

Touch national monument: web-based AR application of Taniwhasaurus mikasaensis



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For a Borderless World of Geoscience
Japan Geoscience Union, American Geophysical Union

WHAT'S TANIWHASSAURUS MIKASAENSIS

音声 (<https://www.dropbox.com/s/dl6q2ub47yzeb6o/Project%20-%207%3A11%3A20%2C%2021.33.mp3?dl=0>)

What's *Taniwhasaurus mikasaensis*

- A species of marine reptile, Mosasaurid (Caldwell et al. 2008)
- Range of *Taniwhasaurus* = Santonian-Maastrichtian (863-660 Ma; Jiménez-Huidobro and Caldwell, 2019)
- founded by Kikuo Muramoto on 21st, June, 1976
- Japan's-designated natural monuments (16th, July, 1977)
- The first fossil specimen for designation of natural monument
- Housed in the Mikasa City Museum, Mikasa, Hokkaido, JPN
- Specimen number MCM-M-0009



Taniwhasaurus mikasaensis

Diagnosis: Crest on the top of the skull



REPTILIA Linnaeus, 1758
 SQUAMATA Oppel, 1811
 MOSASAURIDAE Gervais, 1852
 TYLOSAURINAE Williston, 1897
 TANIWHASAUROS Hector, 1874
 TANIWHASAUROS MIKASAENSIS Caldwell et al., 2008
 Holotype: MCM-M0009

Reconstruction model of *T. mikasaensis* exhibited in the Mikasa City Museum

Model Sculpter: Goro Furuta

Supervisor: Takuya Konishi (Ph.D)





***Taniwhasaurus mikasaensis* MCM-M-0009**

WHAT'S AR? WHY AR?

What's AR? Why AR?

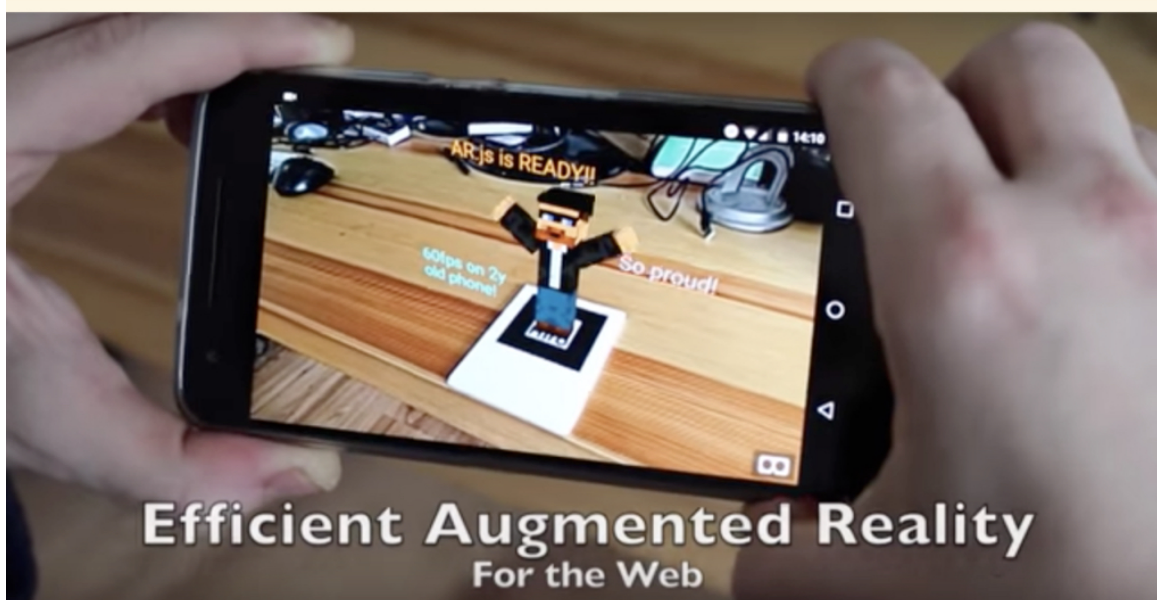


©Pokémon GO



©Google/Youtube

Web-based AR and Marker-based AR



Efficient Augmented Reality
For the Web

<https://aframe.io/>

HOW TO MAKE 3D MODEL OF THE NATIONAL MONUMENT FOR AR

How much is the cost?

Major Photogrammetry Softwares

minimum cost



59\$~



Free



about 1\$
per model

Famous 3D scanner



cost : 3,500,000 JPY~

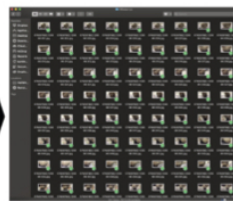
- Photogrammetry is the cheapest way to make 3D models from fossil or geological specimens .

How to make 3D model?



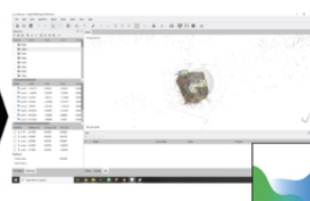
Video recording by iPhone 6 (.mov)

Record video from multiple
directions and save.
Dorsal and ventral view.



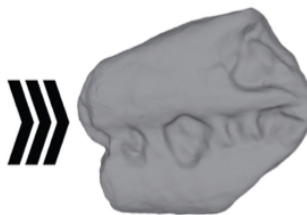
Convert to JPG images

By using Free Video to JPG
Converter. Making 300
images from one video.

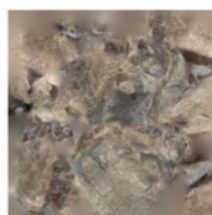


3D model construction

Construct the 3D data from the
output images by using
Agisoft Metashape (Agisoft LLC).



3D mesh data(.obj)



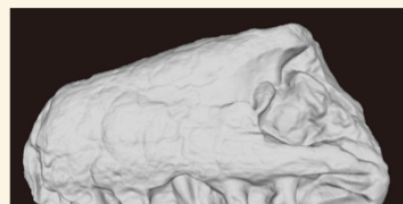
Texture image (.png)

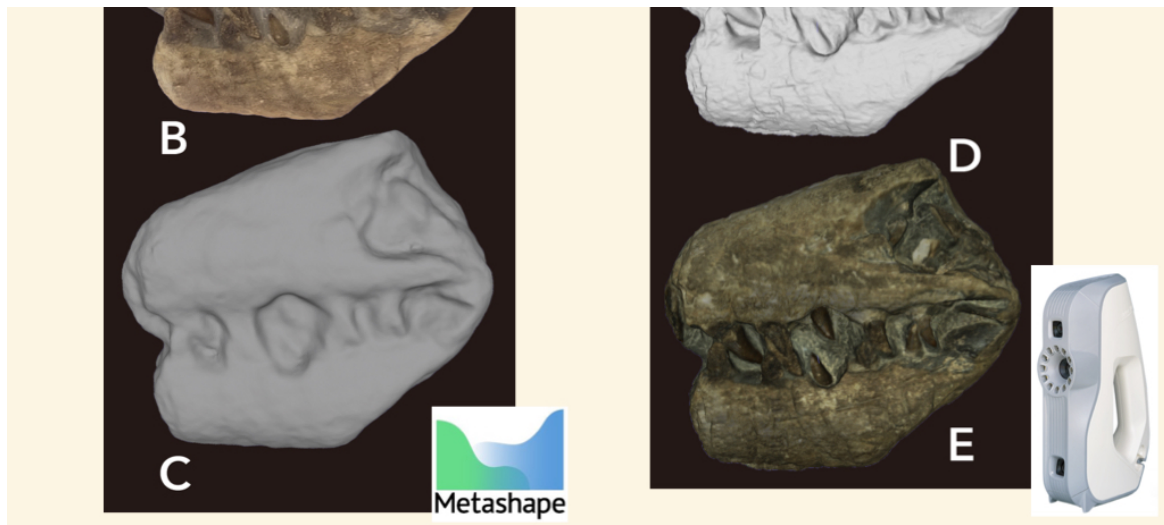


3D + texture

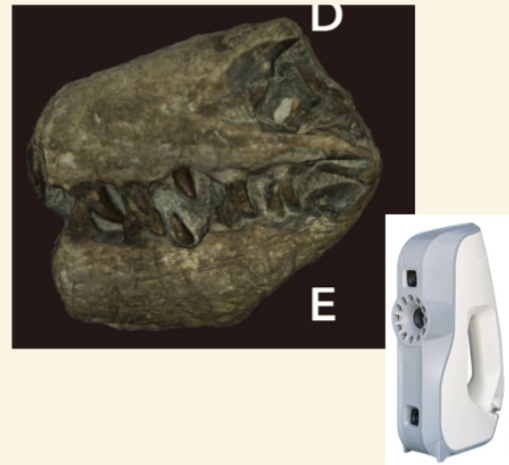
The mtl file connect the obj
data and png image data.

Photogrammetry vs 3D surface scanner



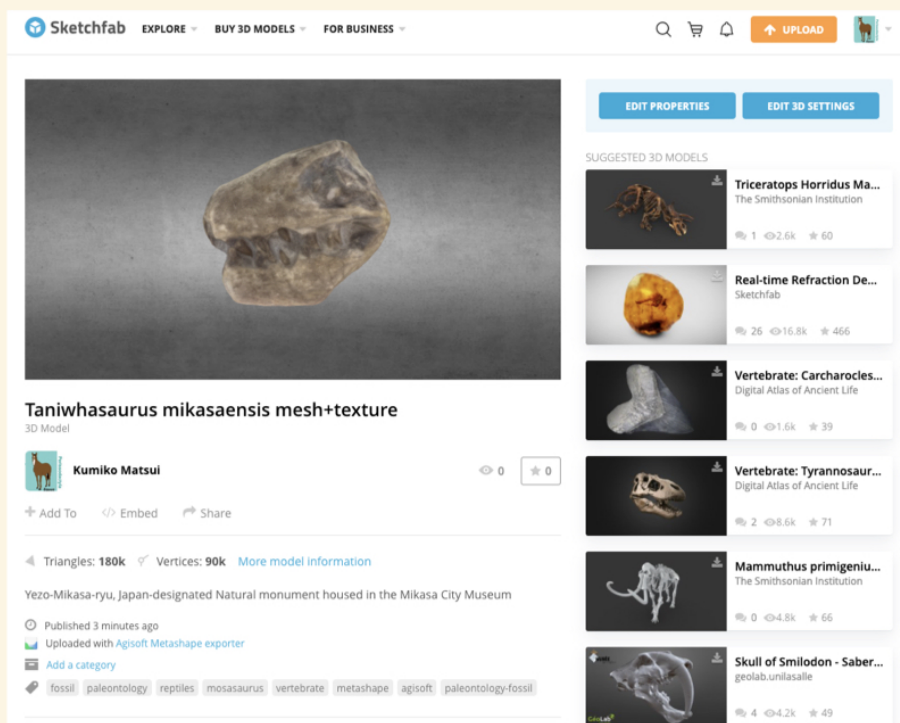


Not big differences in these two methods



- **Photogrammetry-based 3D model with texture data looks better than 3D scanner based one.**
- The 3D scanner is excellent for research applications where fine surface features are required

You can see this model in Skechfab!!



(<https://sketchfab.com/3d-models/taniwhasaurus-mikasaensis-meshtexture-a13e10d702fc4abca388e0b8d3942fce>)

AR IS VERY EASY TO MAKE AND USE!

Web-based AR Application

Branch: gh-pages 3d / WebAR / index.html Find file Copy path

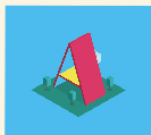

taniwhasaurus Update index.html 9fa1913 11 minutes ago 1 contributor

33 lines (29 sloc) 1.4 KB Raw Blame History

```

1 <!DOCTYPE html>
2 <html>
3   <head>
4     <meta charset="utf-8">
5     <meta name="viewport" content="width=device-width,initial-scale=1">
6     <title>The Mikasa City Museum</title> Title of this App
7   </head>
8   <body style="margin:0px; overflow:hidden;">
9     <script src="https://aframe.io/releases/1.0.0/aframe.min.js"></script>
10    <script src="https://raw.githubusercontent.com/jeromeetienne/AR.js/2.1.3/aframe/build/aframe-ar.js"></script>
11    <a-scene arjs="detectionMode: mono_and_matrix; matrixCodeType: 5x5; sourceType: webcam; trackingMethod: best; debugUITEnabled: false">
12
13      <a-assets>
14        <a-asset-item id="3DModel3" src="tanipha2.obj"></a-asset-item> connect 3D & mtl data
15        <a-asset-item id="Material3" src="tanipha2.mtl"></a-asset-item>
16      </a-assets>
17
18      <a-marker type="barcode" value="5"> recognition of the marker
19        <a-obj-model src="#3DModel3"
20          mtl="#Material3" position="0 0.5 0" scale="10 10 10" rotation="0 0 0">
21        </a-obj-model> 3D model definition position size rotation
22      </a-marker>
23
24      <a-marker type="barcode" value="6">
25        <a-obj-model src="#3DModel3"
26          mtl="#Material3" position="0 0.5 0" scale="0.2 0.2 0.2" rotation="0 0 0">
27        </a-obj-model>
28      </a-marker>
29
30      <a-entity camera></a-entity> open camera App
31    </a-scene>
32  </body>
33 </html>

```

 **A-Frame**
 **AR.js**

Read A-frame and AR.js
definition of a marker and 3D data and related materials

Let's try!!



You can see the national monument on your hand!

- QR code was made by Unitag (www.unitag.io)



INFLUENCE FOR THE MUSEUM VISITORS

Influence for the museum visitors

We attempted hands-on education event in the Mikasa City Museum in 13th July 2019 to verify educational effect of AR and 3D printed models of *Taniwhasaurus mikasaensis*.

In the hands-on corner of *T. mikasaensis*, we prepared skeleton and reconstruction images, 3D printed models of the holotype, and the QR cord and the makers for AR view. Participators can use own smartphones or tablet computers or iPad that we prepared for AR view.

Participators first learned the outline of *Taniwhasaurus mikasaensis*, the importance of the holotype of *T. mikasaensis*, and making of AR and 3D printed models. Then, participators experienced AR view of *T. mikasaensis*.

We survey educational effect of AR and 3D printed models by questionnaires. That result shows that;

1. AR view and 3D printed models makes more participators' interested in *T. mikasaensis*.
2. Many participators had known AR and 3D printing technology but hadn't used actually before. This event provides experience of state of the art.
3. Participators made more interested in joining to museum outreach events.

Age				
10s	20s	30s	40s	Over 50s
2	2	1	5	1

Habitat		
Mikasa City	Hokkaido (except for Mikasa City)	Others
3	9	0

Question / Answer	yes	no	Non-answer / others
Q1: Had you known "3D printer" before participate in this event?	9	2	
Q1-2: Had you used any 3D printer?	0	9	
Q2: Had you known "AR" before participate in this event?	7	4	
Q2-2: Had you used any AR?	3	4	
Q3: Have been to any museum frequently?	6	3	2
Q4: Had you known <i>Taniwhasaurus mikasaensis</i> before participate in this event?	6	5	
Q5: Does this event make you more interest in <i>Taniwhasaurus mikasaensis</i> ?	6	5	
Q6: Will you want to join to any event like today in future?	11	0	

The number of person
the number of person

THE USEFULNESS OF AR FOR MUSEUMS UNDER COVID-19 SITUATION

The usefulness of AR for museums under COVID-19 situation

Under the pandemic of COVID-19 in 2020, museums all over the world were forced to be closed. If prevalence of COVID-19 are barely controlled, museums should suspend touching exhibitions.

In this situation, many museums provide video programs in web. AR might become a further alternative exhibition because of avoidance of contagion.



Restriction of hands-on exhibition in the Mikasa City Museum

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Because of maintenance we have just saved your content and will within a few minutes logout all users and restart our server. We will be back in a moment.

Sorry for the inconvenience!

Because of maintenance we will within a few minutes restart our server. We will be back in a moment.

Sorry for the inconvenience!

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LIVE SESSION

Meeting time:

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GO TO SESSION