



eROBSON

Affordance Cards



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Educational Robotics at Schools Online with Augmented Reality - eROBSON project has received funding from the European Union's Erasmus Plus programme, grant agreement 2020-1-NO01-KA226-SCH-094120.



Tool

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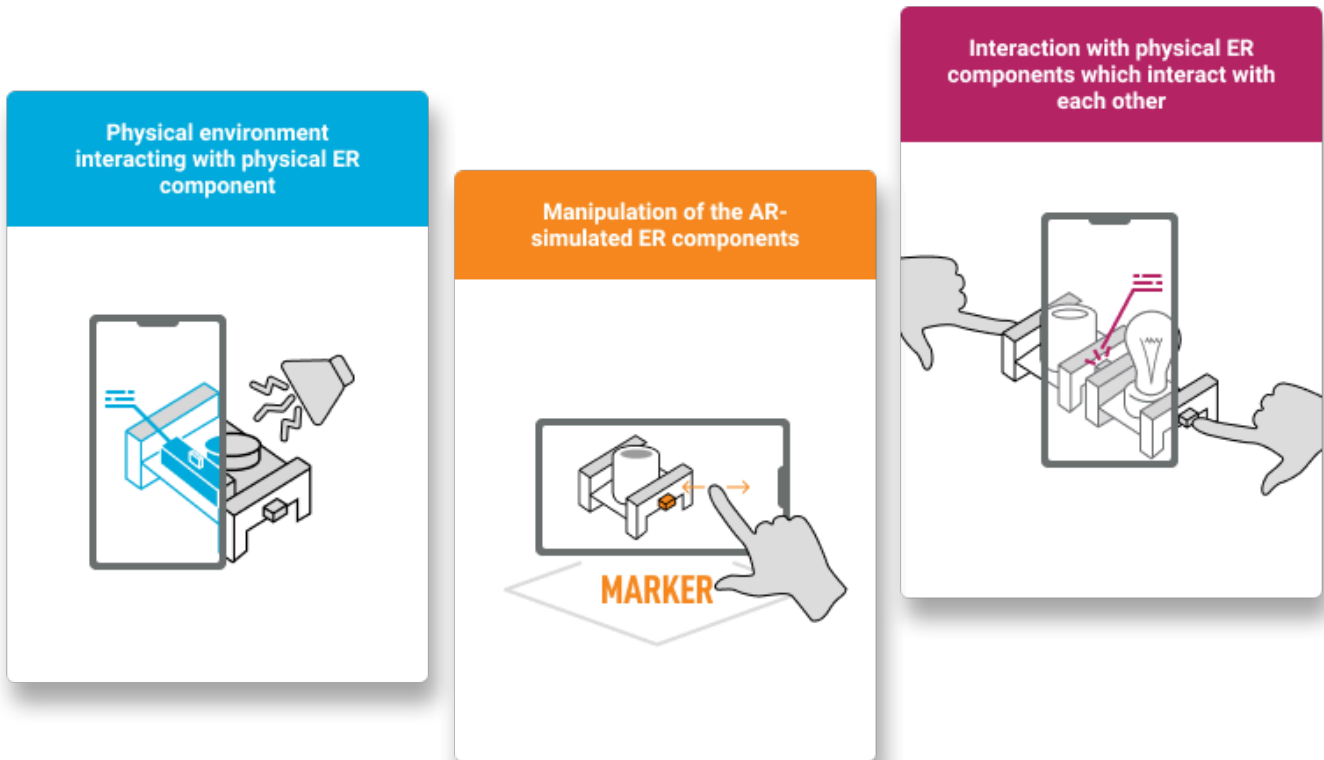


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Summary

In order to facilitate the design phase of the proposed methodology, we developed a set of cards. These cards are meant for teachers and instructional designers, who might have expertise in either Educational Robotics (ER) or Augmented Reality (AR). Each card represents a different AR affordance in the context of ER. A designer of an AR-ER activity can use these cards to learn about the possibilities of an AR-ER system and to connect a scenario design to the technological affordances.

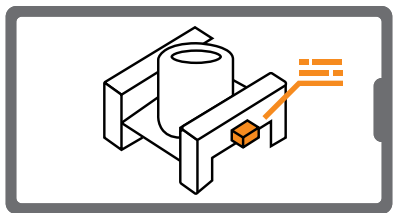


The cards illustrate multiple properties of AR in an AR-ER system. First, they illustrate types of displayed content and user interface. An AR app can show 3D models of ER components in an AR space and other media content in the same AR space. An AR app can also display user interface elements and other media content in the screen space (not in the AR space). An AR app can also visualize components of a simulated environment, such as noise level, ambient temperature, and similar. Second, the cards illustrate different interaction types and modes. Interaction is depicted on the cards with the hand elements. The user can interact with AR content via the user interface of the AR device or can interact with the physical elements – an image marker or a physical ER object. An AR app can detect a physical interaction (e.g., between a physical ER component and the physical environment) and support a simulated interaction (e.g., between a sensor type ER component and a simulated environment state). Third, the cards distinguish between the physical and the AR-visualized elements of the AR-ER experience. The cards that illustrate how an AR app can work with physical ER components are colored in blue, while those that show how an AR app can work with AR-simulated ER components are orange. Finally, the cards illustrate different recognition types. Both marker-based AR and marker-less AR are illustrated with the marker element under an ER component. Object recognition is used when physical ER components are to be augmented.

AR visualization of 3D models of ER components

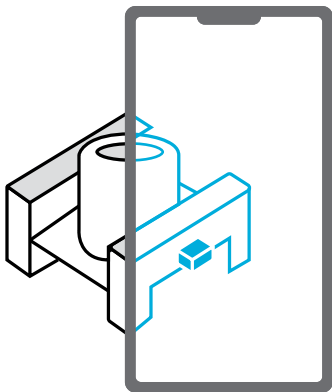


AR visualization of contextual information for the AR-simulated ER components

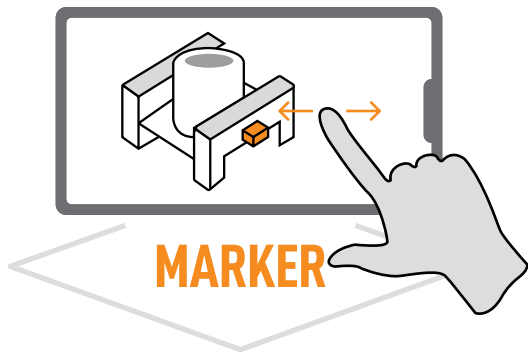


MARKER

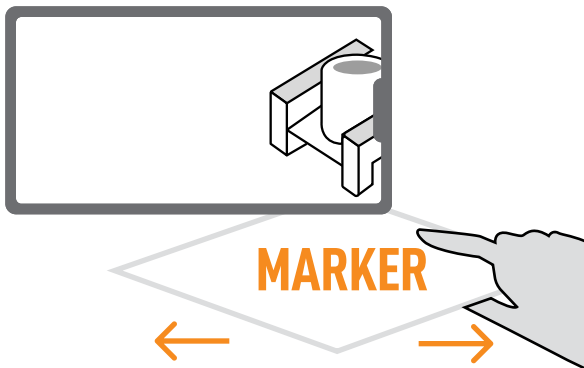
AR visualization of contextual information for the physical ER components



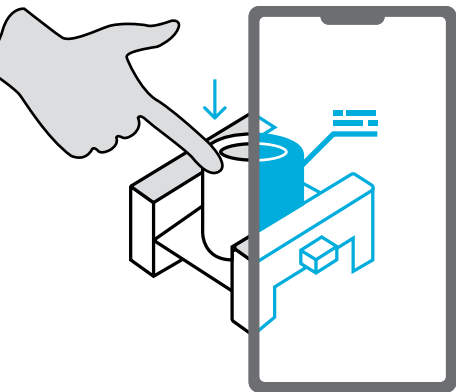
Manipulation of the AR-simulated ER components



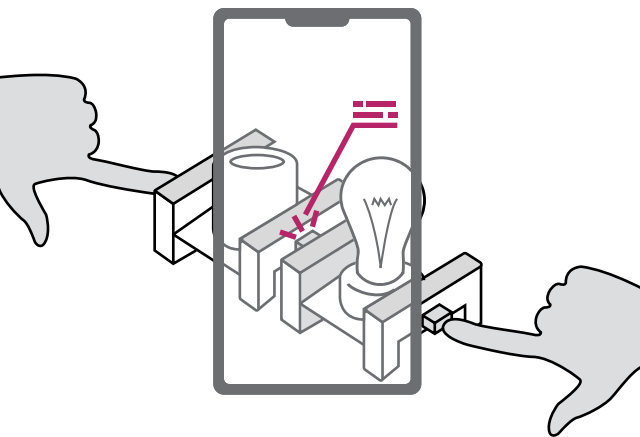
Interaction with AR markers on which AR-simulated ER components are displayed



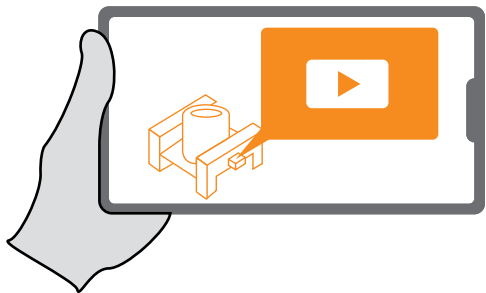
Interaction with a physical ER component on which additional dynamic contextual information is displayed



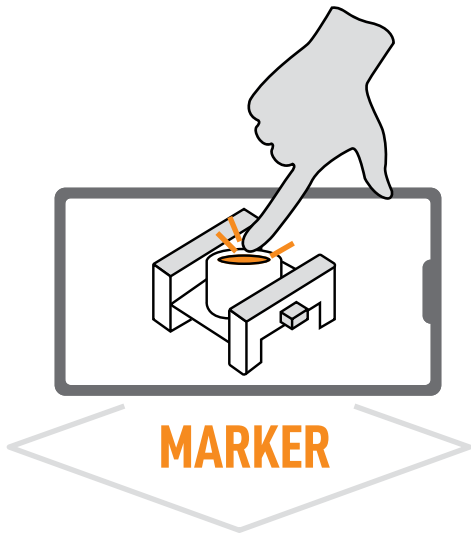
Interaction with physical ER components which interact with each other



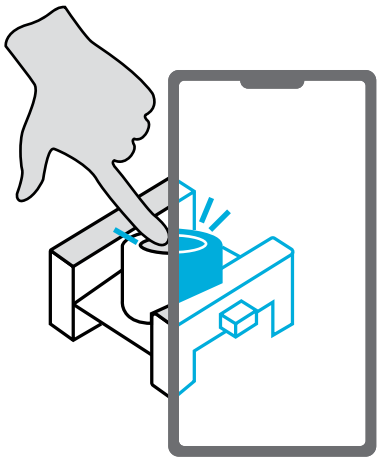
AR visualization of other media content



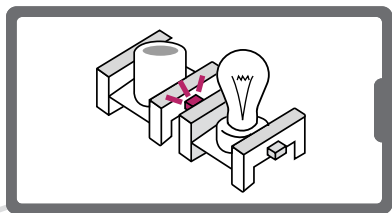
Interaction with AR-simulated interactable ER components



Interaction with physical interactable ER components



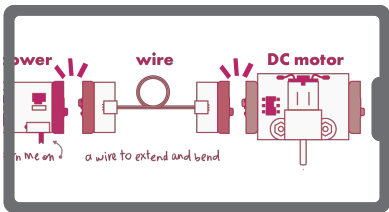
Interaction between the AR-simulated ER components



MARKER

MARKER

Simulation of the ER components interaction in circuits

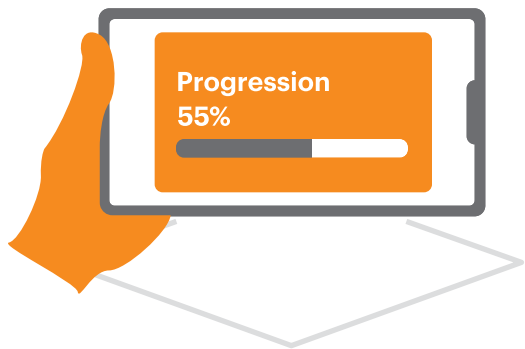


MARKER

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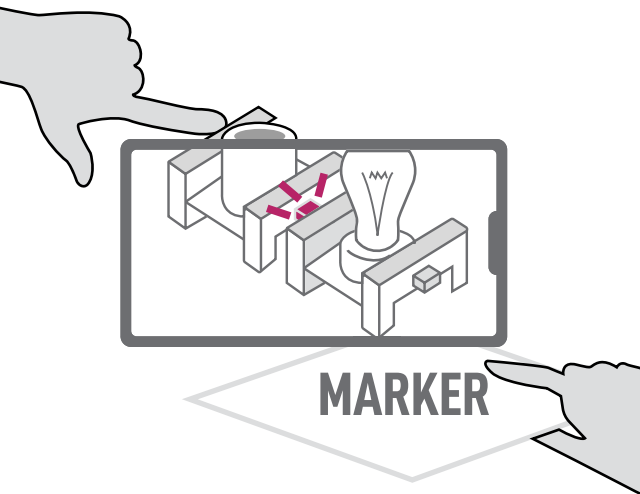
AR visualization of scenario information and progression



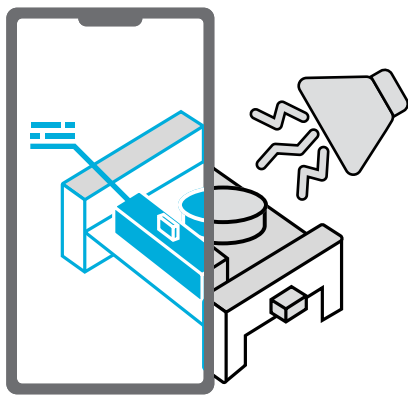
interaction with media content
other than ER components.



Physical ER component interacting with AR-simulated ER component



Physical environment interacting with physical ER component



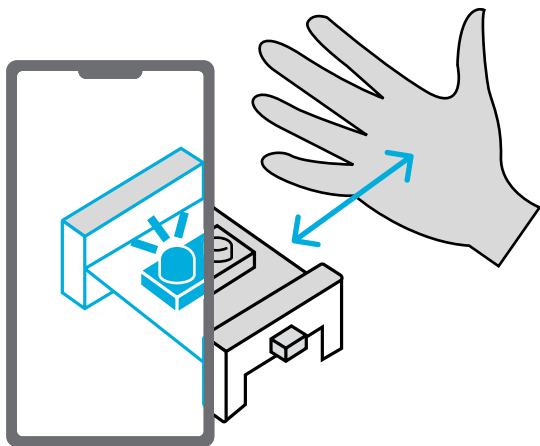
Physical environment interacting with AR-simulated ER component



**Simulated environment
interacting with AR-simulated
ER component**



Physical non-ER object interacting with physical ER component



**Physical non-ER object
interacting with AR-simulated
ER component**



AR-simulated non-ER object interacting with AR-simulated ER component

