웹 기반 메타버스 저작 플랫폼 구현

캡스톤 디자인 계획 발표

최진아, 이혜진, 유선아

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01

프로젝트의 필요성

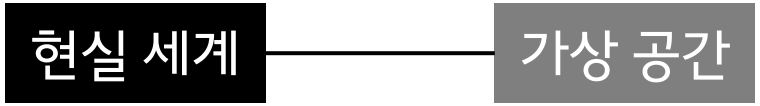
01. 프로젝트의 필요성

메타버스의 개념

META + **VERSE**

Meta(μετά)
이후, 그 너머, 초월

Universe
우주, -세계



현실 세계와 가상 공간을 연결하여 사용자가 자유롭게 가상 세계를 꾸밀 수 있는 공간

01. 프로젝트의 필요성

메타버스의 종류

이미지를 기반으로 한 메타버스

구글 어스(Google Earth)

그래픽을 기반으로 한 메타버스

제페토(ZEPETO)

01. 프로젝트의 필요성

메타버스의 콘텐츠 저작 방법

1) 전문가용 소프트웨어

2) 기업에서 배포 중인 개발 소프트웨어 툴을 따로 설치

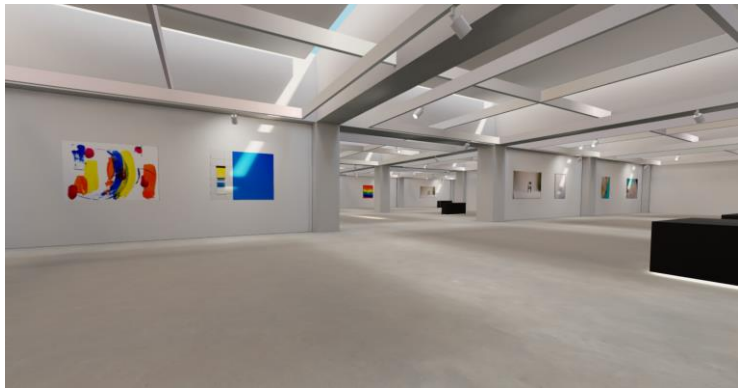
콘텐츠 저작 도구 사용 난이도가 높음

→ 접근성이 떨어짐

01. 프로젝트의 필요성

대중화되지 못한 이유 (한계)

웹 기반 메타버스의 사례



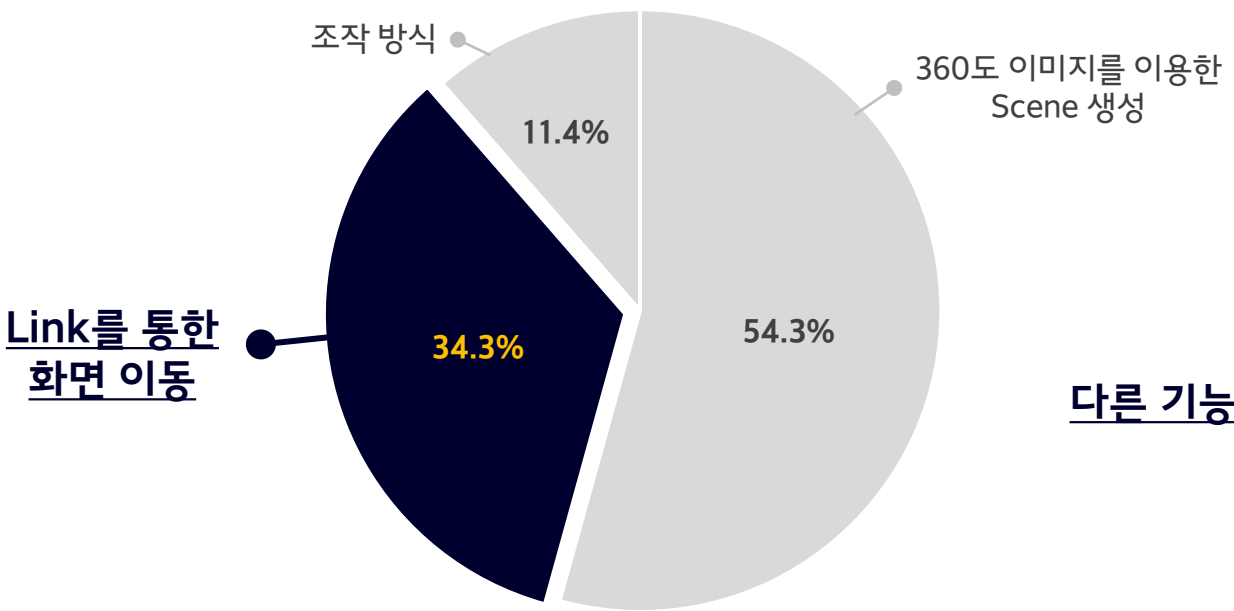
(경제적) 많은 비용 투자 필요, (접근성) 콘텐츠가 부족

→ 대중화가 어려움

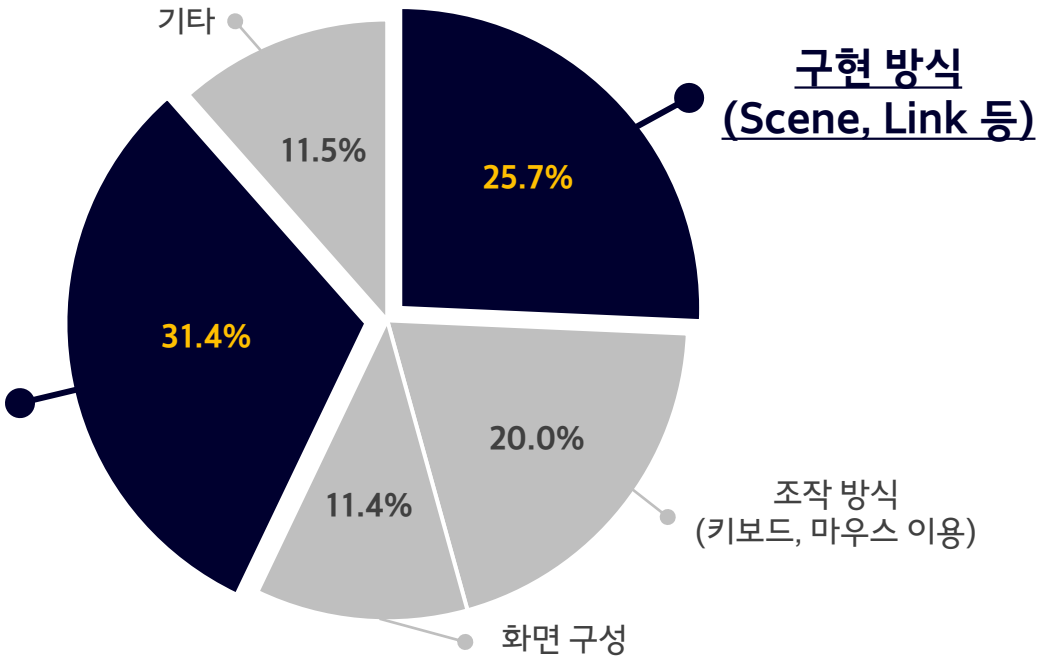
01. 프로젝트의 필요성

설문조사를 통한 기능 요구사항 분석

플랫폼에서 가장 마음에 드는 부분



플랫폼에서 개선해야 할 점



※응답자수:72명

Link에 대한 **만족도**는 높은 편이나,
360도 이미지만으로 만든 **scene에 추가로 다른 오브젝트들을 넣을 수 있는 기능**과
Link 구현 방식(link 위치, 개수)에 대해 **개선**해야 한다는 의견이 있었음

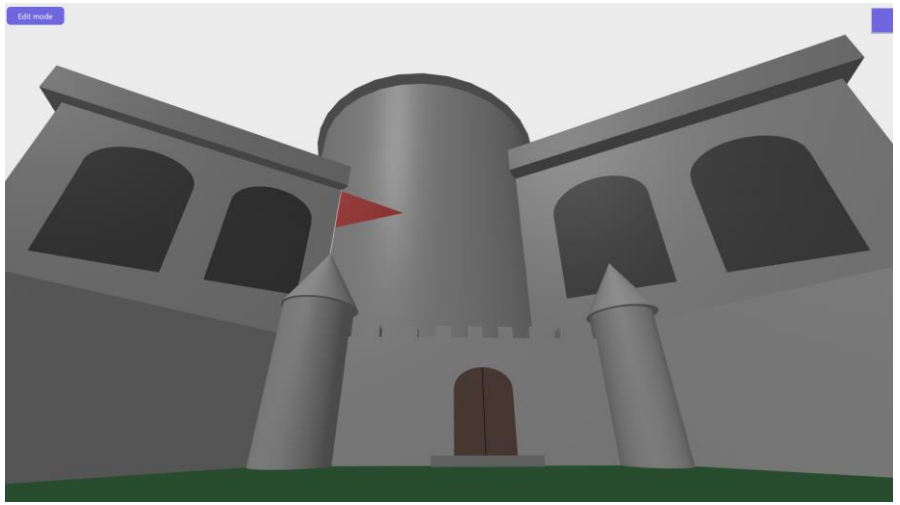
01. 프로젝트의 필요성

구상

웹 기반 메타버스 저작 플랫폼

이미지를 기반으로 한 메타버스

그래픽을 기반으로 한 메타버스



이미지, 3D object 모두 하이브리드 형태로 가능한 웹 기반 메타버스 저작 플랫폼

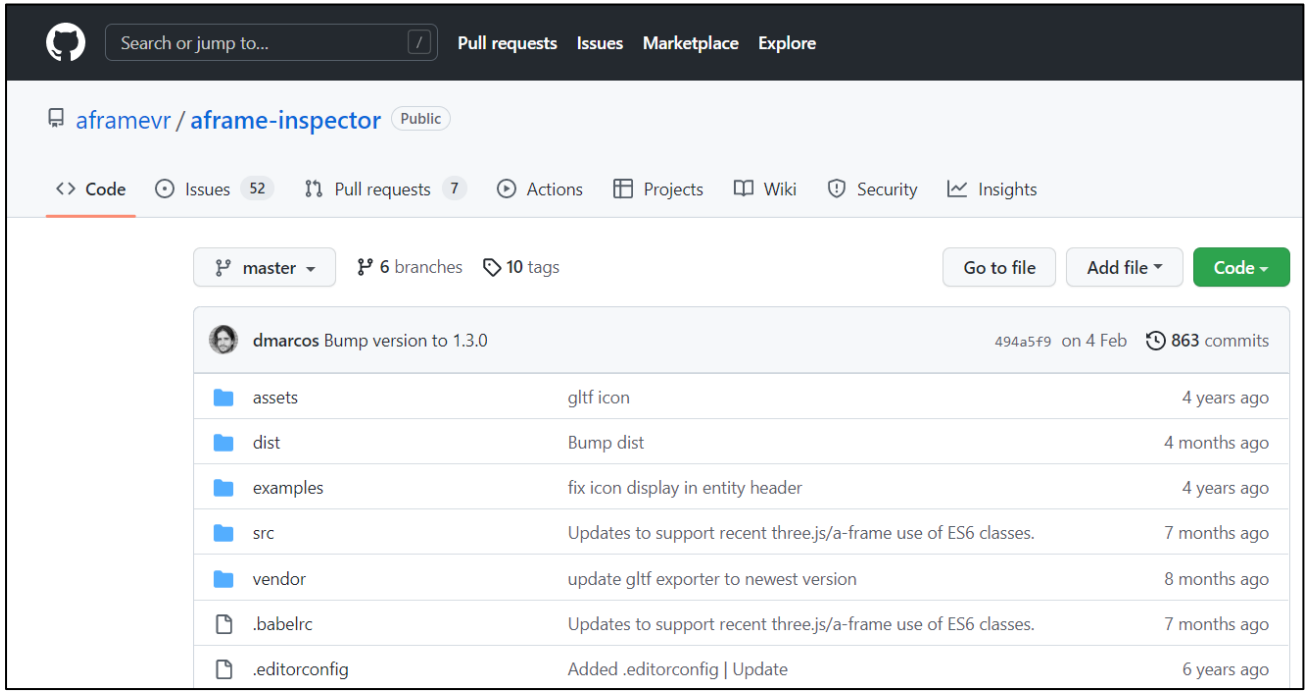
02

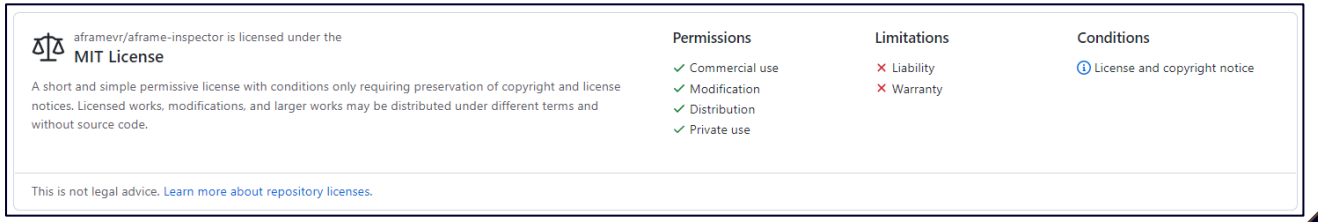
캡스톤디자인1 진행 결과

02. 캡스톤디자인1 진행 결과

개발 언어 및 오픈 소스

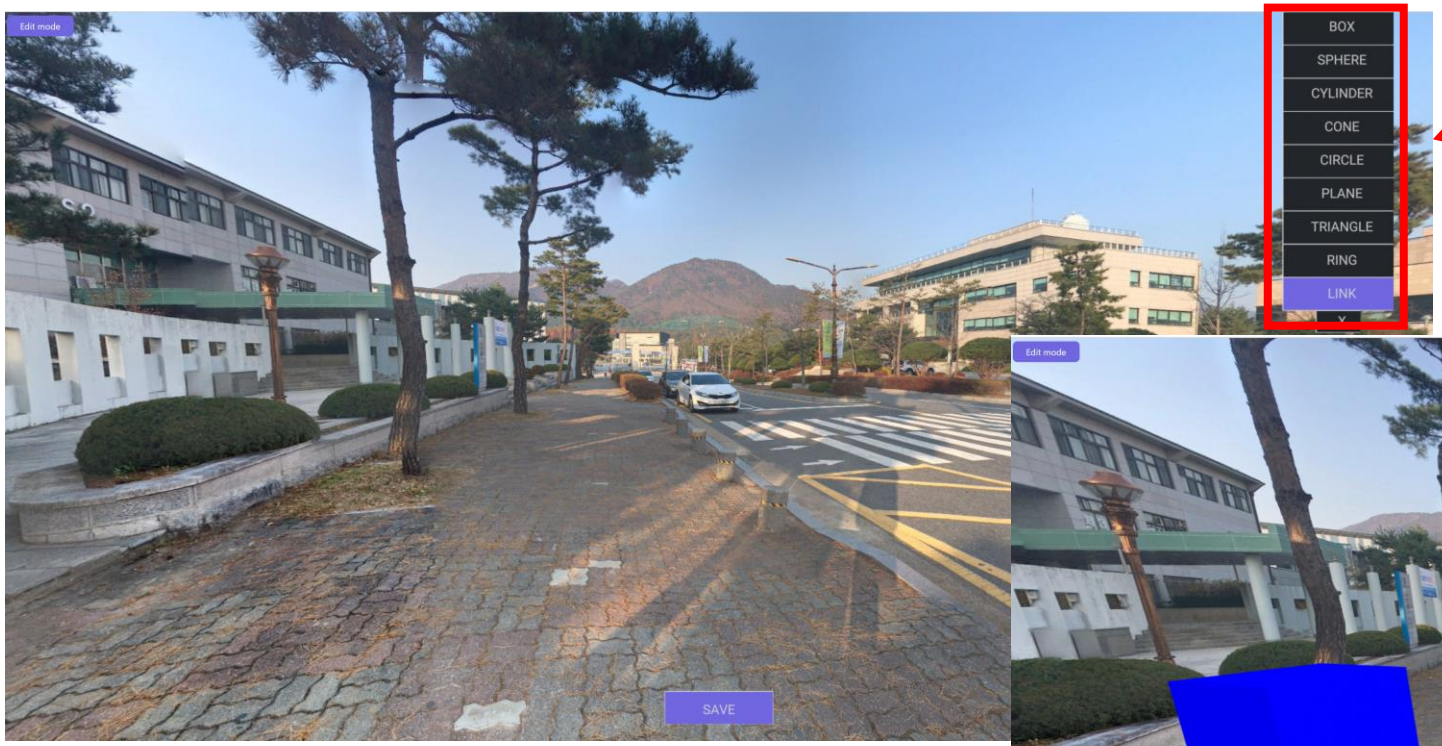
- **프론트엔드(front-end)** : JavaScript, HTML, CSS, React
- **백엔드(back-end)** : Node.js, express
- 데이터베이스 : MongoDB
- 오픈소스 이용 : aframe-inspector(MIT License)

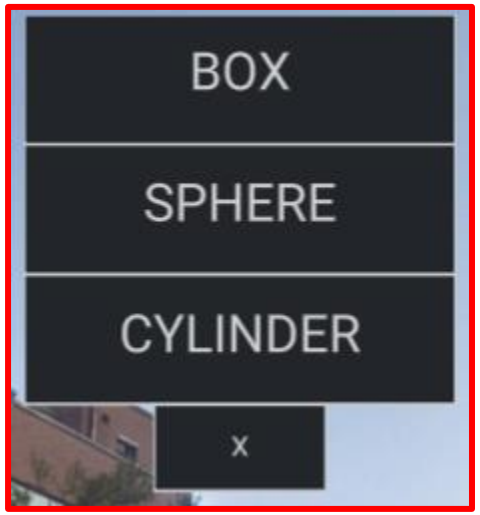


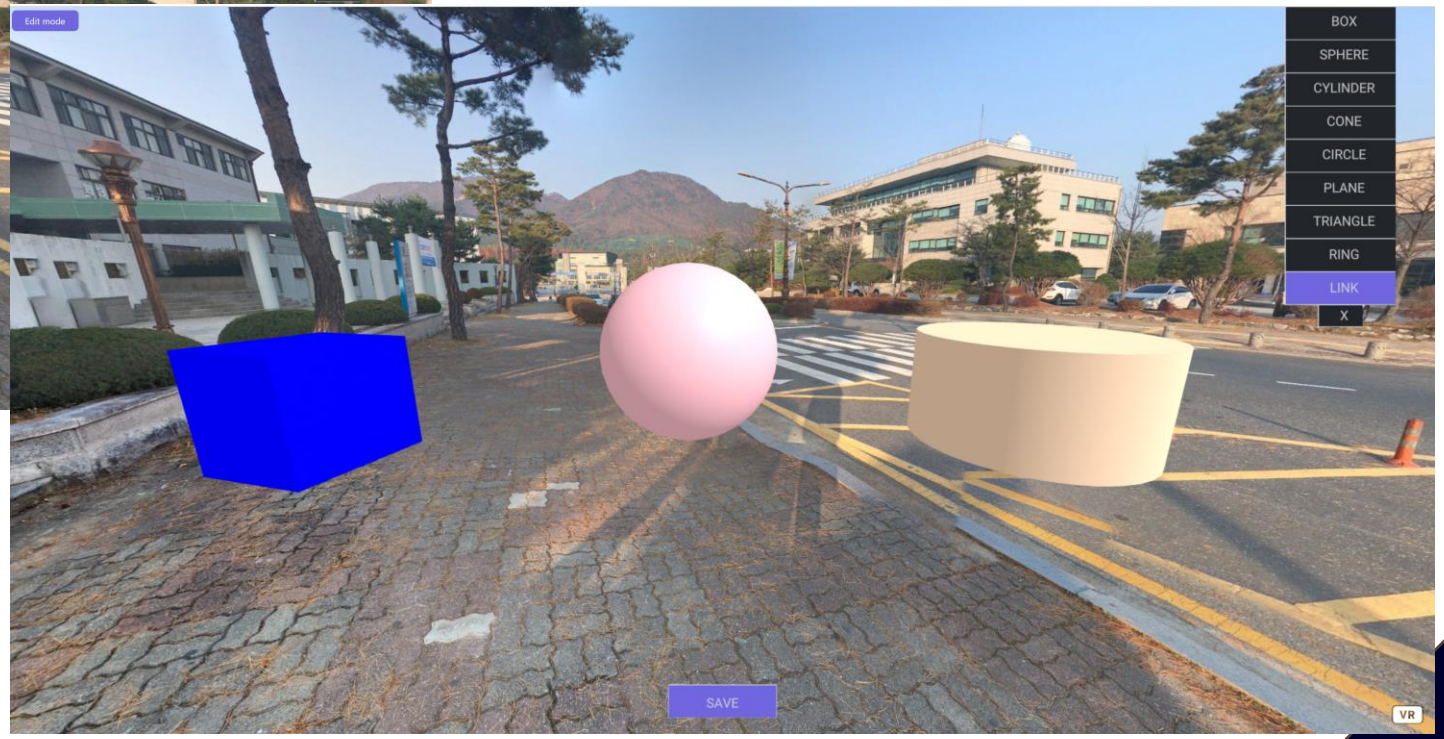


02. 캡스톤디자인1 진행 결과

3D object 생성

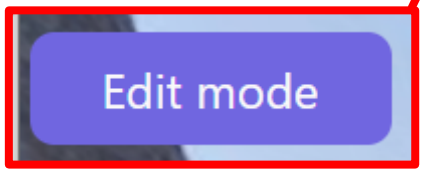




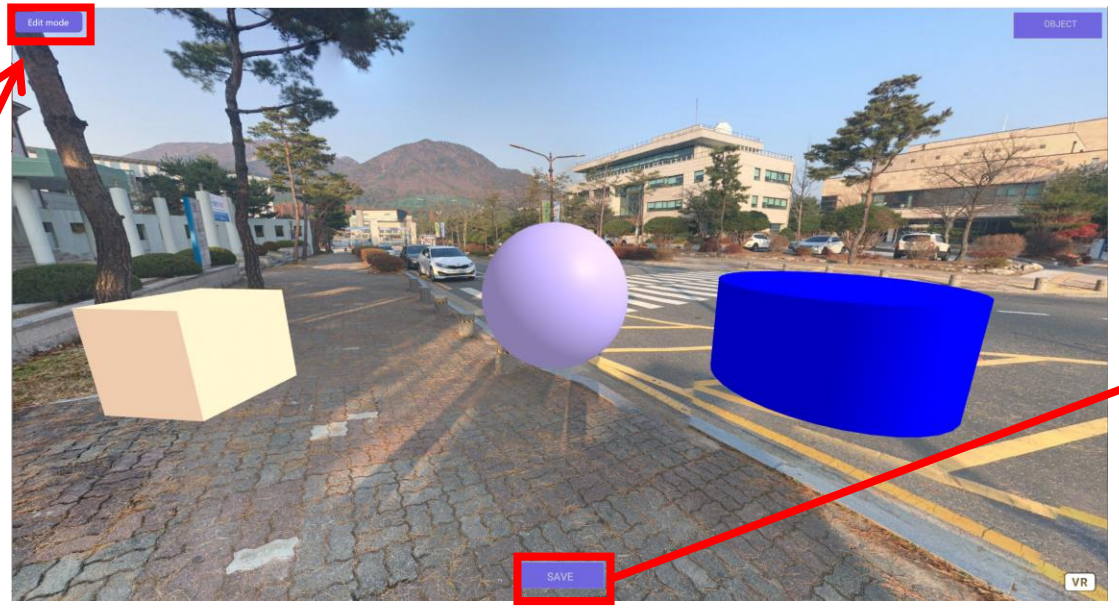


02. 캡스톤디자인1 진행 결과

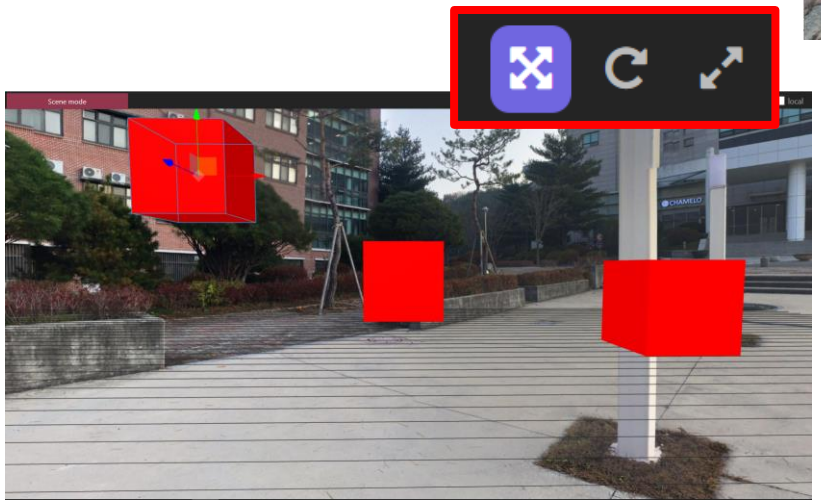
3D object 변형



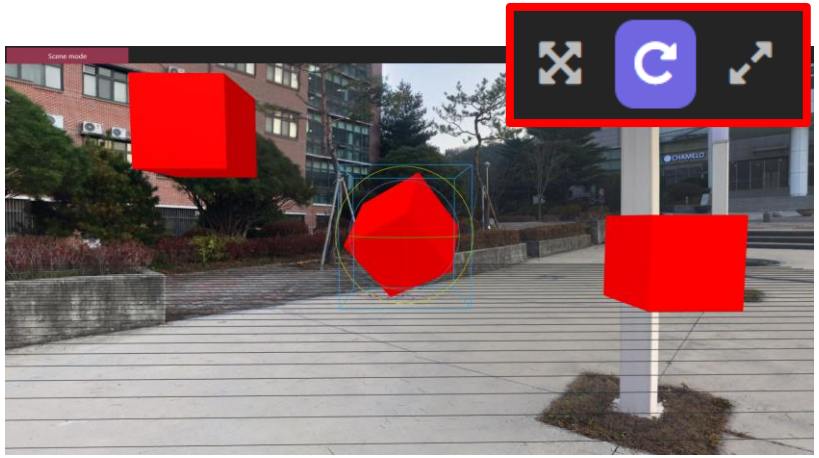
편집 모드



저장



이동 (Translation)



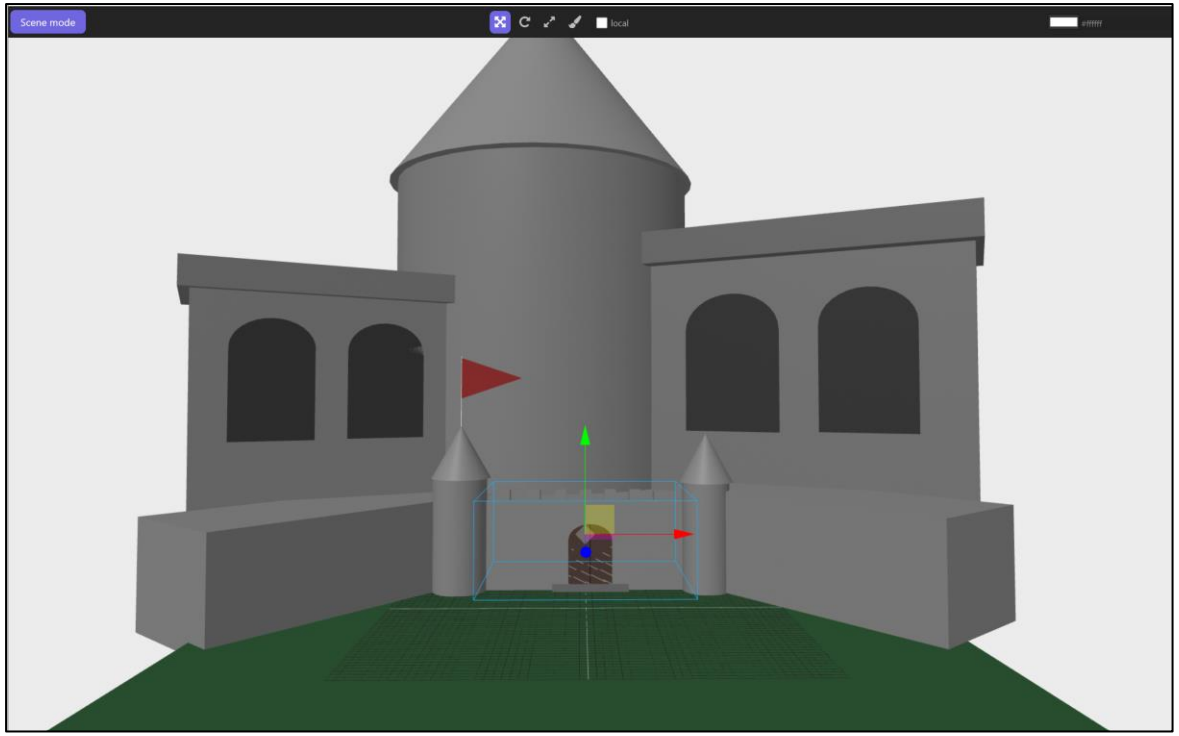
회전 (Rotation)

신축 (Scale)

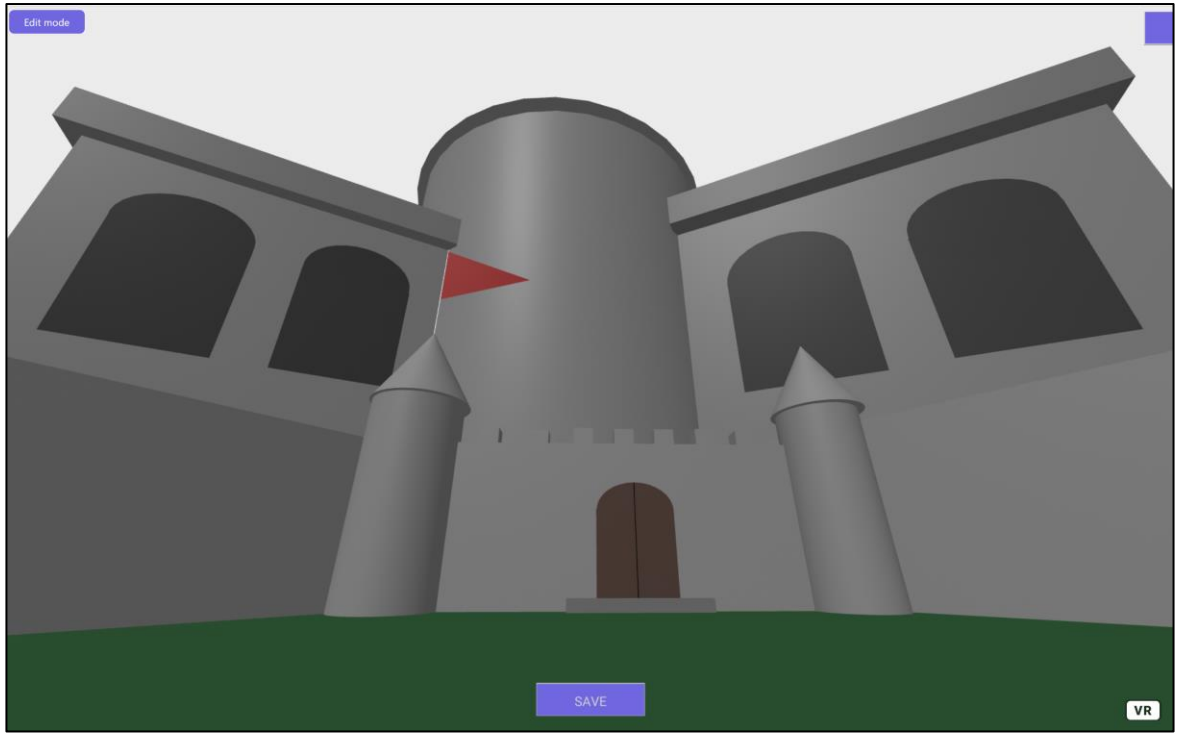
02. 캡스톤디자인1 진행 결과

3D object를 이용해 만든 성

Edit mode

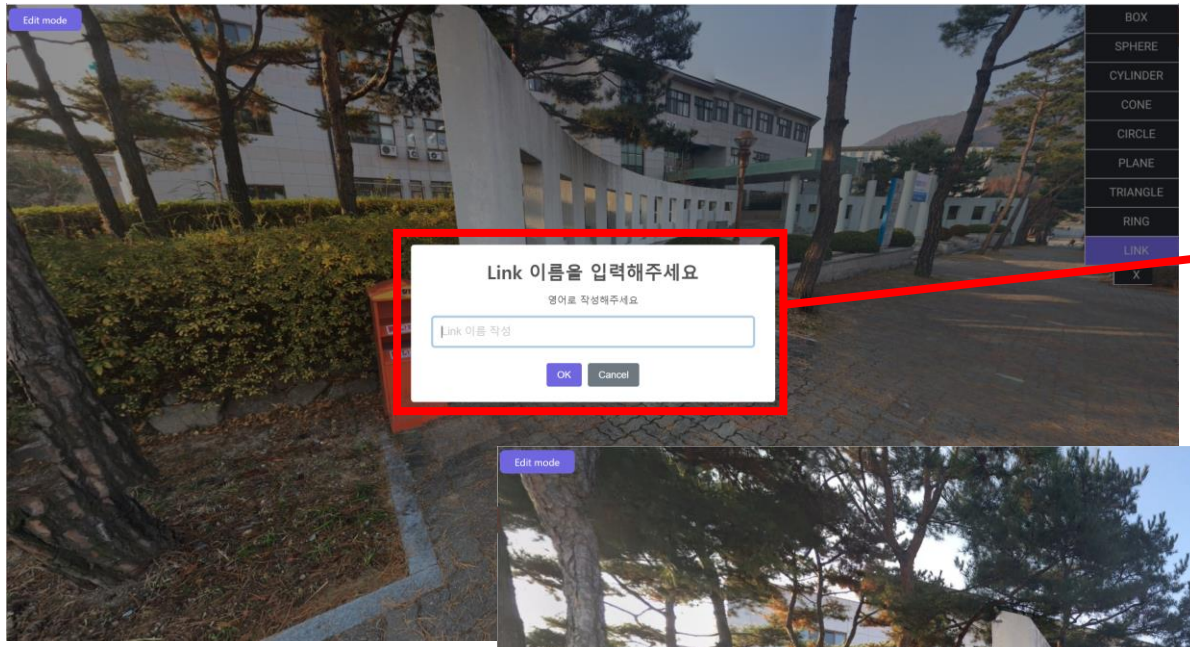


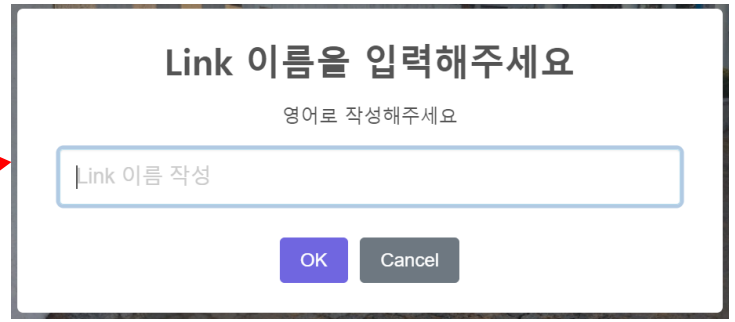
Scene mode



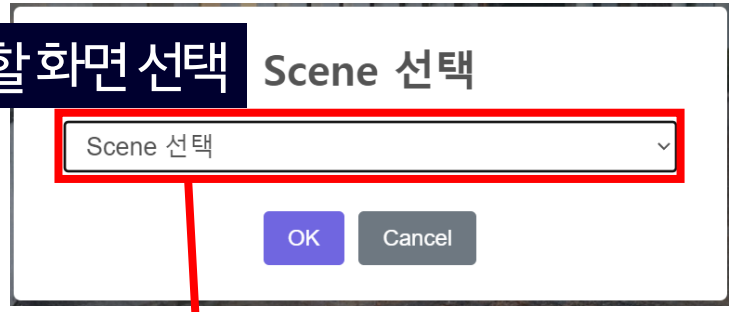
02. 캡스톤디자인1 진행 결과

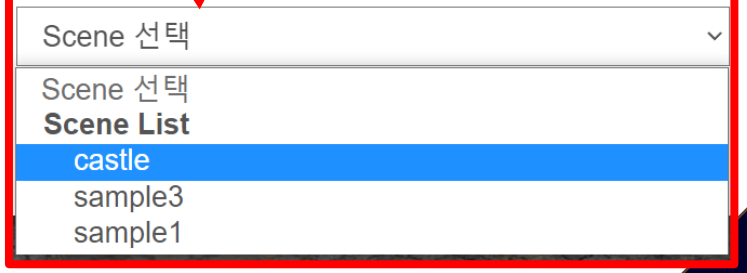
Link object 구현





연결할 화면 선택





02. 캡스톤디자인1 진행 결과

문제점 분석

문제점	해결책
express.js의 유지보수가 어려움	Nest.js, Next.js를 사용한 리팩토링
3D object 생성과 링크 object 생성 기능의 분리	3D object를 생성 시 링크 기능을 넣을 수 있도록 개선
삽입할 수 있는 3D object에 한계	외부 3D object(.obj 등)의 삽입
단위 테스트를 통해 발견하지 못한 결함의 가능성	알파 테스트를 통해 실제 사용자로부터 프로그램의 요구사항을 평가함

03

캡스톤디자인2 개발 계획

03. 캡스톤디자인2 개발 계획

express.js의 유지보수의 어려움

Nest.js, Next.js를 사용한 리팩토링

express ▶ nest NEXT.JS

03. 캡스톤디자인2 개발 계획

express.js의 유지보수의 어려움

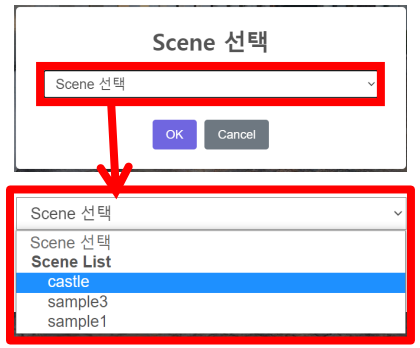
Nest.js, Next.js를 사용한 리팩토링

- 오픈 소스 및 유지 관리가 용이
- Mongoose 등 다양한 모듈 지원

- 웹사이트 형성이 쉬움
- Server-Side Rendering으로 정적 페이지를 Client에 전달

03. 캡스톤디자인2 개발 계획

3D object 생성과 링크 object 생성 기능의 분리

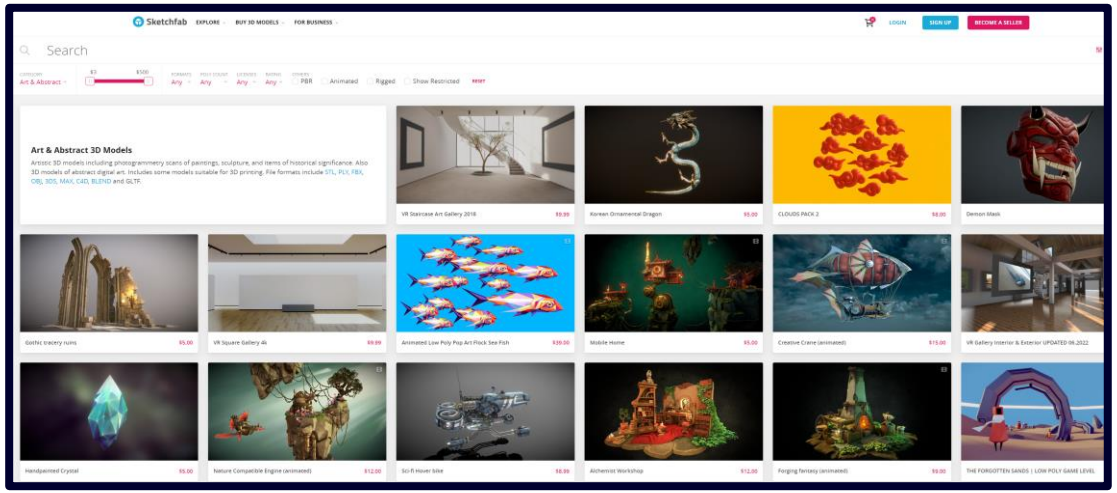


3D object를 생성 시 링크 기능을 넣을 수 있도록 개선

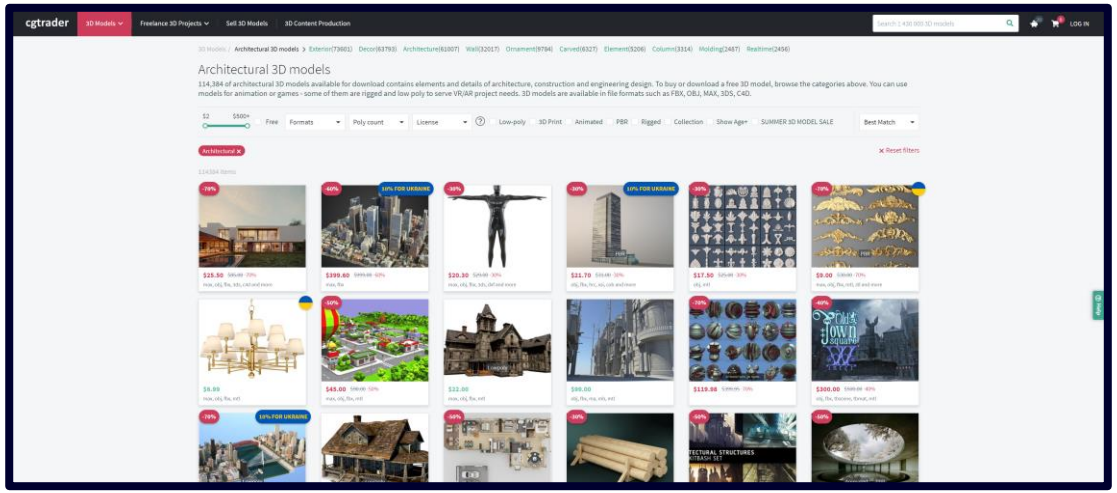
03. 캡스톤디자인2 개발 계획

삽입할 수 있는 3D object에 한계

외부 3D object(.obj 등)의 삽입



Sketchfab



cgtrader

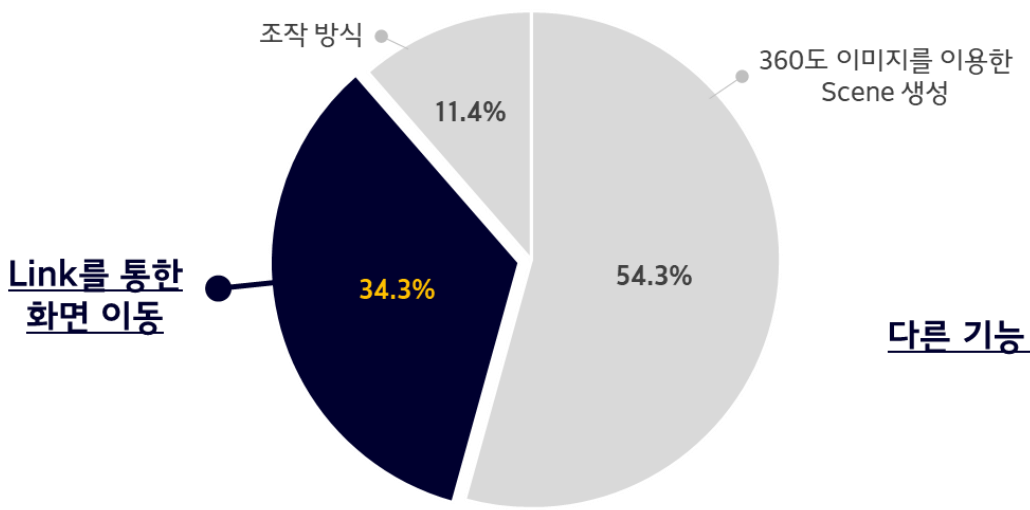
03. 캡스톤디자인2 개발 계획

단위 테스트를 통해 발견하지 못한 결함의 가능성

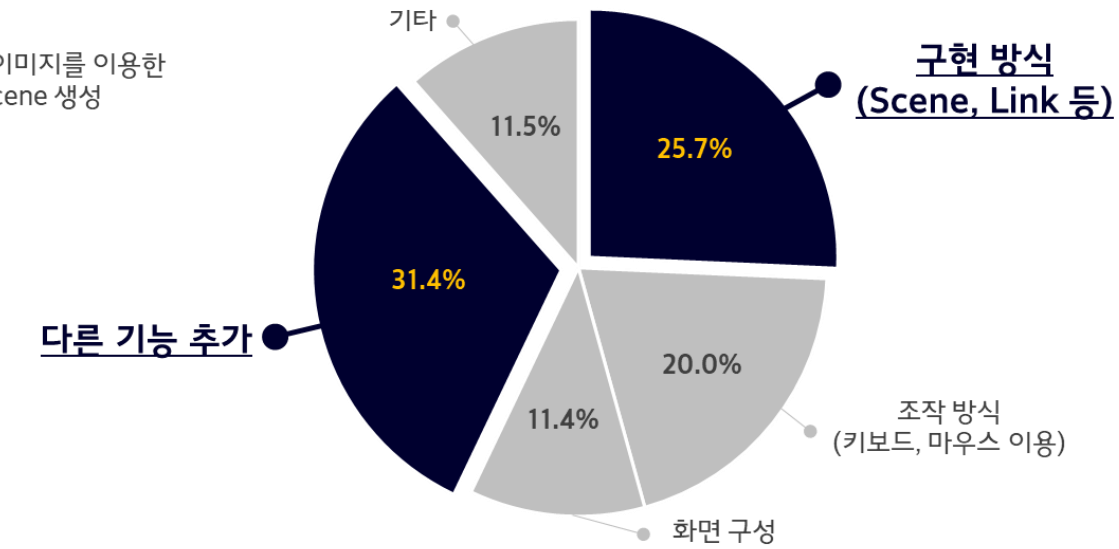
알파 테스트를 통해 실제 사용자로부터 프로그램의 요구사항을 평가함

※ 캡스톤디자인1 에서 진행한 테스트 결과 일부

플랫폼에서가장마음에드는부분



플랫폼에서개선해야할점



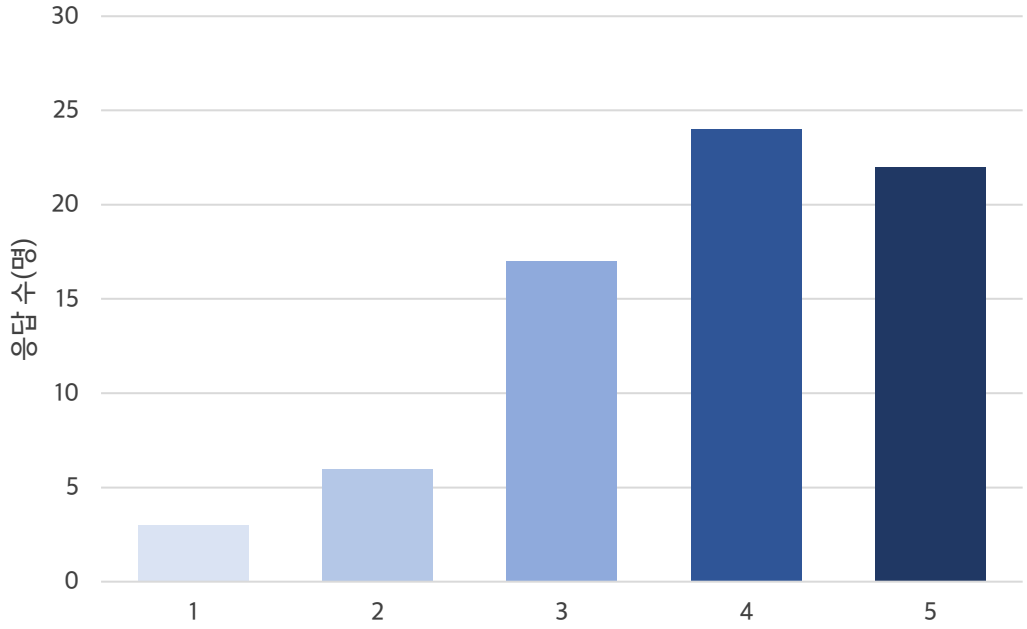
04

프로젝트의 효과

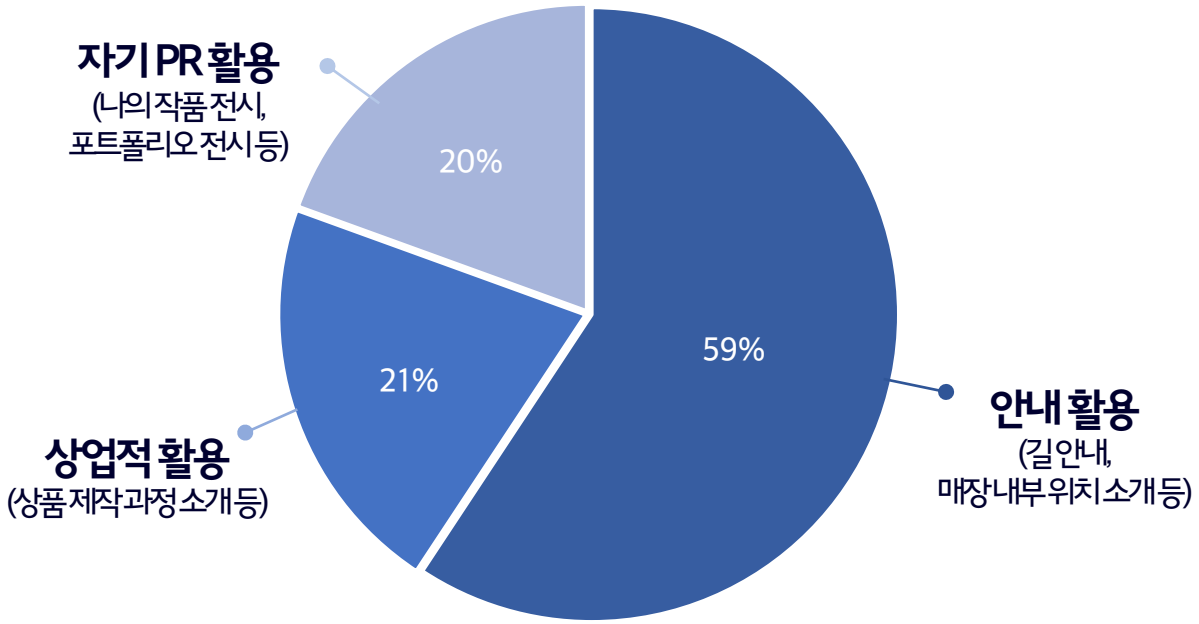
04. 프로젝트의 효과

시장성

플랫폼 추천 의향



플랫폼 활용 방안



기존의 메타버스와 달리 **웹 기반**으로 운영되어 접근성이 쉽고,
직접 콘텐츠를 소비하고 생산하면서 플랫폼을 **상호작용적**으로 이용

04. 프로젝트의 효과

교육성

논문 제목 : Non-face-to-face Career Exploration Program utilizing Web-based Metaverse Hands-on Contents
논문 요약 : 비대면 상황에서 웹 기반 메타버스를 사용하여 공학 관련 진로 흥미도와 관심도를 증가시킨다.
논문 투고 : IEEE FRONTIERS IN EDUCATION 2022 – Grand challenges in Engineering Education

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2022.03.07
초록 accept 발표

2022.04.25
논문 submit

2022.06.10
논문 accept 발표

2022.07.11
peer 평가 발표

2022.07.25
최종 논문 accept 발표

2022.10.8-11
컨퍼런스(구두 발표)

Year	Acceptance Rate	Abstracts	Published
2020	55%	774	424
2019	56%	648	365
2018	59%	911	539
2017	45%	660	302

▲ accept rate

Year	Attendance
2020	561
2019	437
2018	668
2017	436

▲ attendance

Non-face-to-face Career Exploration Program utilizing Web-based Metaverse Hands-on Contents

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***Abstract*—Career exploration programs for high school and middle school students are a useful strategy for keeping students in high school and preparing them for further study or training. Among various career exploration programs, a "Tech-Prep" program, a course aimed at smoothing the transition from high school to college, has become increasingly popular in recent years. The Tech-Prep program may provide various educational contents to develop systematic links between secondary and post-secondary institutions to help students prepare for high-tech careers. In general, the programs' contents contain hands-on activities or applying theoretical and academic skills to real-world problems. Unfortunately, due to the COVID-19 pandemic, face-to-face learning activities had to be changed to non-face-to-face classes, such as video lectures or remote sessions. As a result, an educator may not easily adopt hands-on activities to the Tech-Prep program since every participant participates in the program on a remote site. The Tech-Prep program designer should consider the issues to overcome the limitations. This research introduces a non-face-to-face Tech-Prep program and its case study in the pandemic circumstance. To provide hands-on activities in the non-face-to-face Tech Prep program, we suggested the PLIMP structure to help participants so that they may plan, design, and implement their metaverse. To show the effectiveness of the non-face-to-face Tech-Prep program, we provided a pilot program to the high school in the Republic of Korea.**

Keywords—Online learning, Education environment, Career Exploration Program, Tech-Prep Program

I. INTRODUCTION

Career exploration programs for K-12 students are one of the critical courses. High school and middle school students should decide to keep students in high school and prepare them for further study or training. Recently, many career exploration programs are not teaching theory lessons but encouraging student participation in the classroom. For example, the Digital Safari Academy(DSA) curriculum at Mt. Diablo High School in Concord, California, emphasized project-based learning and experience to tackle real-world problems, including making an annual plan about virtual companies and creating new technology products [1]. Through a career exploration program, students can develop problem-solving and reasoning skills. Also, students observe whether the job aptitude is suitable for students or not.

Among various career exploration programs, a "Tech-Prep" program is a course that encourages students to participate actively. The goal of the Tech-Prep program is to smooth the transition from high school to college [2]. In addition, the Tech-Prep program may provide various educational contents to develop systematic links between secondary and post-secondary institutions to help students prepare for high-tech careers. The educational contents of the Tech-Prep take time to think about their future, including doing hands-on activities, applying theoretical and academic skills to real-world problems, using work styles that emulate employment settings, and so on.

The Tech-Prep program consists of hands-on activities that students can experience in person. Since student participation is the main activity, it is natural that face-to-face classes take place. However, due to the COVID-19 pandemic, it has become difficult to turn Tech-Prep into non-face-to-face classes. Therefore, educators need new educational strategies to replace face-to-face classes. Non-face-to-face classes such as video lectures and remote sessions are suitable for educators and students. To smoothly operate non-face-to-face classes, digital tools that can adequately interact between educators and students become a fundamental element of learning [3].

This paper focuses on the roles of an educator, students, and staff in non-face-to-face classes and looks for related research on applying hands-on contents to non-face-to-face classes (Section 2). We suggest the considerations for proposing the "PLIMP" structure, an education model that uses hands-on contents for non-face-to-face classes (Section 3). Then, case studies using the PLIMP structure seek to explain the change in students' interests in engineering and the learning achievement by conducting online hands-on contents (Section 4). Finally, we evaluate the effect of the Tech-Prep program consisting of hands-on contents in non-face-to-face classes (Section 5).

II. RELATED WORK

Researchers have shown class methods depending on meeting between educators and students, such as face-to-face classes, mixed classes, and non-face-to-face classes. The study of non-face-to-face classes is also noteworthy because it increases students' interest and concentration in mixed classes [4]. When only non-face-to-face classes are conducted, it is necessary to organize easy classes that students can understand immediately rather than complex contents that take time to understand [5]. Educators must spend much time making the class more student-centered and preparing creative classes such as applying hands-on contents [6].

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Thank you