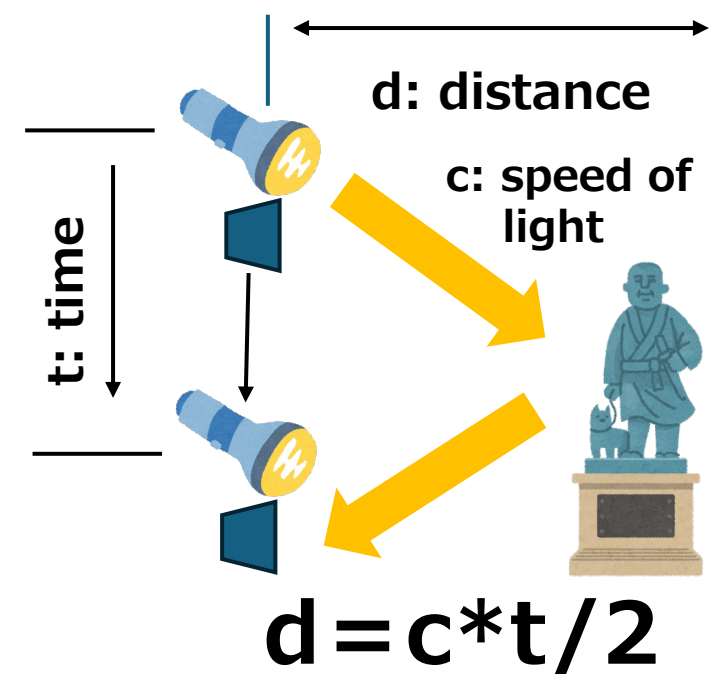
## Introduction

Until several years ago, it was difficult for the general public to acquire 3D data. Recently, portable devices have been equipped with LiDAR (Light Detection And Ranging).

LiDAR is a method for determining ranges by targeting an object or a surface with a laser and measuring the time for the reflected light to return to the receiver.

It is easy to acquire 3D data by LiDAR at low cost, so making 3D digital specimens and using 3D databases have become more popular.

This study aims to investigate the possibility of creating 3D digital model collections in paleontology using a simple, easy and inexpensive approach that applies portable devices equipped with LiDAR.



## Materials & Methods

Two Apple iPad Pro® (3rd and 4th generation) and an iPhone® 15 Pro equipped with LiDAR are used with the Scaniverse application.

\*<https://scaniverse.com>

The scanning distance of Scaniverse is from 0.3 m to 5.0 m for 3D modelling.

Targets of paleontological 3D models in our study range from the size of hand-sized specimens to exhibits several meters in size, exhibition rooms and outcrops, including a 5 cm ammonite and an ~3 m full-body replica of Naumann's elephant, *Palaeoloxodon naumanni*.



iPad Pro® (3rd and 4th generation)  
iPhone® 15 Pro

### (Operation Methods)

- ① Start the application
- ② Select the size of the object
- ③ Scanning range adjustment
- ④ Start scanning
- ⑤ Scan without omission
- ⑥ Select completion/construction mode
- ⑦ Construction (with waiting time)
- ⑧ Storage
- ⑨ Output by use (stl, etc.)

### SCANIVERSE



- \*free
- \*Niantec
- \*Scan range  
30 cm ~ 3 m
- \*OS  
Apple
- Android(limited)

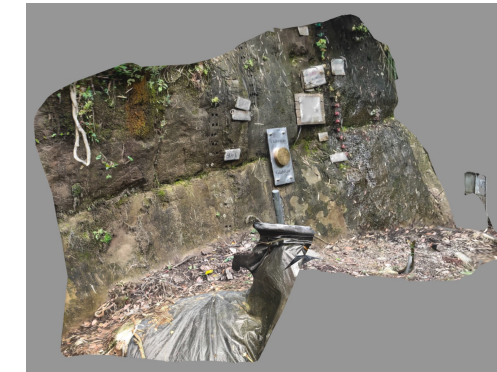
\*<https://scaniverse.com>



Scanning by SCANIVERSE

## Results & Discussion

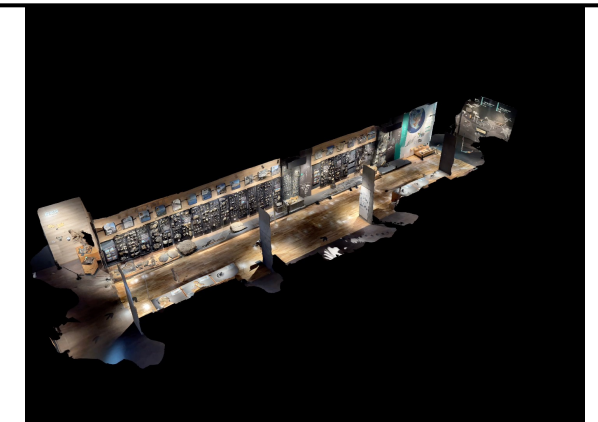
Big **Quality is Good.**



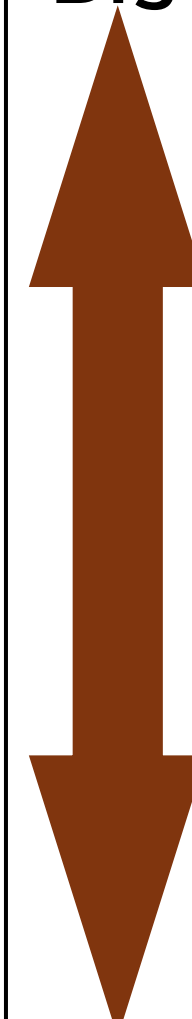
Outcrop of GSSP "Chibanian"  
About 5 m



Exhibition room of Oishi Fossil Gallery of Mizuta Memorial Museum  
Josai University Educational Corporation  
About 12 m



Exhibition room of Amakusa Museum of Goshoura Dinosaur Island  
About 20 m



Fossil of *Stegodon* teeth  
About 20 cm



Type specimen of Naumann's elephant's mandible  
About 60 cm



Footprint fossil of Proboscidea  
About 1 m



Full-body replica of Naumann's elephant  
About 3 m

Quality is Bad.



Fossil of coral  
About 3 cm



Fossil of ammonite  
About 5 cm



Fossil of trilobite  
About 7 cm

About 10 cm

In this case study, it was difficult to create good quality 3D models of specimens under 10 cm diameter, because these specimens are too small to focus the objects. On the other hand, 3D modelling of specimens greater than 10 cm, and up to 5 m long produced reasonable results.

## Conclusion and Remarks

These 3D model collections can be used as exhibits and for education by making 3D printings and virtual reality (VR) models.

Because the LiDAR technology is now built into common devices, problems may arise because anyone could make and share 3D models simply, easily, and inexpensively.

Several issues of ownership, such as copyright, could arise from creating these models because digital data policies are not uniform or codified between museums and institutions.

In the future, rules to govern these collections internationally need to be developed.