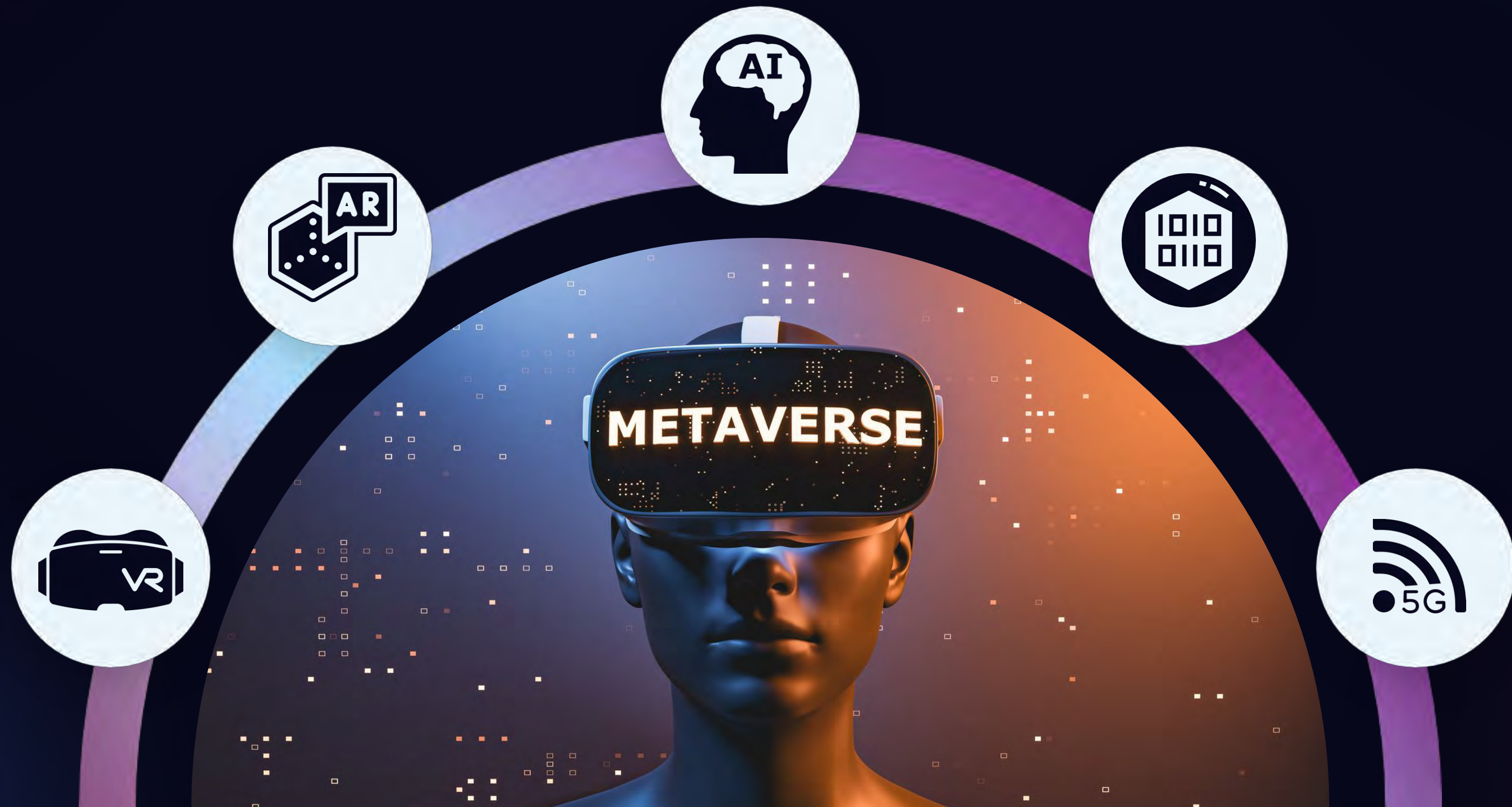


METaverse:

Building an Innovative Platform for Teaching
and Communication in the University



Content

01

Introduction
Research goals
and objectives

02

**Theoretical
foundations**
Applications of the
metaverse in education

03

Methodology
Data collection and
analysis procedures

04

**Building an
innovative
simulator**

05

**Technical
implementation
of the simulator**

06

**Simulator tests
and evaluation**

07

Conclusion
Summary of results



Introduction to the topic

METaverse?



Goals and objectives of research

1. Analysis /problems in distance learning/.
2. Study of technological aspects of the metaverse and their application in education.
3. Development of a conceptual model of a university environment simulator.
4. Technical implementation and testing of a prototype of the simulator.
5. Performance evaluation

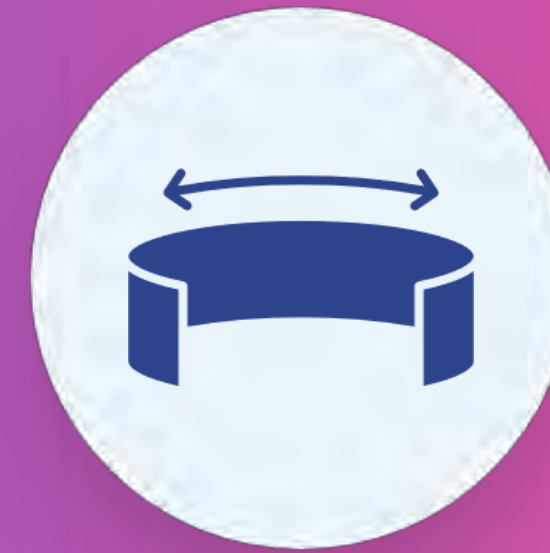
Theoretical foundations of metaverse



Applications of the
metaverse in education



Technological
aspects of the
metaverse



Virtual classrooms

- Interactive learning
- Simulations and hands-on learning
- Gamification of learning

Methodology

Selection of tools and technologies

- 01 **Unreal Engine 5**
to create the virtual environments
- 02 **Reality Capture**
photogrammetry to create 3D models
from real images
- 03 **Oculus Rift и Microsoft HoloLens**
For integration of VR и AR





Building an innovative simulator for teaching and communication in Naval Academy Nikola Vaptsarov

- 01 Scenario 1.
- 02 Scenario 2.
- 03 Scenario 3.



Students and cadets will be required to log into the Naval Meta Academy platform. They will be able to visit classrooms and university facilities.



Metahumans with artificial intelligence will provide the learner with the opportunity to communicate with different characters - navigator, mechanic, etc. specialties.



Live connection of the avatar with the user's body movements in order to emotionally impact the system.

Scenario 1



Scenario 2



The meta platform will be aimed at building simulations to allow students and cadets to practice given cases in a digital environment resembling a university.



For example, practical navigation training will be carried out between several users forming a class division XXX - XXX in a digital environment as a group class activity with the aim of practicing a given exercise in the field of shipping - ship control, maneuvering and entering a port, and interaction on the Bridge with the personnel.



Scenario 3

The so-called “Meta NOVA”. In this scenario of action and construction of the simulator, Artificial Intelligence and the improvement of the individual skills of each student or cadet stand on a pedestal.

Here we are talking about a completely separate existence of a server maintained by the smartest Meta person who himself chose this name “Meta NOVA”.

The interesting thing about this scenario is that we have a whole new world of opportunities to improve and change the skills and database available to our avatar, thanks to the so-called server manager who, through skills and knowledge of everything published or recorded on the internet, will help the average user in Meta to train at a very high level.



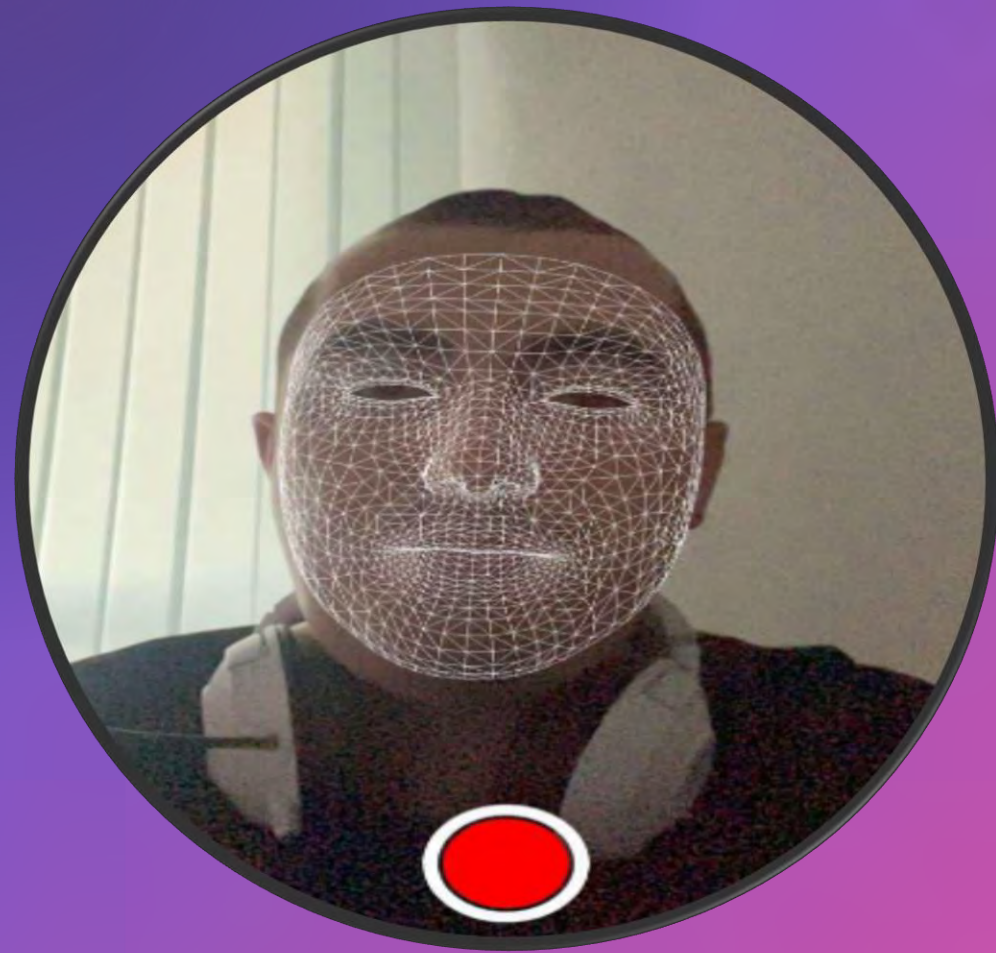


Existing problems in teaching and communication during distance learning

Traditional teaching methods often fail to capture students' attention and to stimulate their active participation.

The lack of interactivity and engagement can lead to reduced motivation and lower performance.

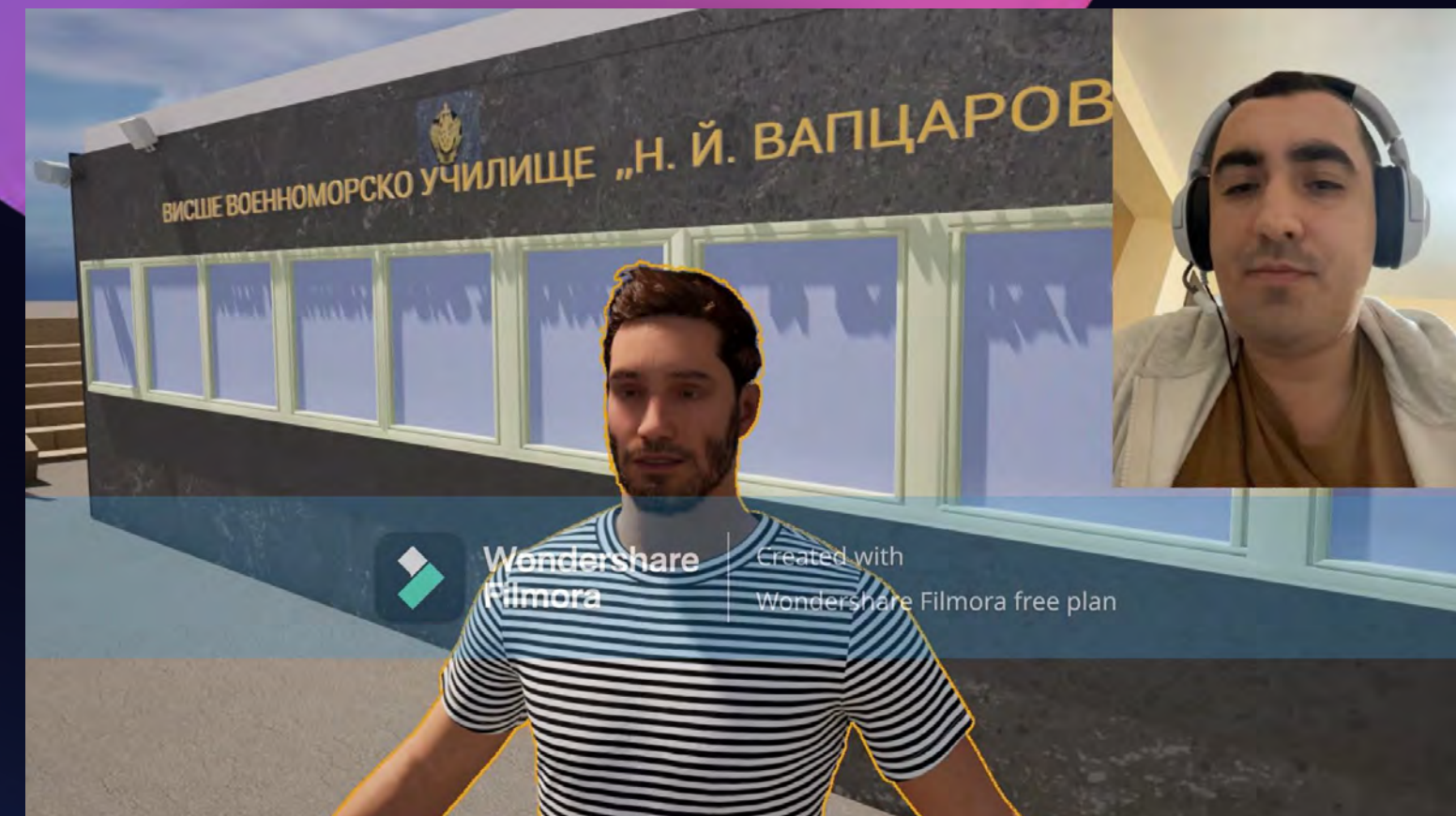
Advantages of using the metaverse in education



The metaverse provides a platform where students can learn through hands-on application and interaction with the learning material.

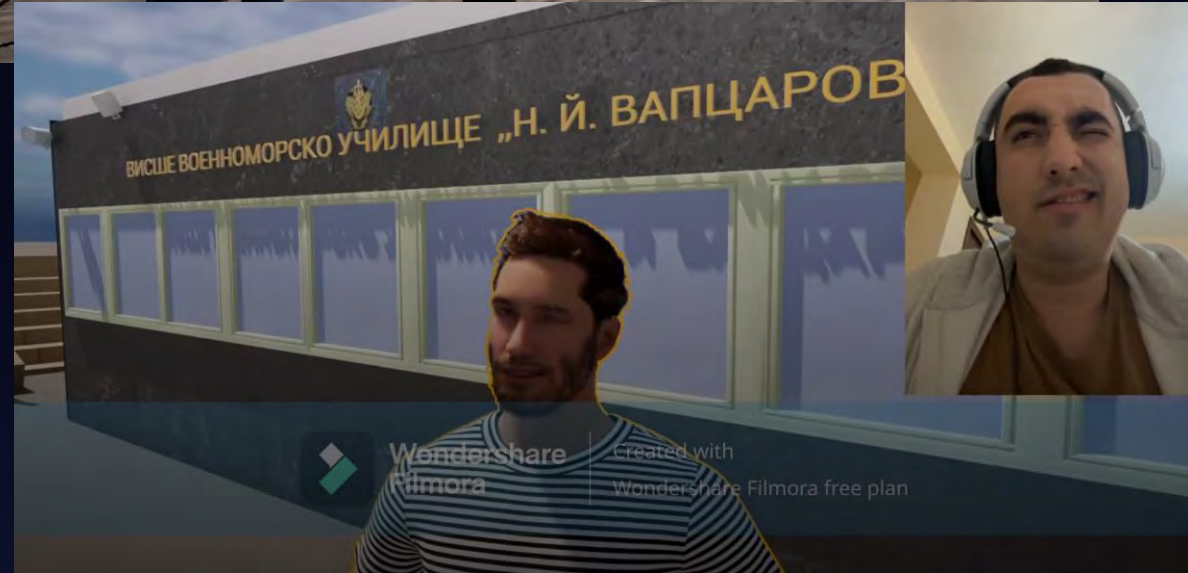
It also facilitates collaboration and communication between students and instructors in real time, regardless of their physical location.

The addition of body motion recognition software and an infrared face ID camera will add a new perspective to the virtual space in real time – everyone will be able to show emotions that are sensory-related to the body of the real avatar outside the simulator.



Designing a University Environment Simulator

Using Unreal Engine 5



The simulator will be designed to offer a variety of virtual classrooms, laboratories and social spaces based on the real buildings of Naval Academy.

3D models created through photogrammetry will be used to ensure maximum realism.

For this purpose, drone photos are taken and processed to create a generalized 3D picture of the university, which are subsequently processed in the Reality Capture photogrammetry software and, after a long overlay, the final 3D object is obtained, which is inserted into the Unreal Engine Simulator.

3D photogrammetry for creating buildings and avatars

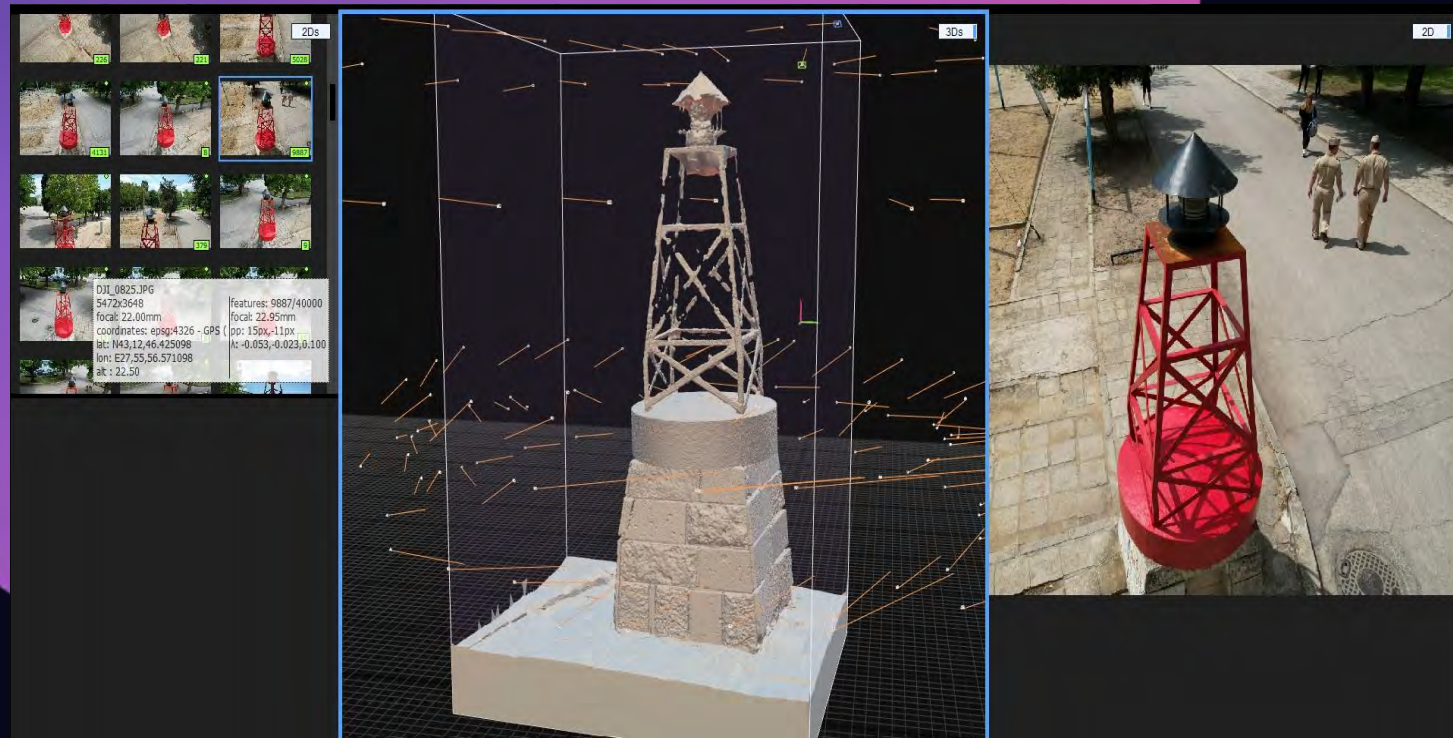


In the era of new technologies, one of the most common techniques for digitizing people and objects in 3D space, and more precisely in the Meta universe, is photogrammetry.

It combines art, science, and photo technology to obtain reliable information about physical objects and the environment through processes of photographing, recording technical data and parameters (such as dimensions and color gamut), and interpreting photographic images.

In a nutshell, photogrammetry is the process of converting a 2D image (photograph) into a 3D model.

3D photogrammetry for creating buildings and avatars



The 3D scanning process begins with taking pictures of an object from all sides. When the shooting process is complete, it is time to import all the pictures into software such as Reality Capture, where analysis and construction of a model based on them begins.

During this step, we can find out which pictures create errors and fix them with the tools that the program offers.

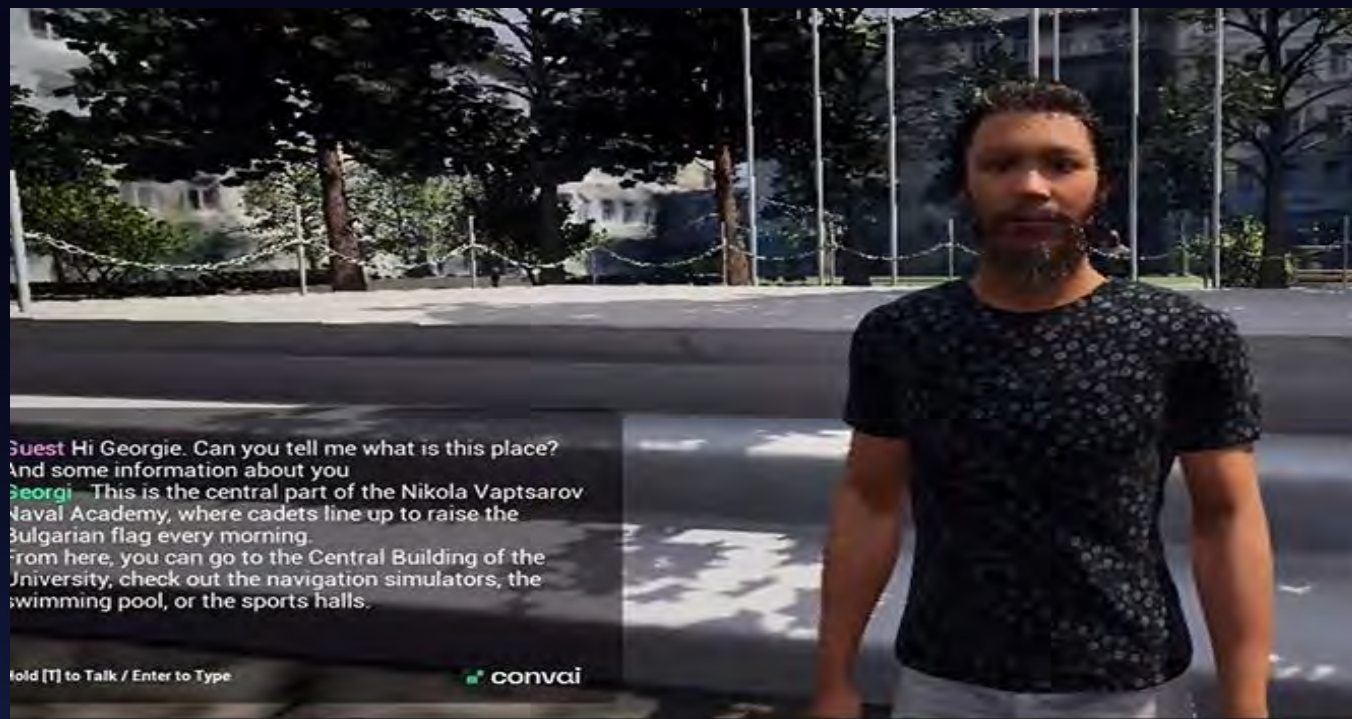


After generating a high-poly version, the reconstruction of the parts that have unfinished or problematic areas occurs. Usually this is done with the help of Zbrush, where all imperfections are cleaned up and a retopologized model is started. Finally, the completed low-poly model and the maps created for it are imported into a render engine such as Blender and the rendering of final images in a scene with the selected object begins.

Artificial intelligence integration for interactive avatars



Cadet Maria - Artificial Intelligence / Cybersecurity /



Student Georgi -Artificial Intelligence / Navigation /

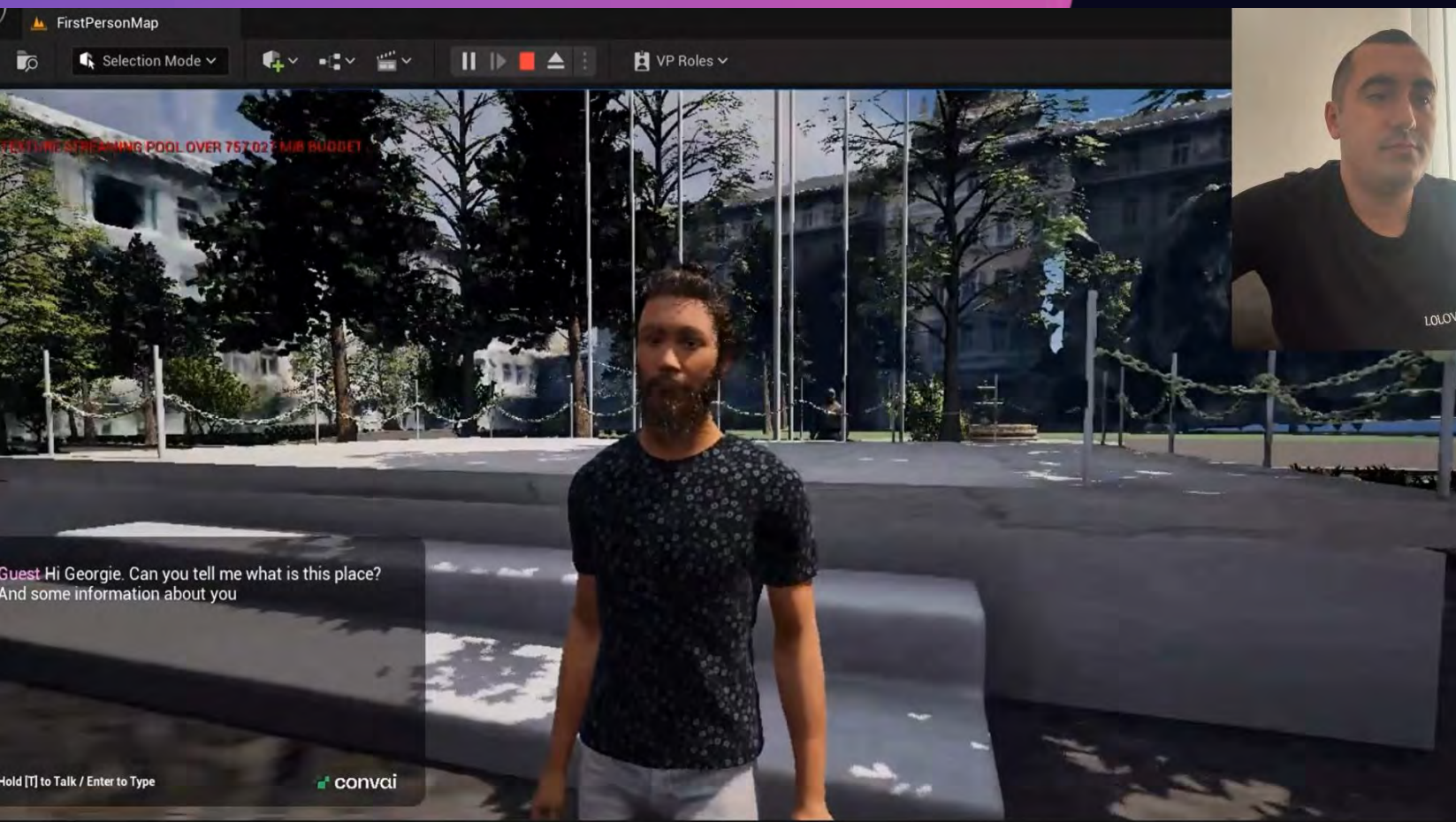
The avatars in the simulator will be powered by AI, allowing them to have conversations and interact with users in a natural way.

They will be able to provide responses that are indistinguishable from those of real people, thanks to advanced AI algorithms.

The integration of artificial intelligence (AI) into interactive avatars plays a key role in creating a dynamic and engaging metaverse.

AI integration goals.

1. Improving interaction: Autonomous avatars can hold conversations, answer questions, and provide information in real time, creating a more realistic and engaging environment.
2. Learning Personalization: AI can analyze each student's behavior and progress, providing individualized learning materials and assignments.
3. Support and assistance: AI avatars can serve as virtual assistants, providing help with platform navigation, problem solving, and accessing learning resources.
4. Simulation of real-world scenarios: Through intelligent avatars, complex simulations can be created to prepare students for real-world situations and challenges in their professional field.





Evaluating the effectiveness of AI avatars

To assess the effectiveness of integrated AI avatars, various methods are used to collect feedback from users. This includes surveys, interviews, and interaction data analysis. Survey participants – 10 students and 20 cadets /age 18-31/

Критерий	Оценка (1-5)	Процент удовлетворени потребители
Реалистичност на взаимодействието	4.5	90%
Полезност на предоставената информация	4.2	85%
Леснота на комуникация	4.0	80%
Персонализация на отговорите	4.3	88%
Общо удовлетворение	4.4	87%

Графика 2: Резултати от анкети за интерактивни аватари



Technical implementation

The simulator architecture will include various modules for managing the virtual environment, interacting with users, and processing data.



The main components will include a server infrastructure for managing sessions and interactions, as well as client applications for users.

Performance evaluation

Main criteria:

- **Learner Engagement:** How much time do students spend in the Metaverse environment and what is their level of activity?
- **Learning outcomes:** Can the environment improve understanding of certain topics that are traditionally difficult to grasp?
- **User Experience:** Do students find the interface and interactions in Unreal Engine 5 intuitive and useful?
- **Technical stability:** Bug frequency and performance optimization.



User feedback

Participants appreciated various aspects of the platform, including:

- Ease of use and proactive interface
- Real-time interaction opportunities with avatars and other students
- Level of engagement and interest in the learning material
- Technical stability and visualization quality
- Improving understanding of certain academic topics



Критерий	Оценка (1-5)	Процент удовлетворени потребители
Удобство и интуитивност	4.3	83%
Ангажираност и интерес	4.1	76%
Техническа стабилност	3.8	70%
Подобрение на разбирането	4.6	88%

Conclusion

The simulation platform in the metaverse offers an excellent foundation for innovative and effective learning, providing a virtual environment that supports understanding of the learning material, develops practical skills, and facilitates interaction between learners and instructors.

With the implementation of the recommended improvements, the simulator can increase its value as an educational tool and serve as a model for future educational platforms integrating new technologies.



A look Towards the future!

Next is a practical demonstration!



Въпроси????

Questions????



Thank you guys!

Въпроси????

Въпроси????