



Presented at the FIG Working Week 2023,
28 May - 1 June 2023 in Orlando, Florida, USA

FIG WORKING WEEK 2023

28 May - 1 June 2023 Orlando Florida USA

Protecting
Our World,
Conquering
New Frontiers

an educational cadastral surveying simulator applying a metaverse platform

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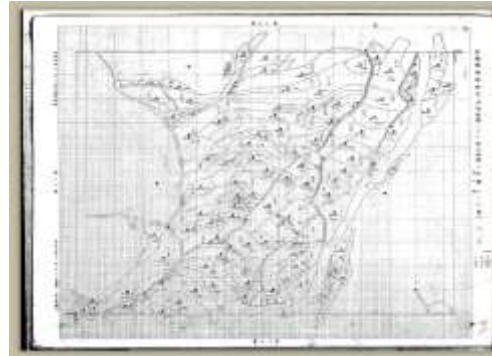
Purpose of Presentation

- Proposing a solution to the shortage of professional land surveyors in Korea
- Suggesting a new generation surveying education system using a metaverse platform.

Cadastral maps in Korea



Land Investigation Business(1910~1918)



The cadastral maps(paper)



Digitalization of Cadastral Maps(1975)



Modern Cadastral Maps(.cif)

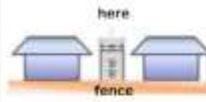
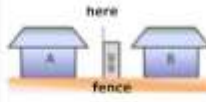
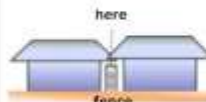
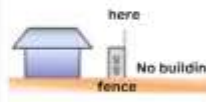
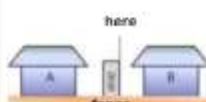
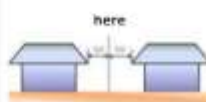
Cadastral maps in Korea have been produced for nearly 110 years, and they are still in use today

Old maps were not accurate because of limited technology. Now, it is hard to survey because of these map

Therefore, surveyors in Korea have to consider many things when cadastral surveying

Cadastral Suveying in Korea



the boundary	example	case	the boundary	example	case
middle of the fence		There is a fence	left of the fence		The fence was installed by B
		There is a fence and the eaves of two buildings overlap	outside of the fence		The fence between a building and other land
right of the fence		The fence was installed by A	Middle of the between the eaves		there is no fence between two buildings,

Criteria used in Korea for determining land boundaries

Cadastral surveying requires a lot of experience and expertise.

Education using simulators



Flight Simulator (1982~)

Source: YouTube



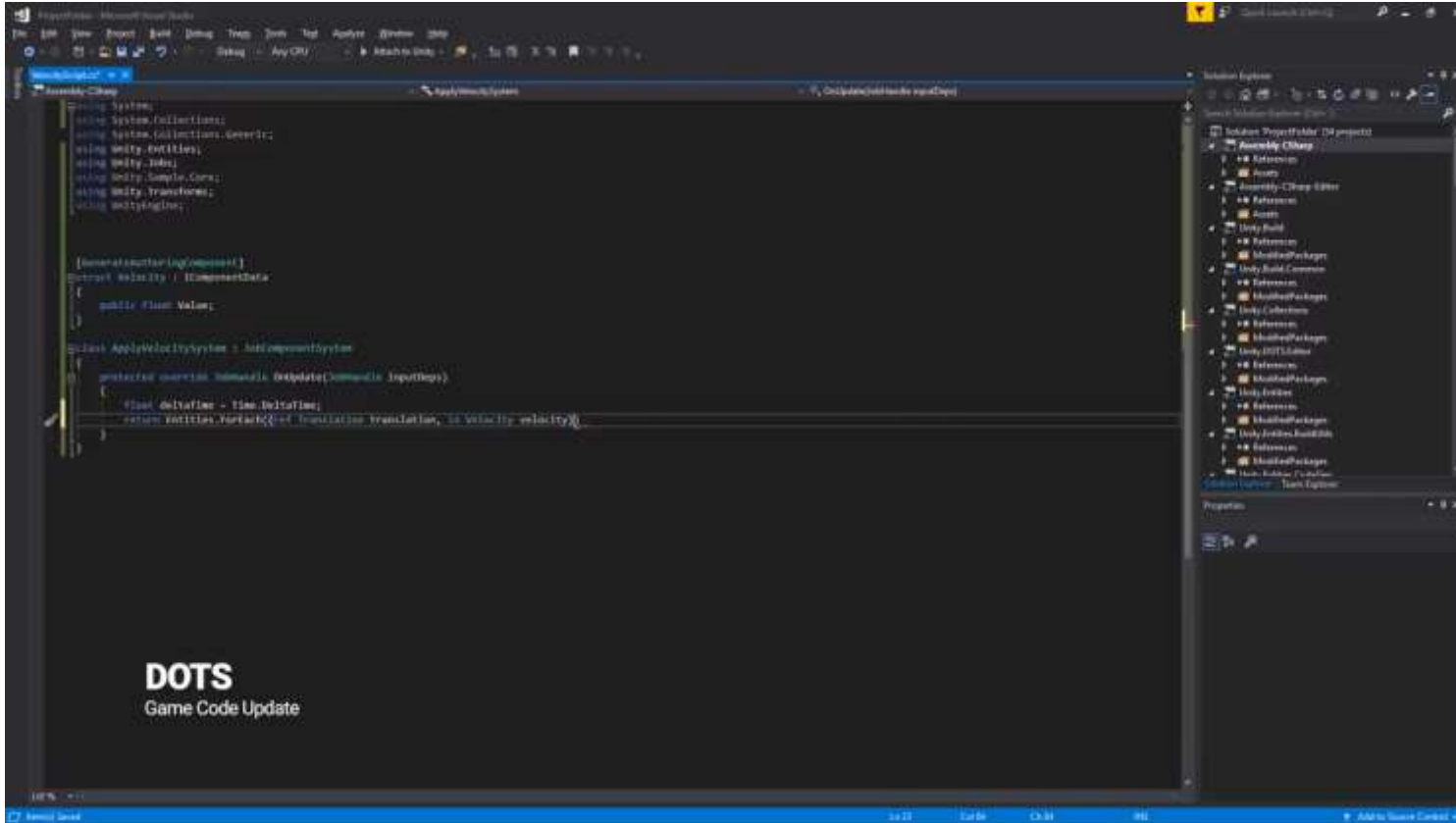
Using a flight simulator to mimic real-life airplane operation in a virtual environment.



Survey Simulator (2022~)



Performing land surveying tasks in a virtual reality environment that mimics real-life situations.



출처:유튜브



Unity is a game engine for creating 3D and 2D video games, as well as interactive content like VR experiences and 3D animation.

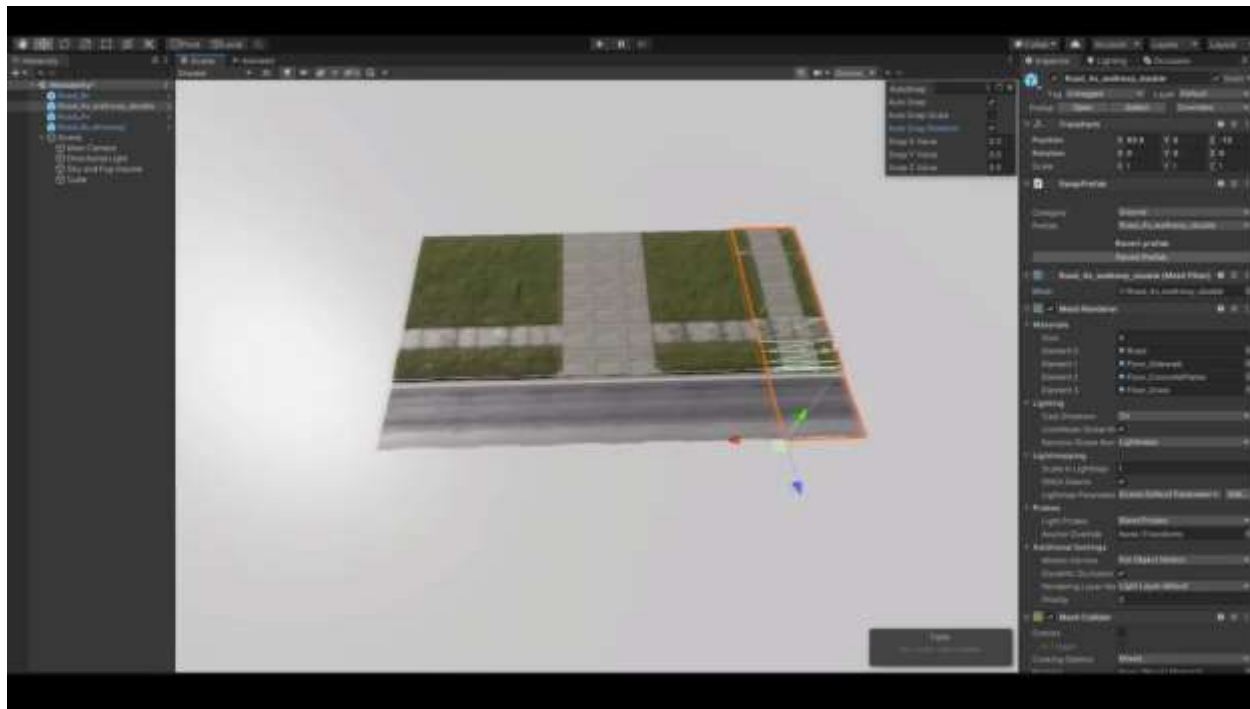
Meta

Meta's VR headset, the Meta Quest, was used to increase the simulator's realism. The headset displays the screen and the controllers enable interaction with objects.



출처:유튜브

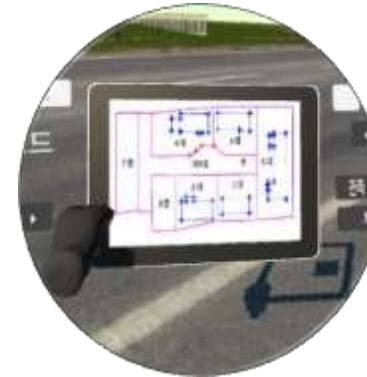
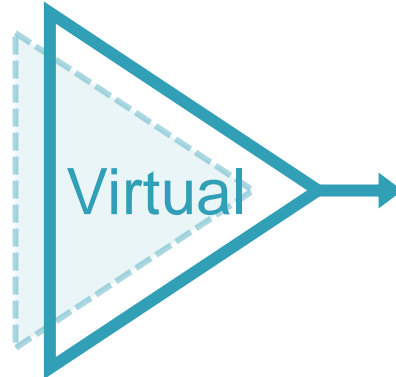
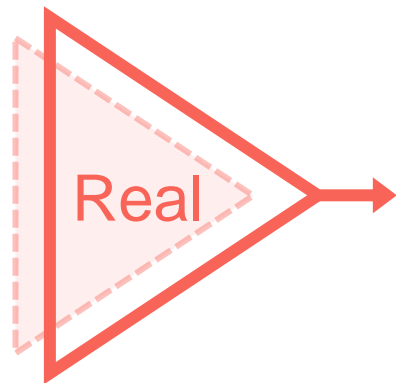
1 Creating a Land for suveying using



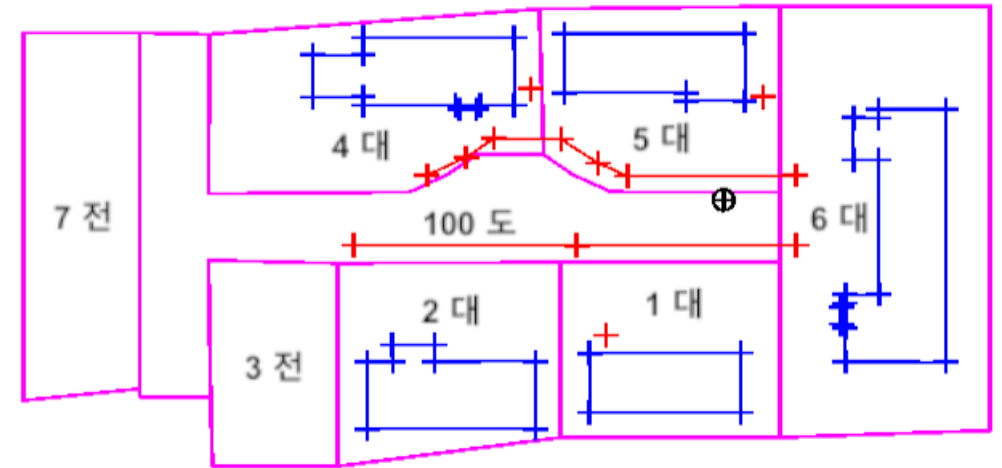
Parcel number	Land catrgory	Number of points	Building	Area(m ²)
1	Land	4	Y	545
2	Land	4	Y	598
3	Field	5	N	369
4	Land	7	Y	756
5	Land	6	Y	605
6	Land	6	Y	1271
7	Field	16	N	596
100	Road	4	N	993

List of land

1 Replicating land surveying equipment



2 Performing land surveying through VR-based site exploration



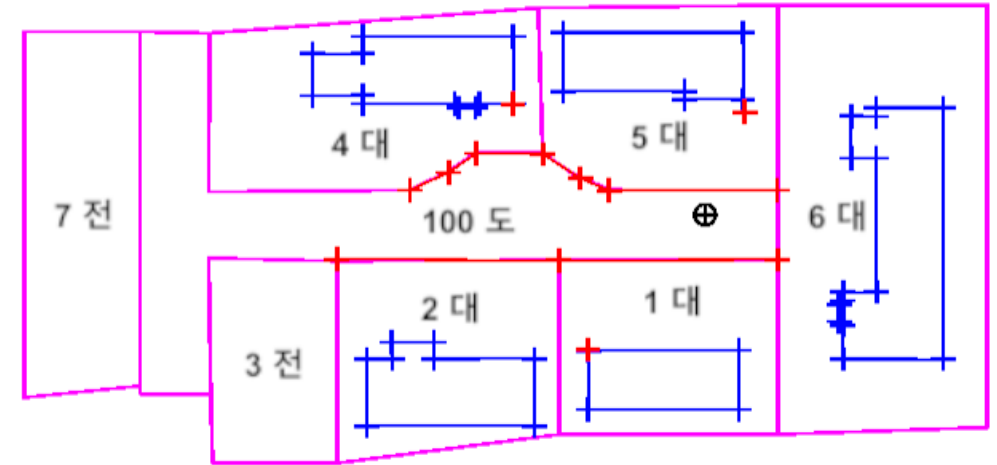
Surveying outcomes

Red: Observed points

Pink: Cadastral map

Blue: Buildings

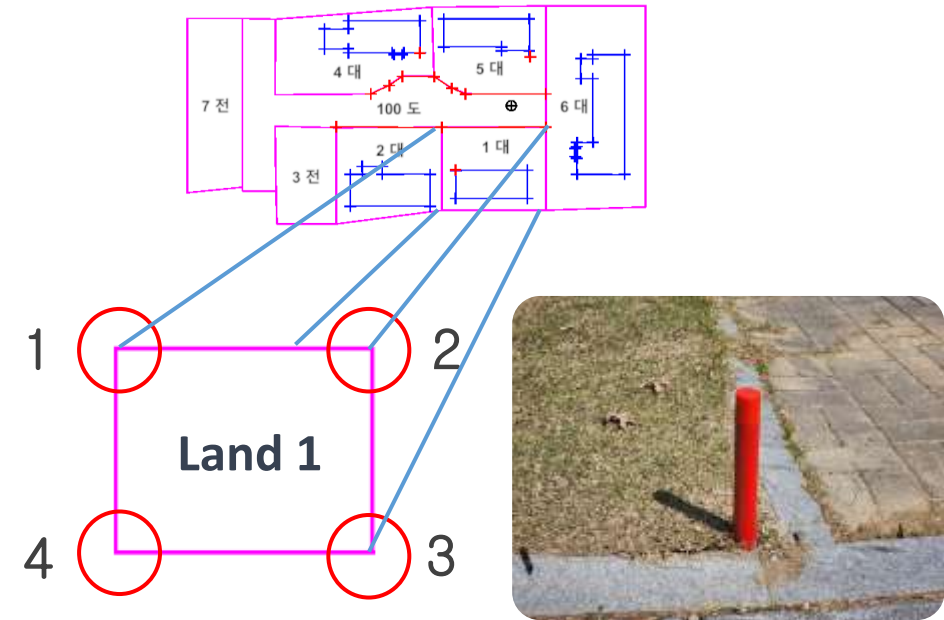
3 Determining boundaries based on observation data



Boundary determination results

- Red: Observed points
- Pink: Cadastral map
- Blue: Buildings

4 Restoring land boundary points



Restoring the on-site location of cadastral boundary points

5 Feedback after land surveying

simulation evaluation metrics

Criteria	Score
Accuracy (Error)	30
Correct observation	20
Boundary determination	25
Time taken	10
Safe surveying	15
Total	100

Accuracy (Error)

Measured by the difference between survey results and actual values



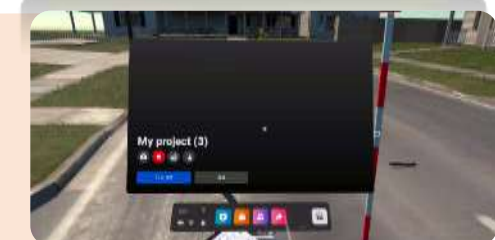
Boundary determination

Confirming whether the boundary line is clearly determined



Time taken

Evaluating the time required to perform the survey



6 collaboration with multiple players



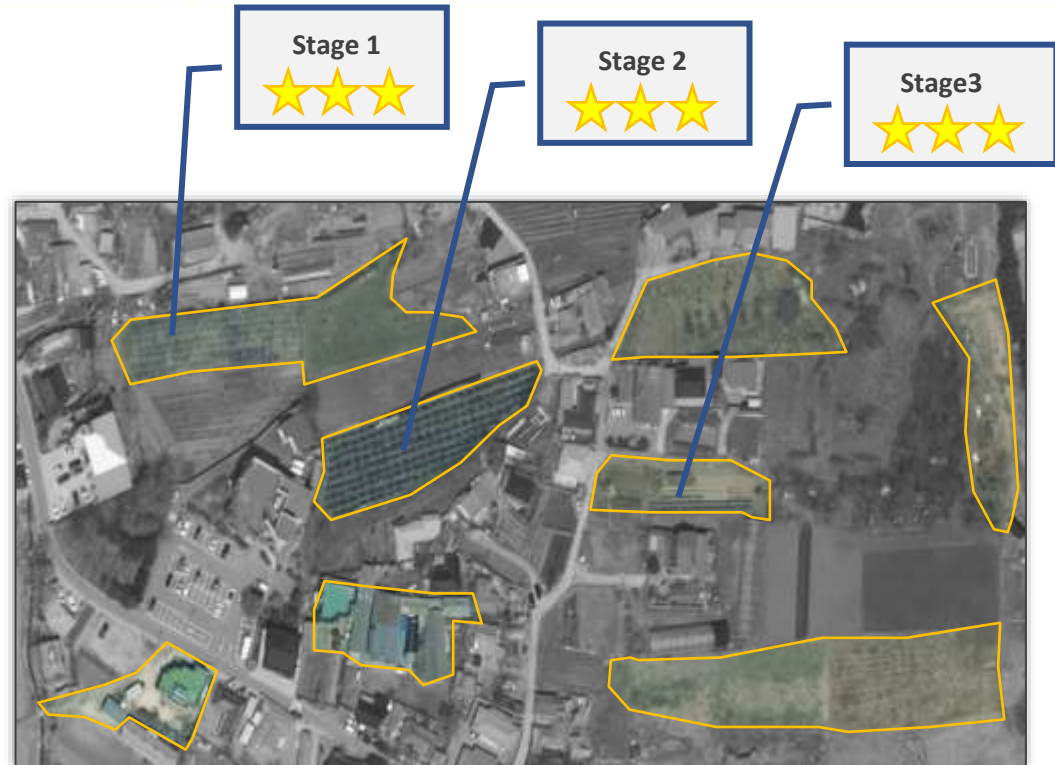
7 Enhancing job skills through step-by-step learning



Source: angry bird



Increasing user interest through progressive difficulty levels



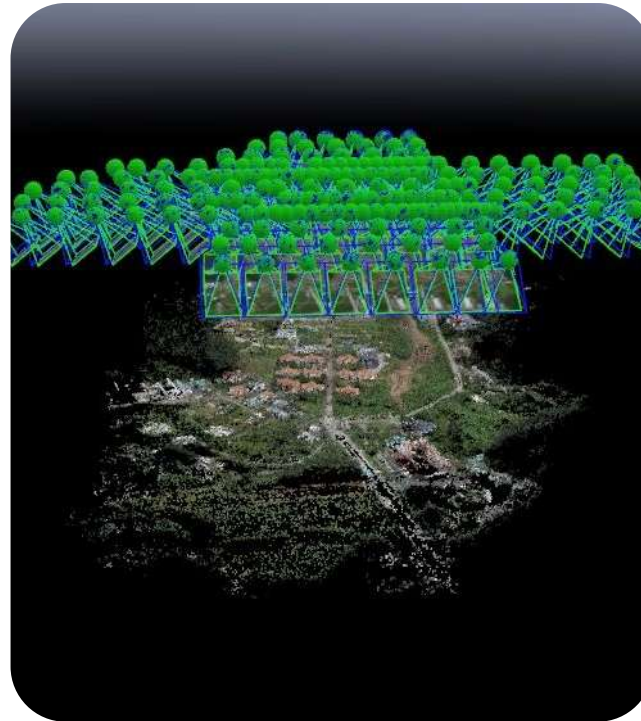
Completion of the entire course leads to an improvement in job skills

8 Simulation environment using digital twin

real



scan



unity



8 Simulation environment using digital twin

real



Red: Points to be observed on the actual site

virtual



Red: Points to be observed in the virtual environment

9 Performing cadastral surveying within a digital twin

Virtual



Red: Points to be observed in the virtual environment

9 Performing cadastral surveying within a digital twin

Real

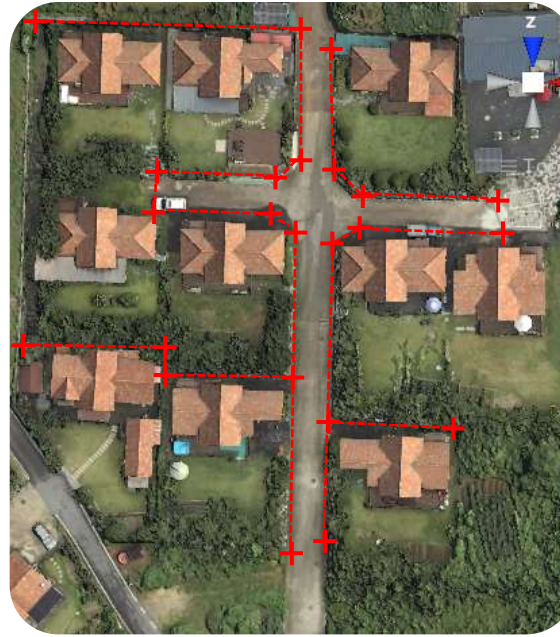
Virtual

Comparing the results



Actual observed data

overlay



virtual space observed data

analysis



analysis by overlaying actual and virtual

1st

Metaverse education platform

- ① Education for those with **little experience**
- ② Education for **student**
- ③ An education system that is not constrained by **time** and **space**



2nd

Judgment training

- ① Training through **various** and **challenging** scenarios
- ② Enhancing job skills through simulations



How to Use

Game content



- Can be used **not only** for education but also as a game content
- **non-professionals** can easily learn and **enjoy** land surveying



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Thank you

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