



UNIVERSITÀ
DI TRENTO

Dipartimento di
Fisica



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NextGenerationEU

AnReAL – an Augmented Reality software for Teaching Motion Concepts

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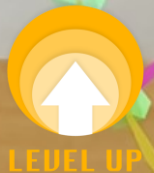
(1) University of Trento

(2) Level Up s.r.l. (Trento)

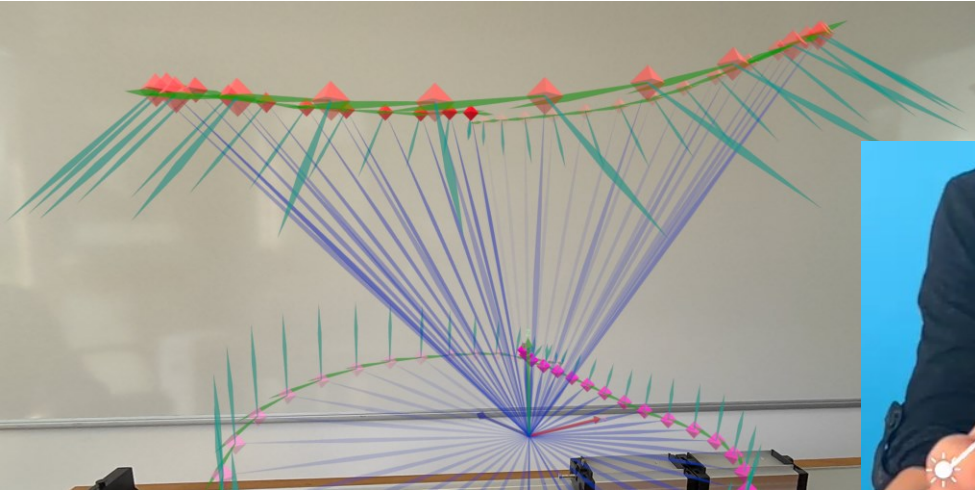
caterina.giovanzana@unitn.it

MPTL

Multimedia in Physics
Teaching and Learning

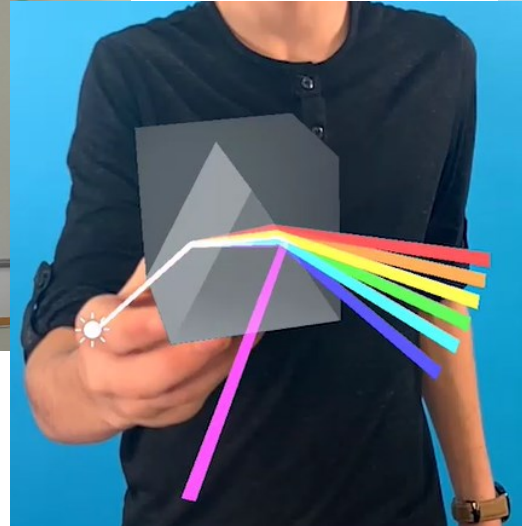


Few words about Augmented Reality (AR)

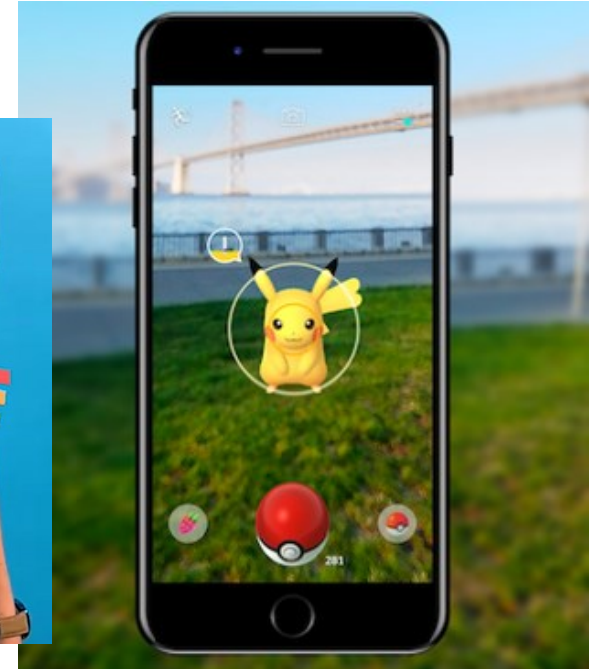


AnReAL application for circular motion

Augmented Reality:
real world + virtual elements



Merge Cube



Pokémon Go

AR and Physics Education *

- Visualizing abstract concepts

* Andrej Vidak et al 2024 Eur. J. Phys. 45 023002

* Jesionkowska, J., Wild, F., & Deval, Y. (2020). Active Learning Augmented Reality for STEAM Education - A Case Study. *Education Sciences*, 10(8), 198.

AR and Physics Education *

- Visualizing abstract concepts
- Enhancing classical experiments

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AR and Physics Education *

- Visualizing abstract concepts
- Enhancing classical experiments
- Simulating complex or expensive experiments

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AR and Physics Education *

- Visualizing abstract concepts
- Enhancing classical experiments
- Simulating complex or expensive experiments
- Boosting students engagement and motivation

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* Jesionkowska, J., Wild, F., & Deval, Y. (2020). Active Learning Augmented Reality for STEAM Education - A Case Study. *Education Sciences*, 10(8), 198.

AnReAL *



AnReAL

Augmented Reality
Active Learning

AnReAL creates a physics lab in AR using the motion tracking devices incorporated into the VR/AR headsets and controllers - letting students see and explore physical quantities linked to any kind of movement.



* Rosi, T., Perini, M., Onorato, P., & Oss, S. (2021). Commercial virtual reality headsets for developing augmented reality setups to track three-dimensional motion in real time. *Physics Education*, 56(2), 025016. [DOI 10.1088/1361-6552/abd5a2](https://doi.org/10.1088/1361-6552/abd5a2)



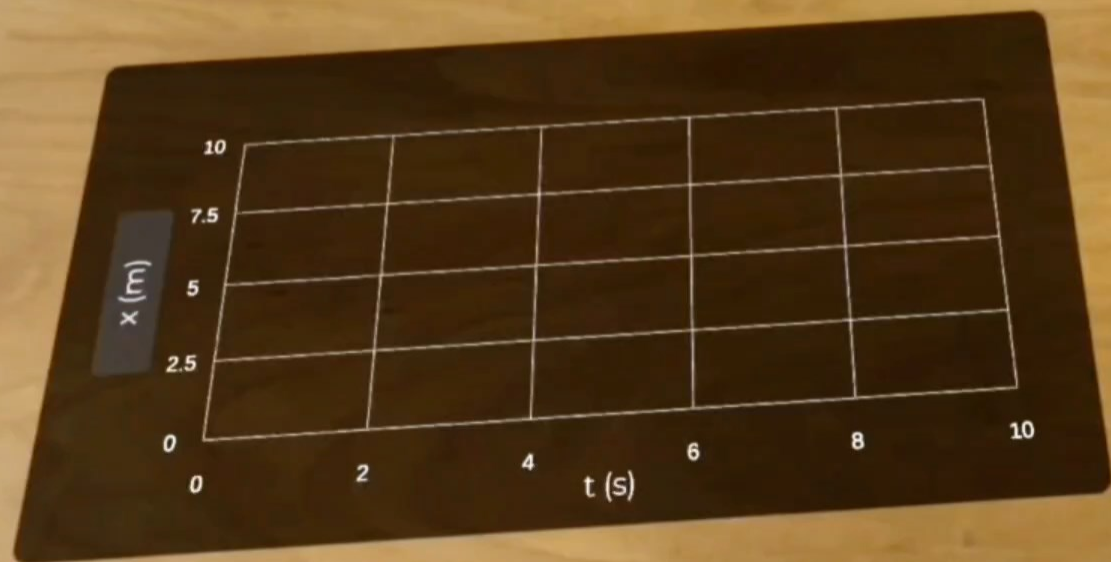
Research question

AnReAL enhances traditional motion lessons creating a more interactive and immersive experience.

RQ: Is the use of AnReAL effective in teaching motion-related concepts?



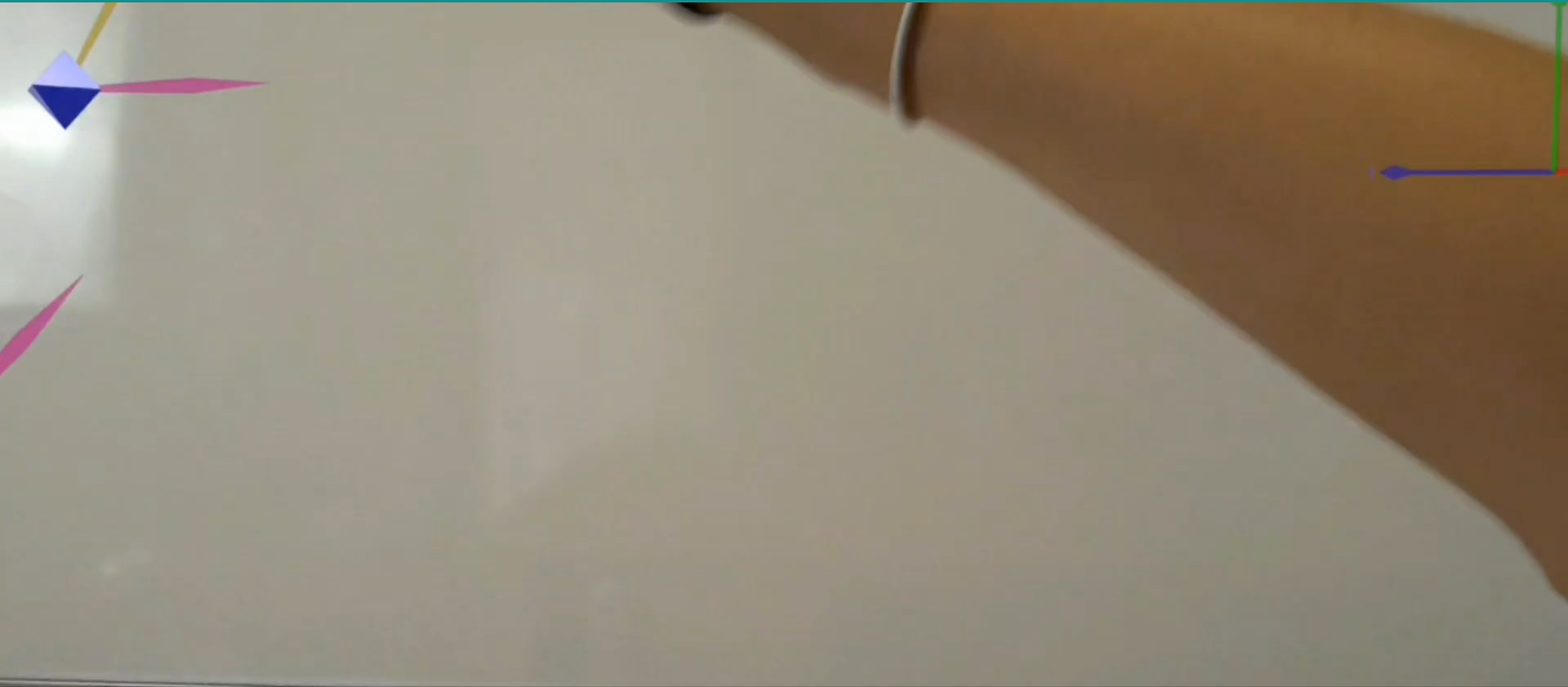
AnReAL's features - trajectories and graphs



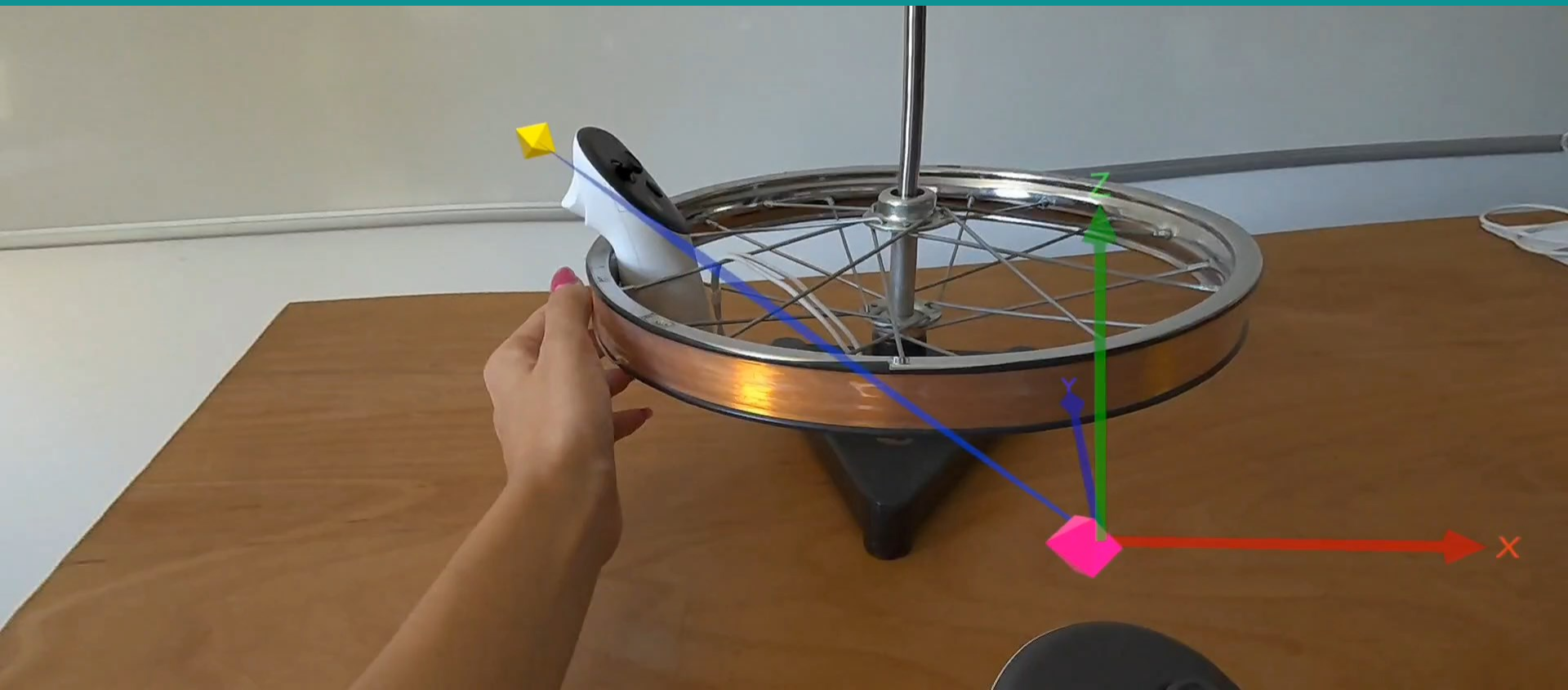
AnReAL's features - vectors visualization



AnReAL's features - vectors visualization

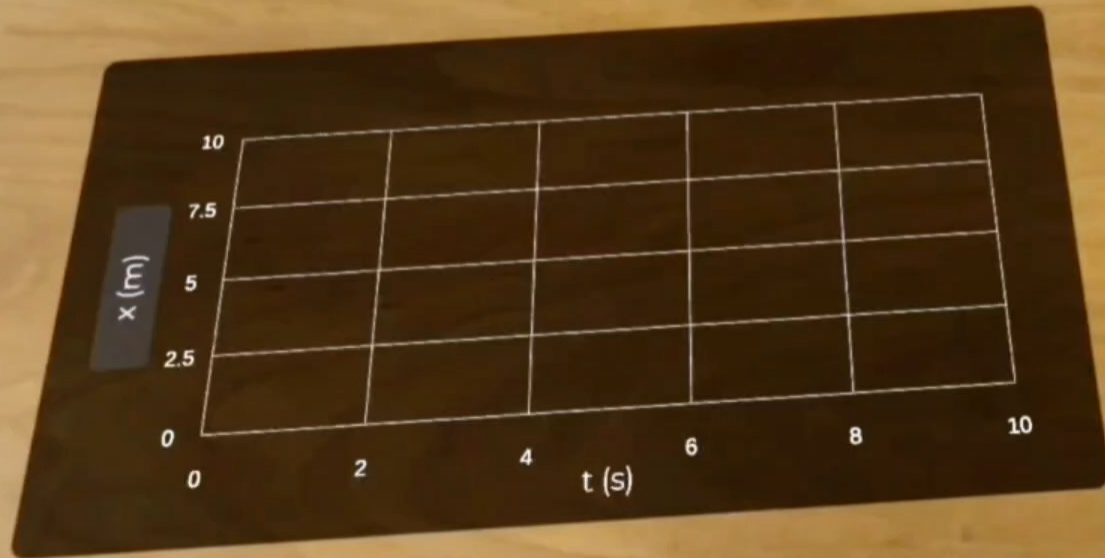


AnReAL's features - vectors visualization



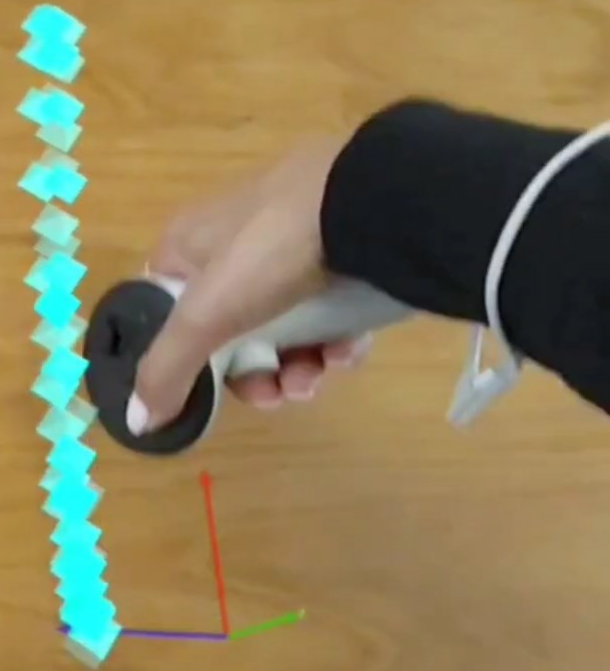
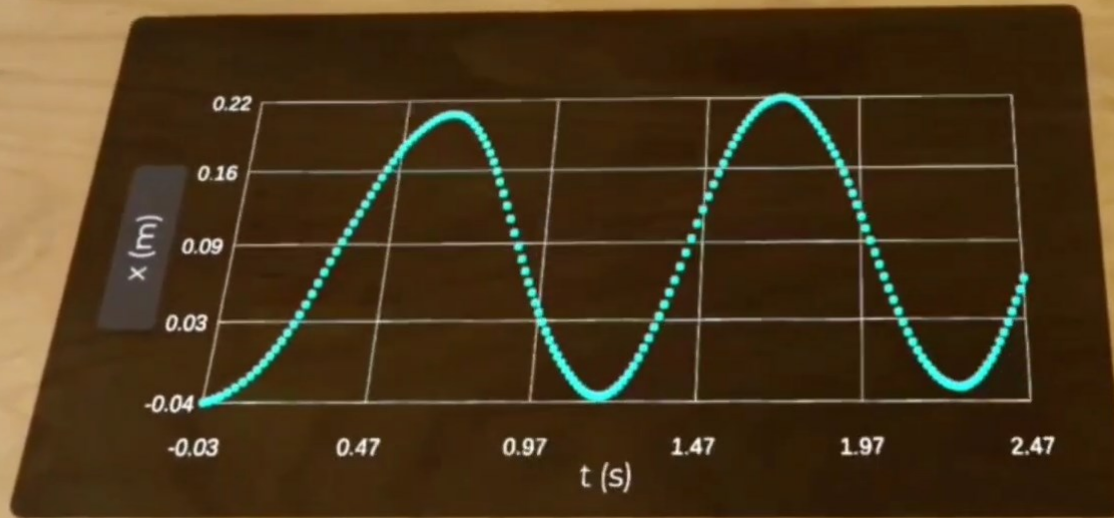
AnReAL's activities

1) Free body movements



AnReAL's activities

1) Free body movements



AnReAL's activities

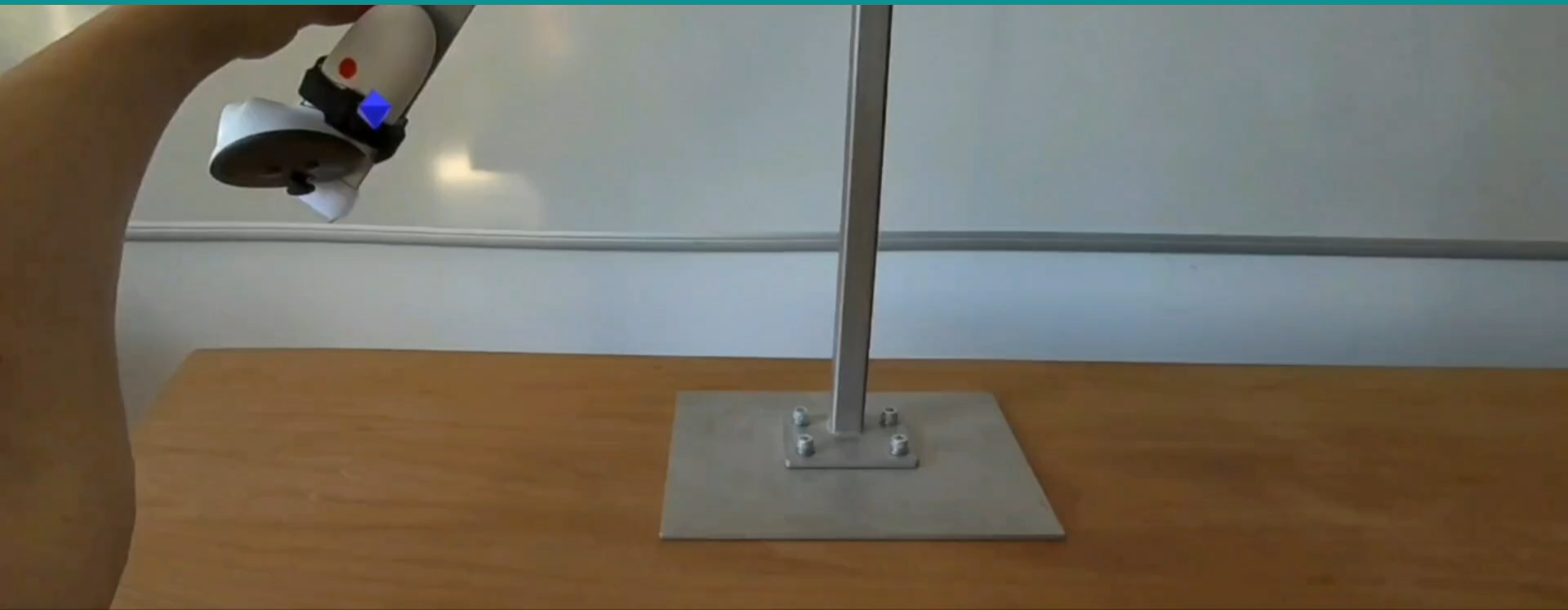
1) Free body movements



AnReAL
Augmented Reality
Active Learning

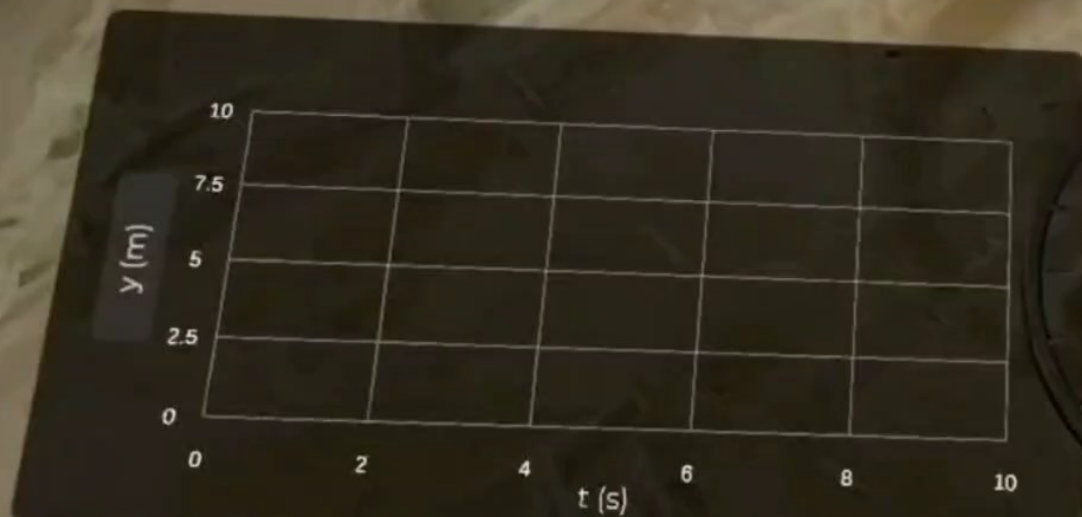
AnReAL's activities

2) Physics Lab Apparatus



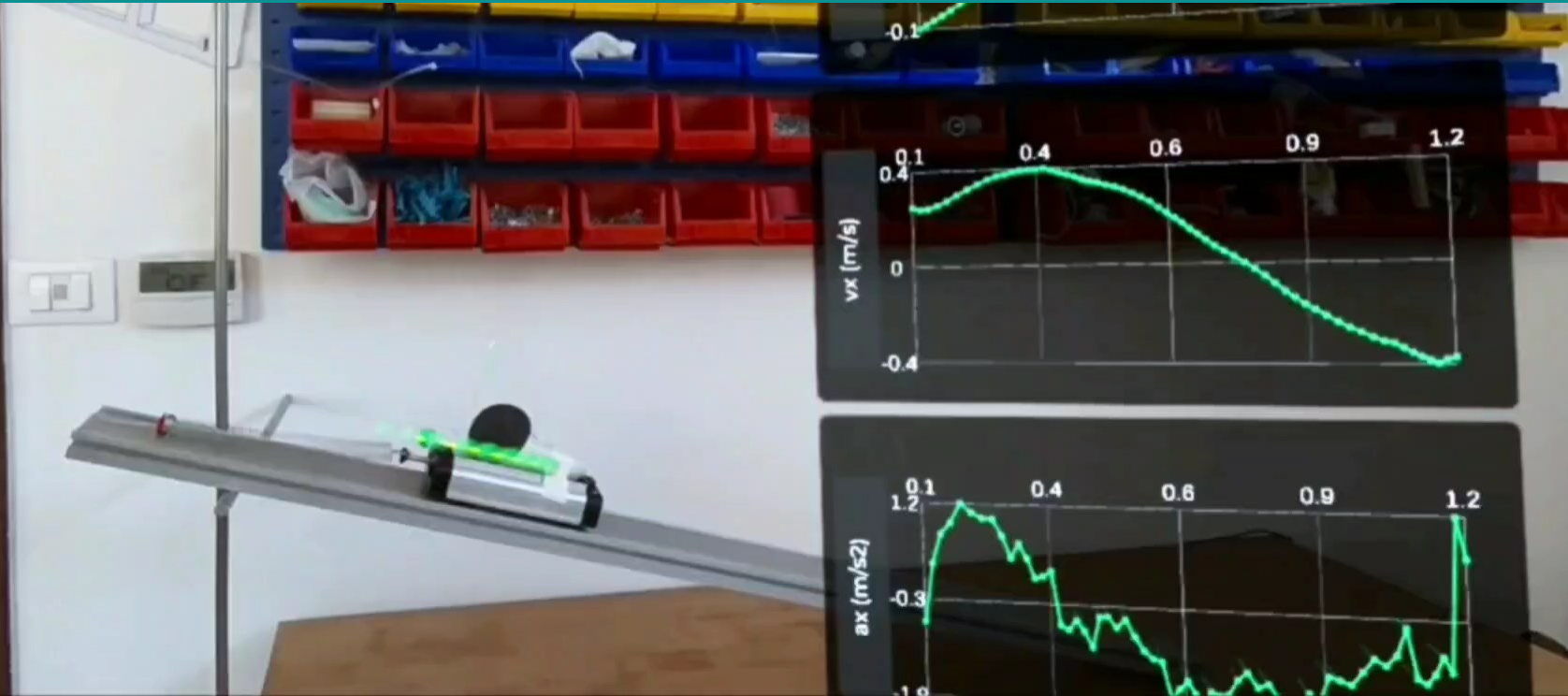
AnReAL's activities

2) Physics Lab Apparatus



AnReAL's activities

2) Physics Lab Apparatus



AnReAL's activities

3) Everyday physics

A white car is shown from a side-rear perspective. A sensor device is attached to the rear wheel. The sensor consists of a black frame with a red LED light and a blue component. A white cable is connected to the sensor. The car is parked on a paved surface. The word "HYBRID" is visible on the side of the car.

0.05 s

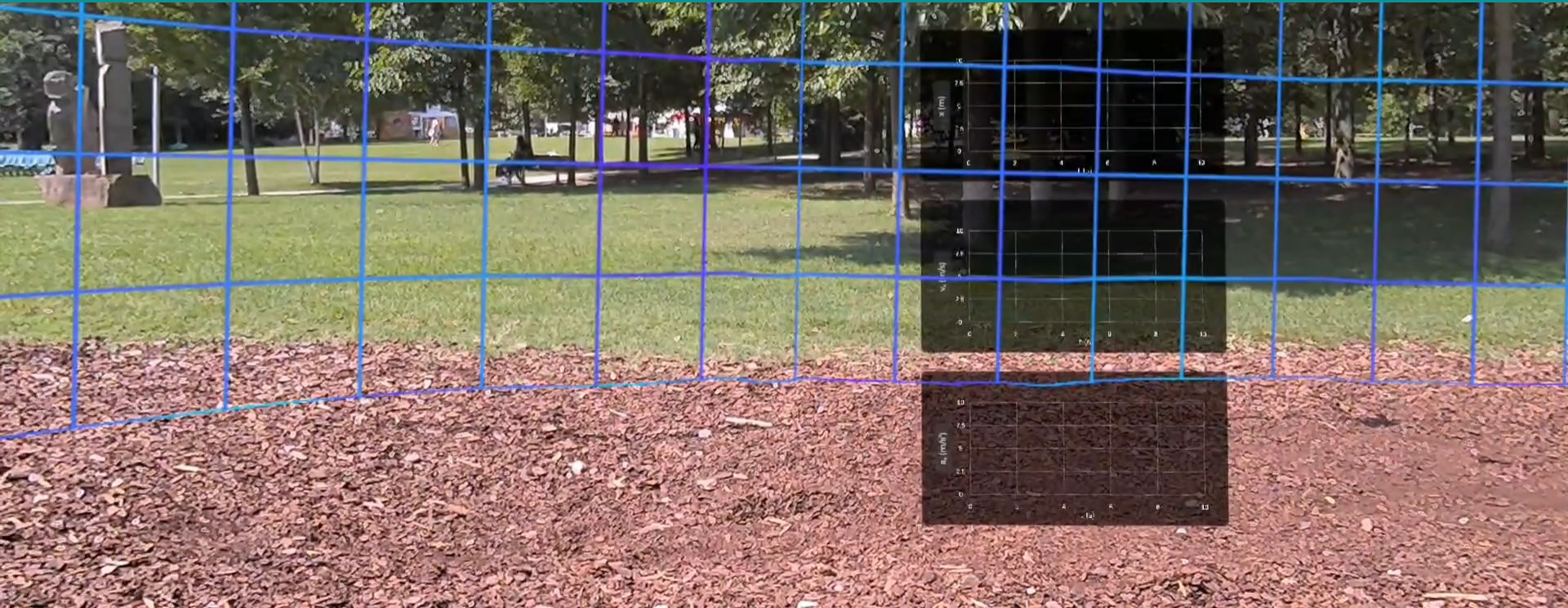
AnReAL's activities

3) Everyday physics



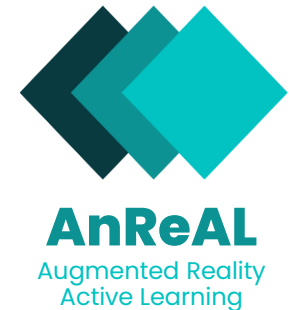
AnReAL's activities

3) Everyday physics



Conclusion and Next Steps

- ✓ Pilot Activities → positive engagement observed from both students and teachers



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Next Steps:

- definition of a community of learners involving teachers
- assessment of **AnReAL**



AnReAL
Augmented Reality
Active Learning

