Development of Maritime Safety and Disaster Prevention Simulation using Digital Twin Technology

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Korea Institute of Ocean Science & Technology

#KIOST Open-Lab Convergence Content R&D

Supervision Institution : KIOST
Participating Institutions : KMOU, NMM, BTP, PKNU, KBS
Participating Companies : DM Studio, Newlayer, KOC
Supporting Organizations : MOTIE, KIAT, Busan City

KIOST
한국해양과학기술원
KOREA INSTITUTE OF OCEAN SCIENCE & TECHNOLOGY

CONTENTS

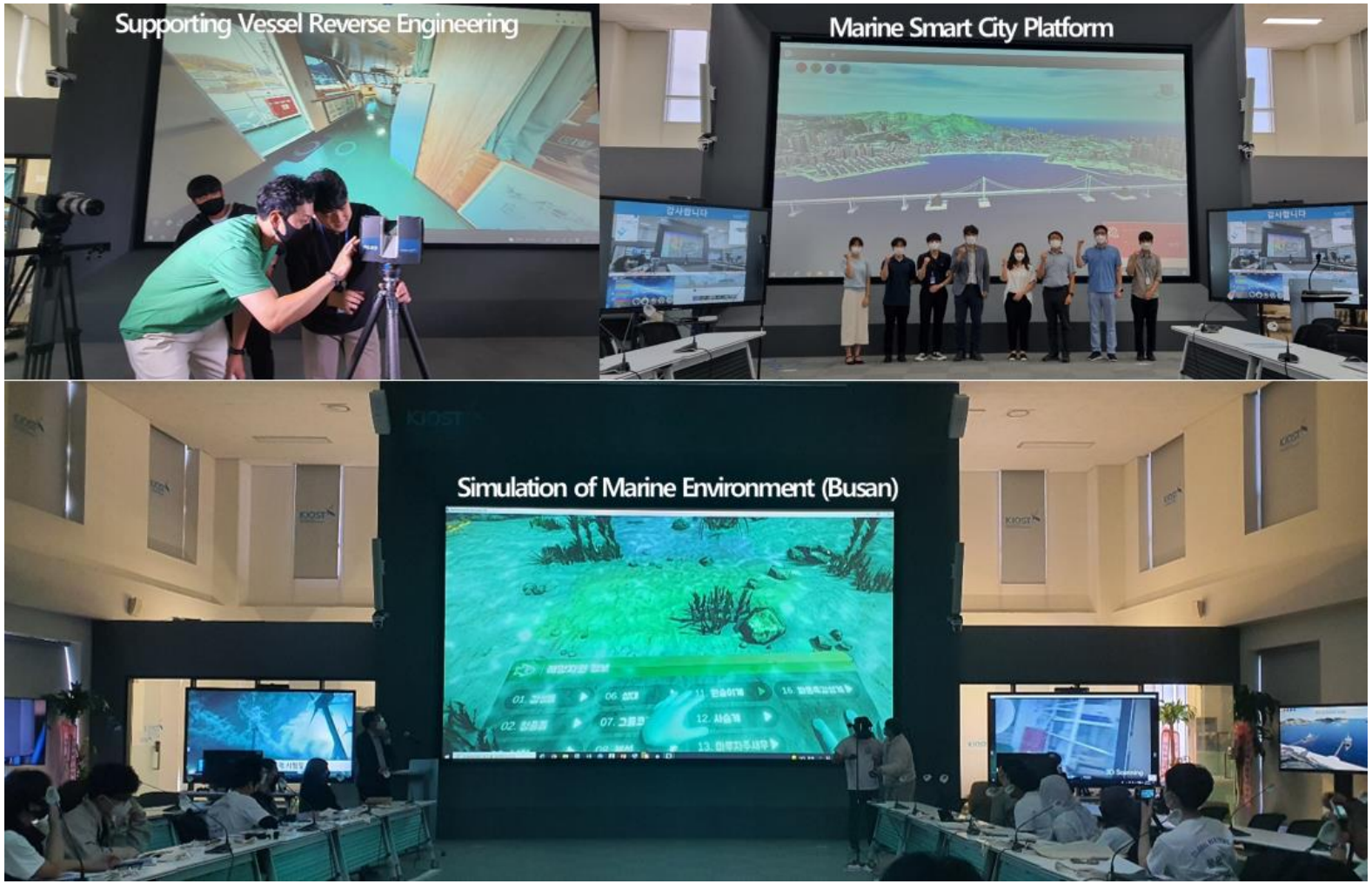
01 What is a Marine Digital Twin ?

Digital twin is a digital representation of an actual real-world physical product, system, or process (a physical twin) that serves as the digital counterpart of it for practical purposes, such as simulation, integration, testing, monitoring, and maintenance.

Level of Digital Twin : 1) Mirroring 〉 2) Monitoring 〉 3) Modeling&Simulation 〉 4) Federation 〉 5) Autonomous

02 Test-Bed of Maritime Digital Twin at KIOST Open-lab

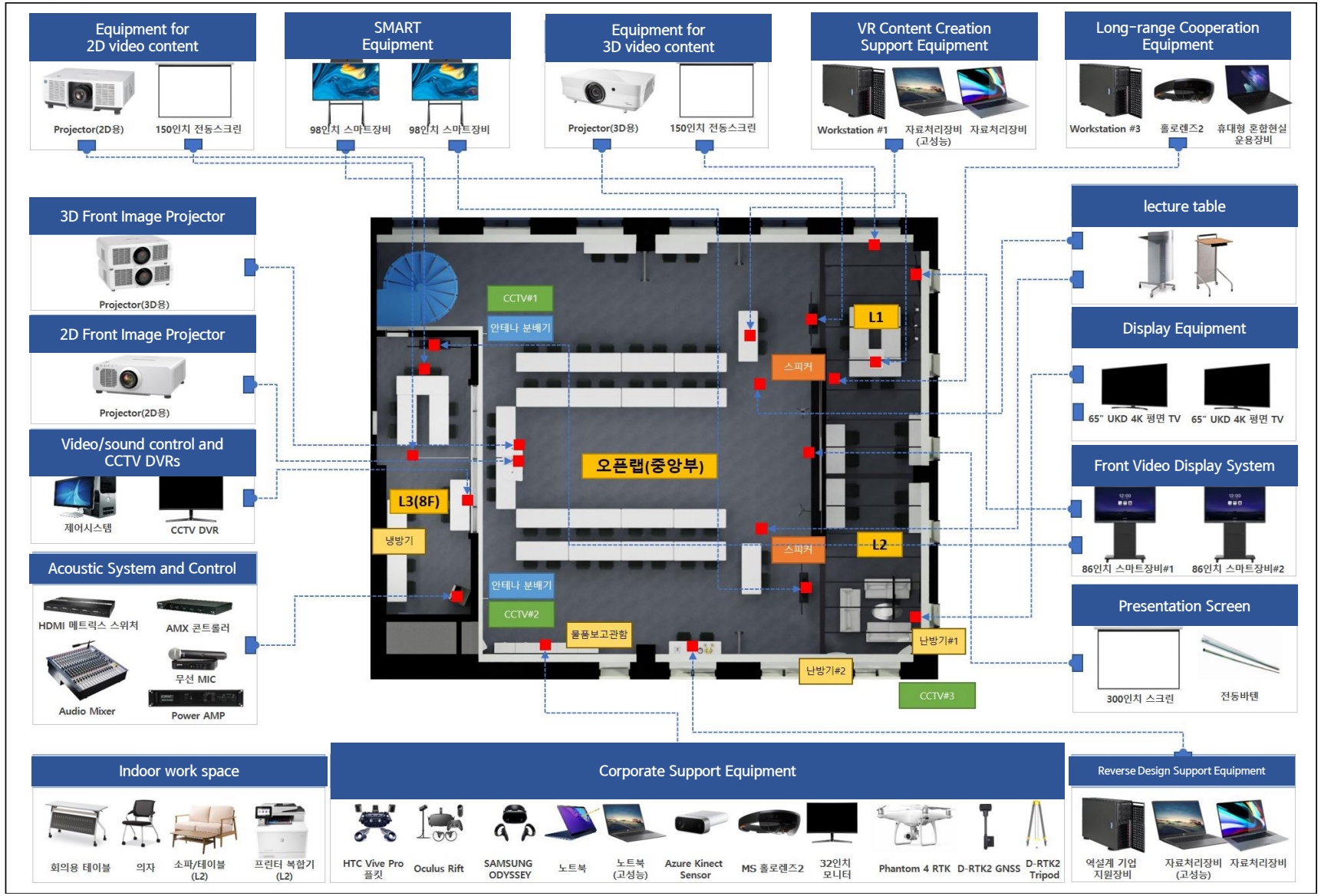
Digital twin technology has been used to develop realistic content in the advanced marine industry, such as maintenance and safety accident simulations such as ships, smart ports, and marine disaster prediction and response simulations.



03 Development of Virtual Ocean Simulation System at Open-Lab

Strengthening marine industries and supporting marine ICT convergence technology

by Providing Open LAB equipment and facilities to foster new marine industries and supporting Mid/Long-term R&D



04 Development of Maritime Disaster Safety Simulation Platform

Open Lab

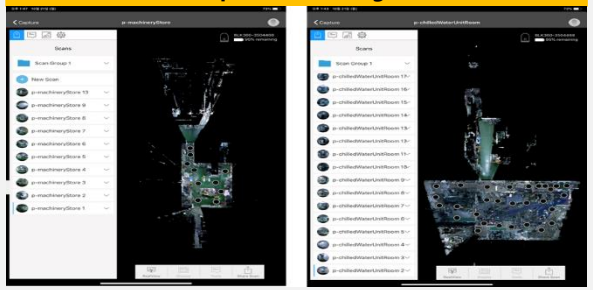
Development of Digital Twin Content for Maritime Disaster & Safety Simulation Platform based on Convergence Technology applying with Point Cloud, Reverse Eng., and Realistic Visualization

1. Development of Point Cloud Technology using 3D Laser Scanning

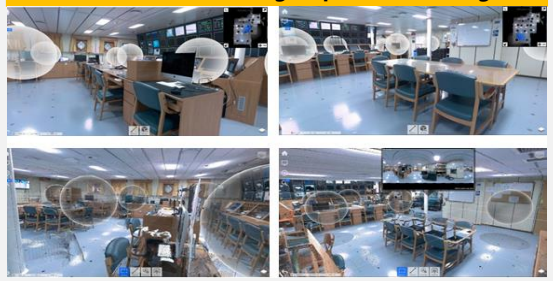
DMS STUDIO

Vessel Scanning

Spatial Scanning



Virtualization through Spatial matching



2. Visualization of Vessels using Point Cloud Technology

3D Laser Scanning for applicational Vessels

ISABU Research Vessel

KLCSM LNG Bunkering Vessel

Visualization Contents

VR application for Education and Training

3. Realistic Contents of Maritime Disaster Safety against Vessel disasters

VR manual of ISABU

VR manual 'KLCSM LNG Bunkering Vessel'

VR/AR Environments

PKNU, KIOST support

VR/AR Convergence Technology

04 Development of Maritime Disaster Safety Simulation Platform

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Open Lab

Development of ship accident safety simulation through the application of digital twin in the advanced marine industry, as well as the possibility of applying and expanding the digital twin design

05 Development of Marine Disaster Prevention Simulation Platform

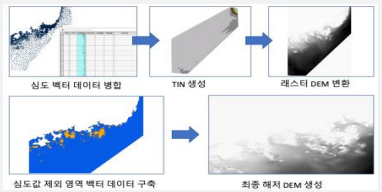
Open Lab

Development of Digital Twin Platform for Coastal Disaster & Management Simulation System based on Convergence Technology applying with Geospatial 3D-GIS and Marine Disaster Simulation

KIOST

Coastal data analysis and data processing

Coastal data analysis and processing



Simulation Real Data Linkage Plan

국토교통부 국토지리정보원 | 기상청 | 한국국토정보공사 | 국립해양조사원 KHOA

Observation of waves compared to moon waves, flooding, and erosion

Simulation Data

Data Linkage plan

Real-time Data

NewLayer

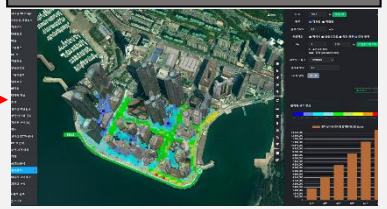
1 Link to the Construction of Simulation Real Data DB

Simulation Space DB

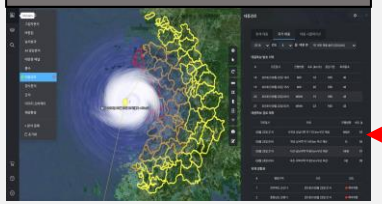
Real-time environment data

2 Development of disaster and disaster simulation

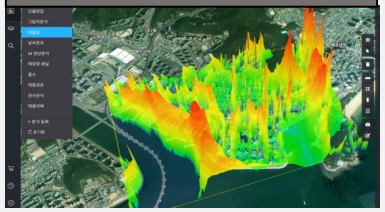
Wave Overtopping Simulation



Typhoon Damage Simulation



Wind Damage Simulation



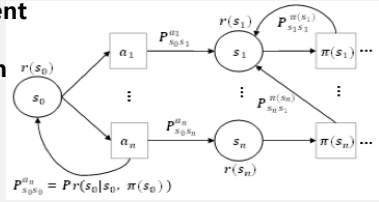
Beach Erosion Simulation

PKNU

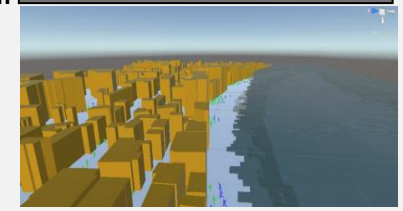
Development of VR/AR Source Technology

Building a Marine Big Data Hub

Development of Super-Resolution Technology



Intelligent Simulation Model



Structuralization of Marine Data

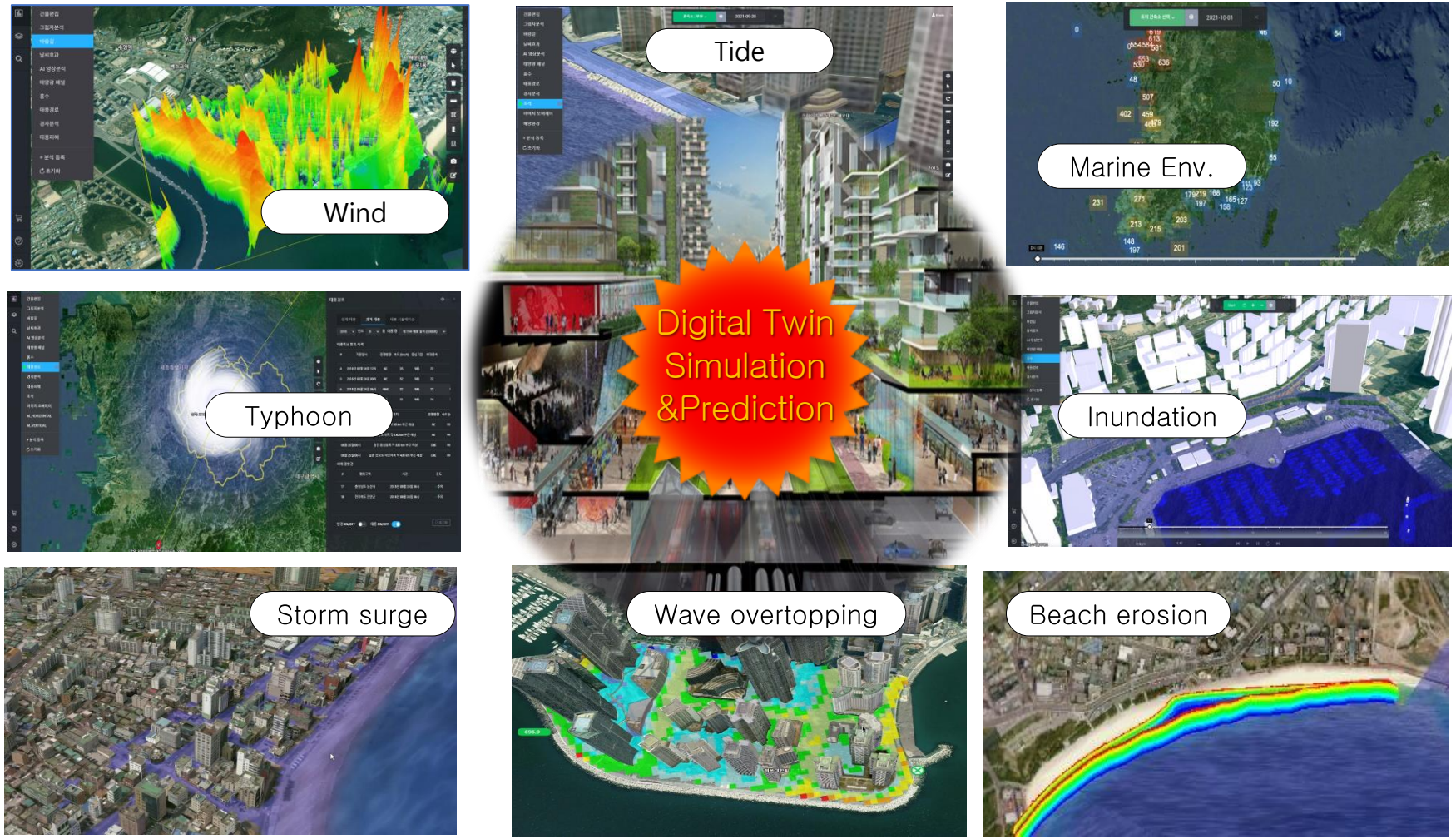
Improvement of data resolution

simulation model

05 Development of Marine Disaster Prevention Simulation Platform

Open Lab

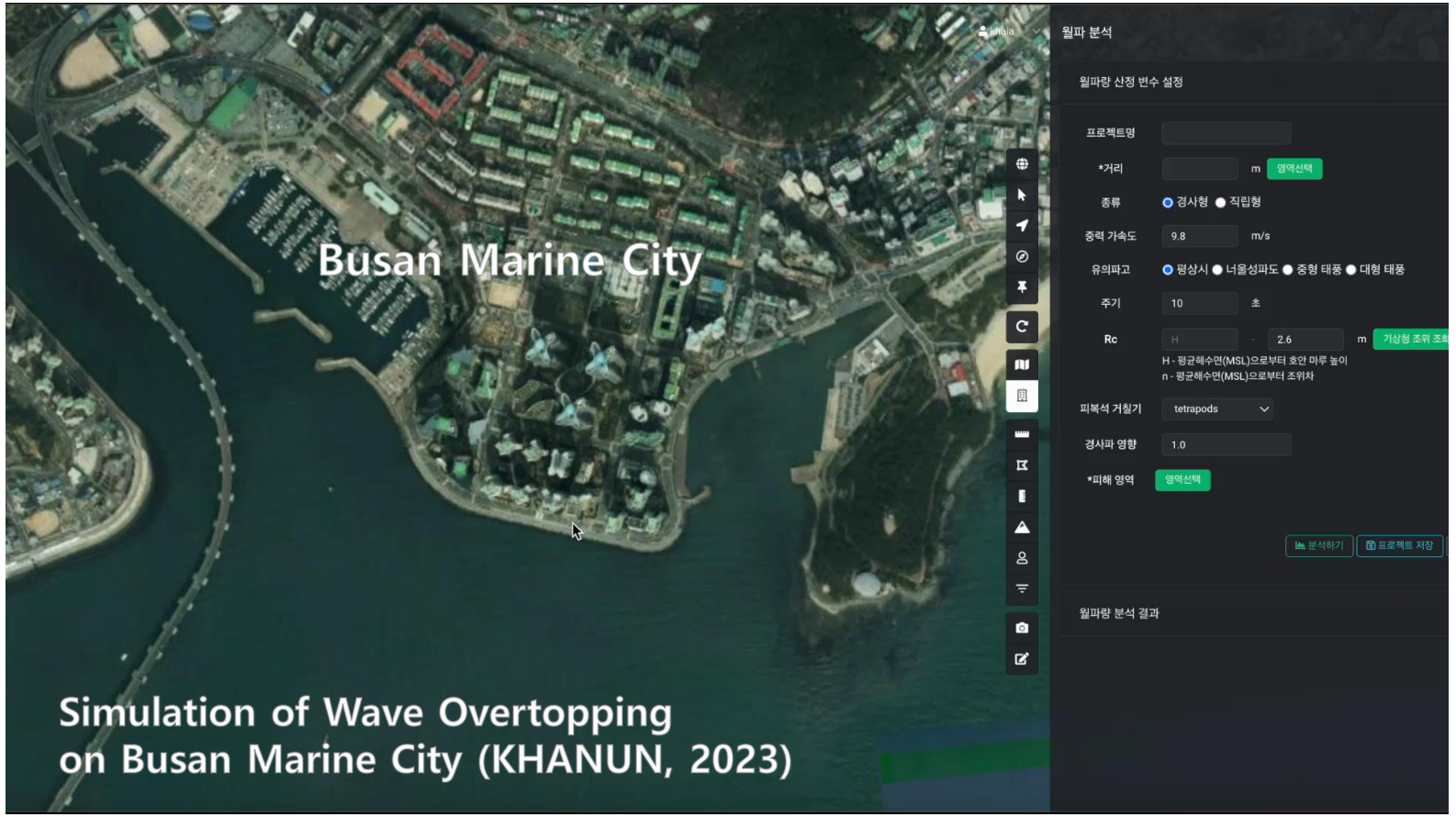
Development of Digital Twin Content for Coastal Disaster Prevention Simulation Platform based on Convergence Technology applying with Geospatial 3D-GIS Marine Disaster Simulation



05 Development of Marine Disaster Prevention Simulation Platform

Open Lab

Development of Digital Twin Platform for Coastal Disaster & Management Simulation based on Convergence Technology applying with Geospatial 3D-GIS Digital Twin Platform

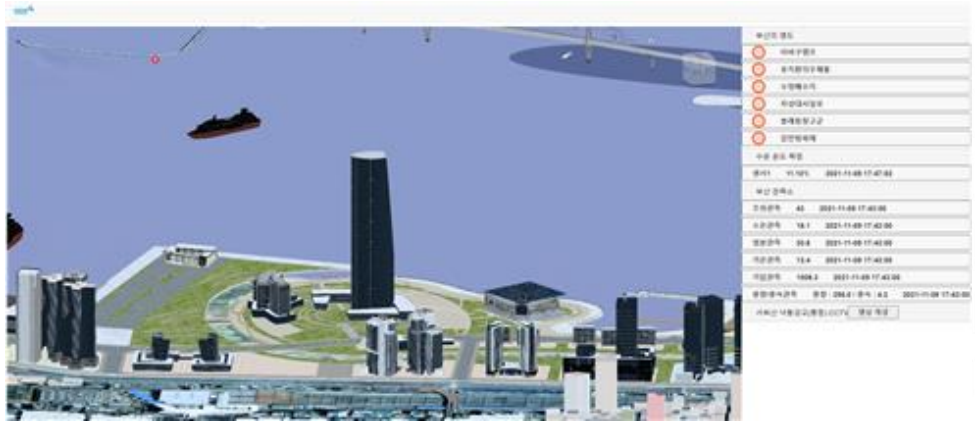


✓ The Marine Digital Twin linked with IoT, Big-Data, and AI technology can predict and respond to changes and impacts in the marine environment and support the minimization of damage by preparing rapid response measures. In addition, it can also support the development of a marine smart city platform that is safe from coastal disasters.

06 Development of Marine Smart City Simulation Platform

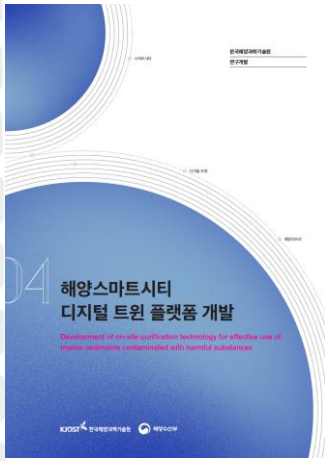
Open Lab

Development of Digital Twin Platform for Busan Marine Smart City Simulation (Virtual Busan) based on Convergence Technology applying with Geospatial 3D-GIS Digital Twin Platform

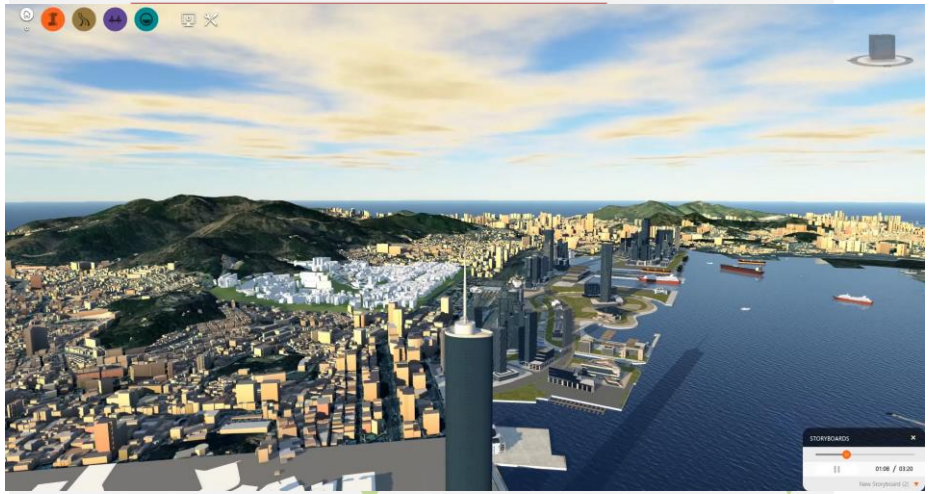


[Marine Smart City Digital Twin Platform]

1. 해양정보 빅데이터 인프라 구축
2. 빅데이터 분석, 활용 원천기술 개발 및 확보
3. 해양 빅데이터 실시간 표출 및 가시화 서비스
4. 무인 해양 빅데이터 생산 인프라 구축
5. 연안지형변동 예측 체계 구축
6. 재해·재난 위험정보 상세 공개를 통한 해양안전
7. 해양 재해·재난 예측을 위한 정보 인프라 구축
8. 입자추적 모델 고도화를 통한 수색구조, 유류확산 예측 정확도 향상



[Marine Smart City VR Simulation]



【해양스마트시티 전담기관】 관리청(부산시, BPA, 해양수산부 등)의 북항 해양스마트시티 운영 지원

07 Education and Support of Open-Lab Digital Twin Simulation

KIOST 한국해양과학기술원 KOREA INSTITUTE OF OCEAN SCIENCE & TECHNOLOGY

Open Lab Strengthening technical education training & Support for beneficiary companies

- Education for maritime plants, digital ships, smart port, reverse design, M&S, and Digital Twin design etc.
- Support for training of experts in Maritime Digital Twin such as Digital New Deal and Marine Smart City etc.
- Developing ship safety accident simulation through the application of digital twin in the advanced marine industry, as well as the possibility of applying and expanding the digital twin (design) technology

OPEN LAB and R&D Projects for

- Establishing Advanced Marine Industry OPEN LAB by combining marine science technology and VR·AR convergence technology
- Developing Reverse Engineering of offshore plant system and Realistic Convergence Content technology
- Supporting a Prototype design and Marine Simulating Test-Bed
- Networking by Industry-University-Institution Collaboration

OPEN LAB Test-Beds

KIOST OPENLAB Test-Bed #01	KNMM 3rd Floor Test-Bed #02	KMOU Test-Bed #03
Simulating Marine Environment and Disaster for Safety Management	exhibiting AR,VR marine contents	Offering Reverse Engineering of offshore plant system

More Informations

www.vrocean.or.kr

Open LAB Support Facilities

Name	Details	Available
Test-bed Space	Open LAB(L0), L1, L2, L3	*
H/W for Edu-training & Development	3D Projector, Workstation, Smartboard	*
S/W for Edu-training & Development	Autodesk package, Matlab package, FEM&CFD	O
3D Laser scanner	FARO FOCUS M70	O
360º video camera	Insta360 Titan 11K	O
3D RTK/LiDAR drone	RTK/LiDAR/GNSS equipment included	O
HMD	Wired/Wireless Vive Pro2	O
HoloLens	MS HoloLens	O
Vessel Real-Time Virtualization Platform	3D Simulation based on VRED	*
High-performance laptop	LG Ultra Gear, Apple Macbook Pro/Air	O
Marine Infrastructure Virtualization Platform	Support for 3D virtualized content & Edu-training throughout Busan	*
Marine 3D GIS Visualization Platform	Busan Marine 3D GIS Content & Edu-training Support	*

* : Application for utilization


Vive Pro2


3D RTK/LiDAR Drone


Real-Time Virtualization Platform for Vessel


FARO FOCUS M70


MS HoloLens II


Insta360 Titan 11K

Open LAB Homepage | OpenLAB in VR | App for Beneficiaries | App for Equipment Utilization

Open LAB Enterprise Support

Networking & Supporting Activities
- Industry-Univ.-Institution Collaboration
- Discovery of Corp. Support Programs
- Exchange meetings
- Corp. meetings

Support for Prototype Production
- Customized production for demand corp.
- Participate in the support project briefing

Run a Secretariat
- Open Lab Support for Business Networking
- Participate in the support project briefing & domestic/international exhibitions
- Marketing and Promotion Support

Open LAB Promotion & Education

Promotion at the Conference of Coastal Disaster Prevention

AutoCAD One Day Class Edu-Training

07 Education and Support of Open-Lab Digital Twin Simulation

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수혜기업신청	시설·장비수요조사	방송홍보	부산 VR·AR 융복합센터 장비활용	부산 VR·AR 제작거점센터 장비활용

08 Expected effects for Busan Maritime Safety and Disaster Prevention

Enhancing Convergence Technology using Marine Science and Digital Twin (Design)

01 Make alternatives About The Crisis of Traditional Marine Industry

Creating new marine industries as an alternative to overcoming the downturn in the industry

02 Urban Regeneration through the Utilization of R&D Cluster in Marine Fisheries

Creating a sustainable development platform and the effect of creating new marine industries and jobs to promote urban regeneration in the underdeveloped Yeongdo-gu

03 Response to the 4th Industrial Revolution in the Marine Fields

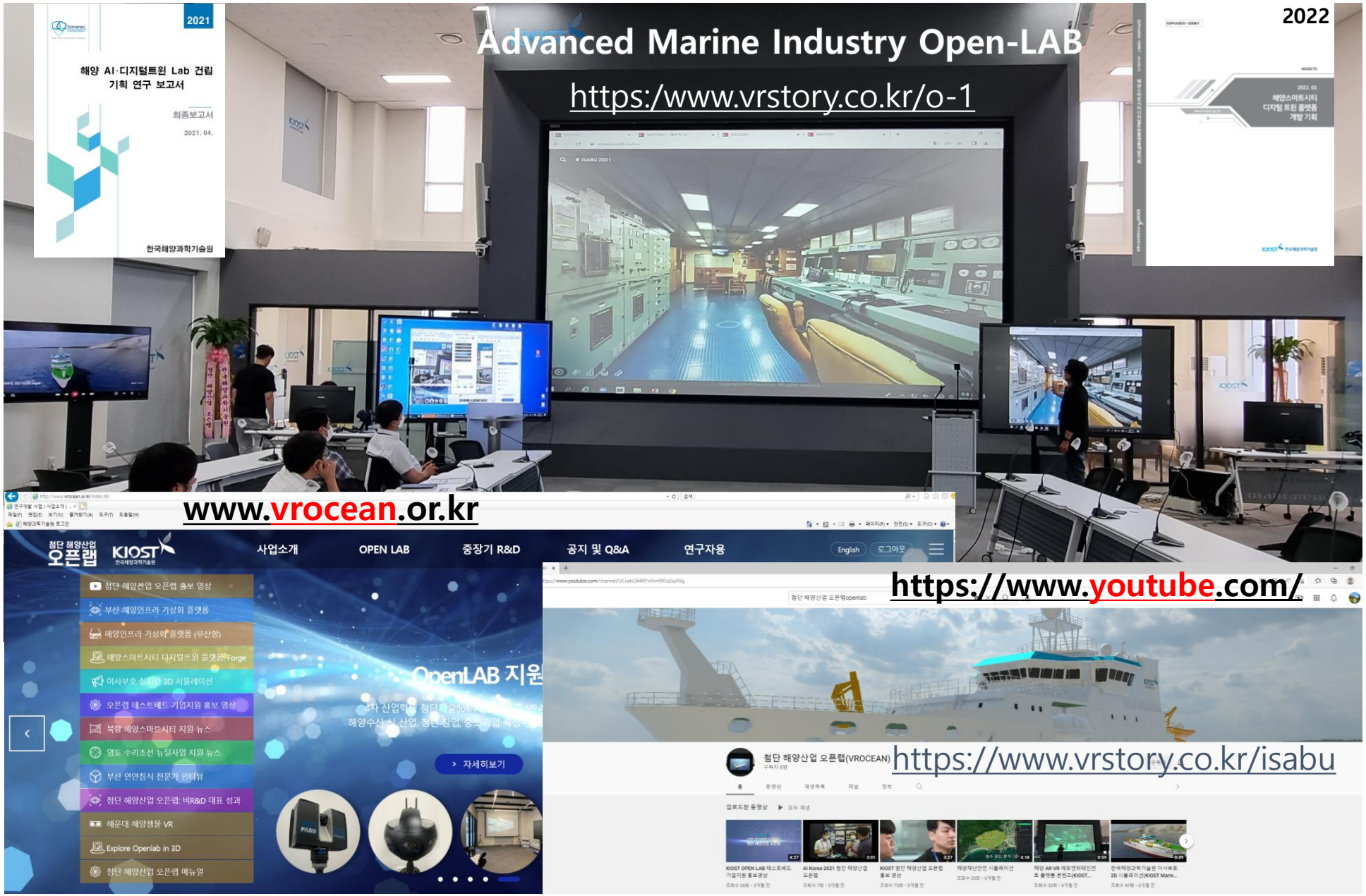
Expect the effect of applying marine big data to marine science & project to commercialization of the 4th Industrial Revolution

04 Enhancing the Commercialization of Marine Science and Technology

Creating an eco-system by commerc ializing technology with marine science and technology (high economic & Technological contribution)

Creating an Innovative Ecosystem to foster new Maritime Safety industries & Strengthening the Competitiveness of Marine ICT Industries in Busan, Korea

Thank you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최종보고서
2021. 04.
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부산 해양인프라 가상화 플랫폼
해양인프라 가상화 플랫폼 (부산항)
해양스마트시티 디지털트윈 플랫폼 Forge
이시부호 실시간 3D 시뮬레이션
오픈랩 테스트베드 기업지원 홍보 영상
북항 해양스마트시티 지원 뉴스
영도 수리조선 뉴딜사업 지원 뉴스
부산 연안침식 전문가 인터뷰
첨단 해양산업 오픈랩 R&D 대표 성과
해운대 해양생물 VR
Explore Openlab in 3D
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