Industrial Applications of AR

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Outline

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- Industrial Applications of AR
- RMU Engineering AR Work
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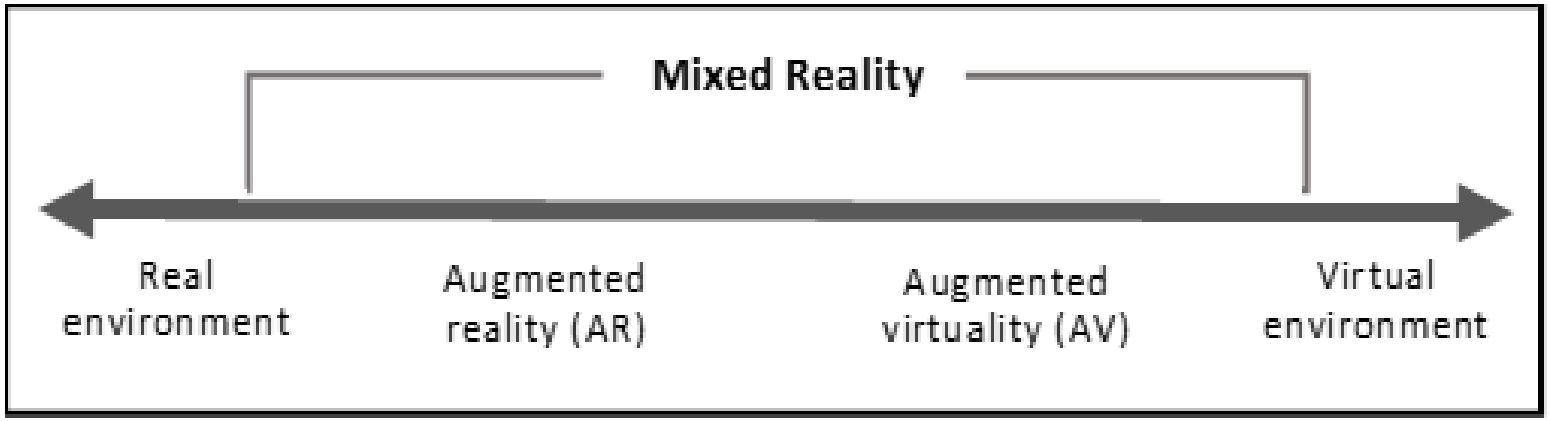
  - 3D Catalog Project
- Conclusions and Future Work

Introduction

– Researchers identified a spectrum indicating the level of involvement of the real and digital (virtual) worlds.



The Reality-Virtuality Spectrum – Adapted from [1]

Introduction

- The main motivation for VR can be attributed to the entertainment sector (e.g. Sci-Fi)
- The driver was the desire to make computing as ubiquitous as possible by eliminating the separation between the human and the computer
- In the early days of **VR** development, the main contributor was the **gaming industry**.
  - Creating worlds where users can immerse and role-play.
  - However, the technology available was not good enough to support such ambitious goals.
- Soon after, VR and AR **technology quickly evolved along with huge leaps** in the available computing capabilities.
- Now VR and AR are considered as an **important asset** for various domains including **industry, healthcare, education, entertainment, and many more.** [2]

Industrial Applications of AR

- Industrial environments are excellent areas where AR could be an instrumental tool.
- Such deployment can help in various areas like:
  - **Simulation**
  - **Design**
  - **Safety**
  - **Maintenance**
  - **Training**

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- AR (and VR) in Design Simulation [3]
  - Work has been done to provide **virtual environments reflecting new or modified designs for manufacturing**
  - Users can **interact and evaluate the operations of the designs as if they are real builds**
  - Some projects also use similar simulations as **superimposed virtual components on a set of physical components to simulate changes, adjustments or additions.**

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– AR Enhancing Human Perception

- Some work is done to use AR to **help humans see more or beyond the physical objects in view**
- An AR can **project labels for the parts in view and interactively update them as the user focuses on certain elements.**
- An AR may also **add graphical views of the internal parts of an objects**, that cannot be seen without opening it.
- An AR could go further **by showing how a part or several parts will operate and interact** in a digital view.

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– AR Help in Assembly

- In one study, a group of **researchers evaluated the use of a paper-based manual, a tablet display of instructions, and a head-mounted display** that shows the instructions in front of the user. The head-mounted display **led to around 82% reduction in errors**.
- Another group used **Microsoft HoloLens** to help **users assemble components by showing the instructions and connections through the HoloLens**.

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- Some work is being done to use **AR for collaborative work.**
  - Groups of designers can use AR **to share a digital view of their work imposed on the real environment and collectively explore options and enhance the design** [5].
- **Maintenance or construction industries** can also **use this approach to coordinate their tasks and ensure accurate execution.**

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- AR in the Automotive Industry [7,8]
  - A group of researchers created **a generic system for scene modeling, system calibration and tracking.**
  - This can be used as the building block for different AR applications in the automotive industry.
  - One example designed based on this system is an application for indicating the **location of 3D coordinates. This is useful for providing maintenance assistance and intelligent manuals.**

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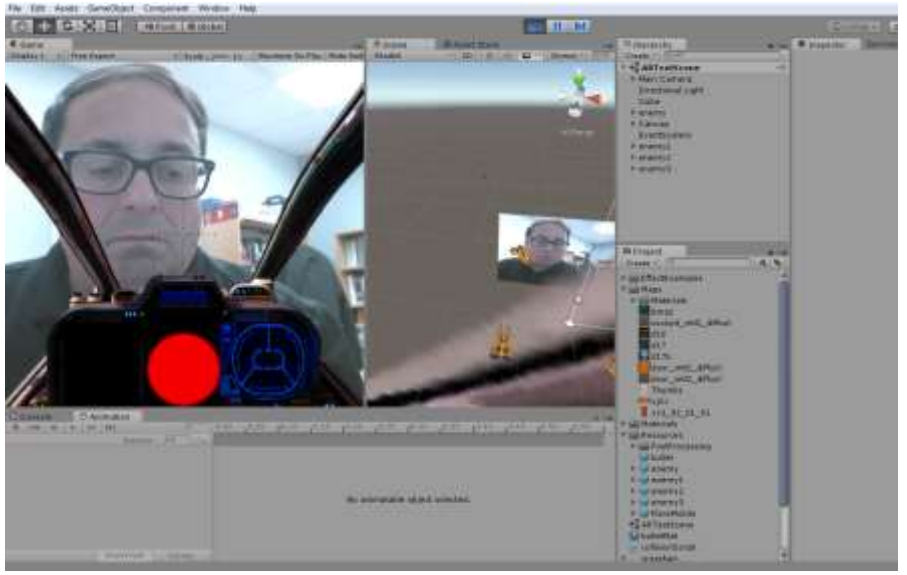
- AR in Construction
  - One of the applications of AR is in **construction safety** [9]**.**
  - Applications can be in various areas:
    - **Simulating hazardous situations in a construction site** for discovery of potential problems and for training
    - **Performing safety inspections** to recognize and identify possible hazards
    - **Creating different scenarios for possible problems** to use for **planning and risk management**.

RMU Engineering AR Work



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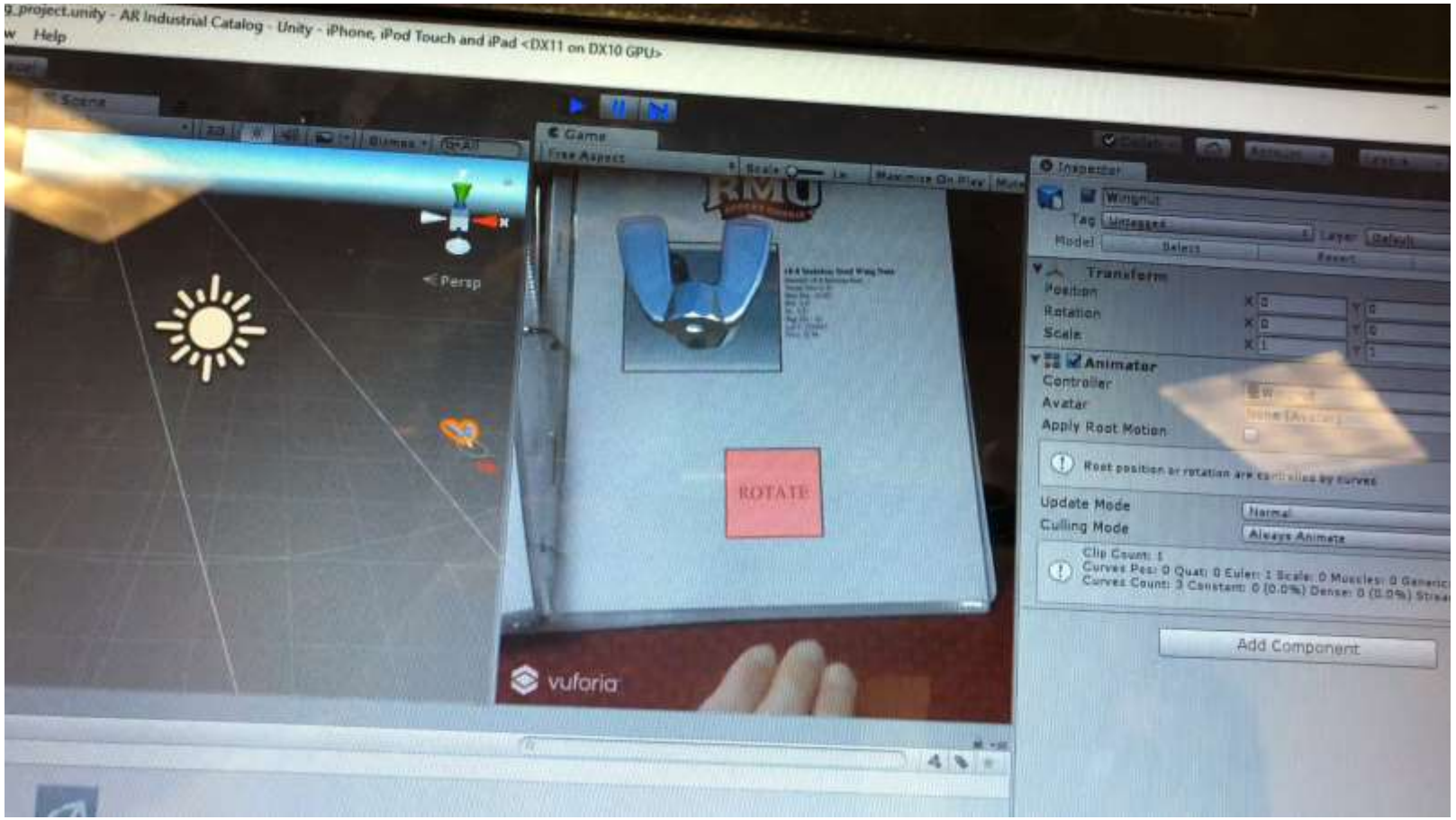
RMU 3D Catalog Project



Conclusions and Future Work

- Mixed Reality applications will only grow drastically, especially with availability of the technologies including open source tools.
- The integration with Industry 4.0 will be better realized.
- RMU intends to continue its work within the collaborative AR and Virtual Simulation space.
- Interdisciplinary research and development will be carried out in this field across all engineering disciplines (Manufacturing, mechanical, software, industrial and biomedical) at RMU.

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