Modular Course B: Creative Design in shoe Industry

Unit B2 – Computational tools and prototyping

Lecture LB2.2 – Virtual prototyping

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DISHOLEA | Improving the digital skills of workforce in Shoe and Leather goods Industry in Jordan and Palestine | GA 101129194

T2.2 – Development of modular courses and training material.

D2.2 – Modular Course in Creative Design

Contents

Introduction

- Virtual prototyping (VP) is a method in the product development process.
  - creation of detailed virtual models of prototypes before they are constructed in real life.
- Designers can create realistic 3D models quickly and cost-effectively.
- Involves the use of:
  - CAD
  - CAutoD
  - CAE
- Designers can quickly explore the performance of thousands of design alternatives without investing the time and money required to construction physical prototypes.
- VP is increasingly being used as a substitute for rapid

Industry 4.0

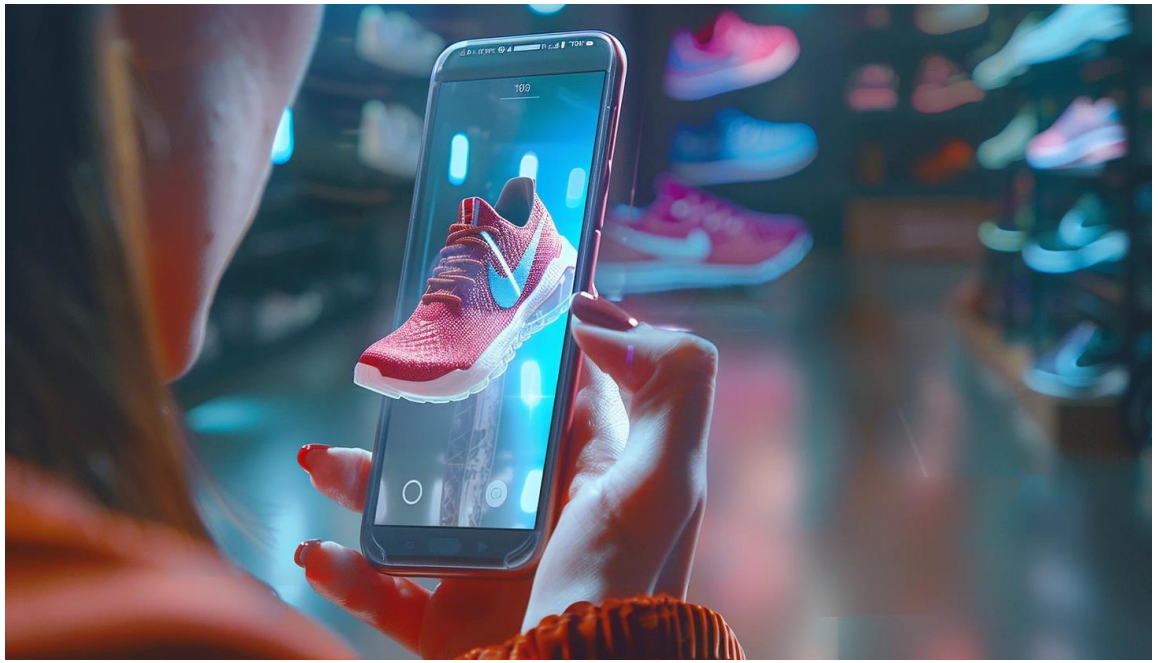
- Fundamental principles:
  - interoperability,
  - virtualization,
  - decentralization
  - real-time service provision
- Characteristics of Industry 4.0:
  a) the digitization, optimization and personalization of production
  b) the automation and adaptation of processes
  c) the interaction of humans and machines
  d) the added value of services and activities
  e) the automatic exchange and communication of data.

Industry 4.0

- Supported by data management and processing technologies, such as:
  - Big Data Analytics
  - **Virtual Reality (VR)**
  - **Augmented Reality (AR)**
  - Artificial Intelligence (AI)
  - Simulation
  - Machine Learning
  - Digital Twin
  - Additive Manufacturing
- And by Internet and interaction technologies, such as:
  - the Internet of Things (IoT)
  - the Internet of Everything (IoE)
  - Cloud Computing

Virtual Reality (VR)

- Multifunctional real-time design environment.
- Designer:
  - build virtual worlds
  - program the interaction
  - design a digital model based on a real physical model and model its relationships with the surrounding space
  - or join objects that do not exist in the real world with real connections.



Example of using VR technology in footwear design Source: https://www.renderthat.com/en/blog-posts/augmented-reality-und-3d-fuer-das-marketing-von-schuhen

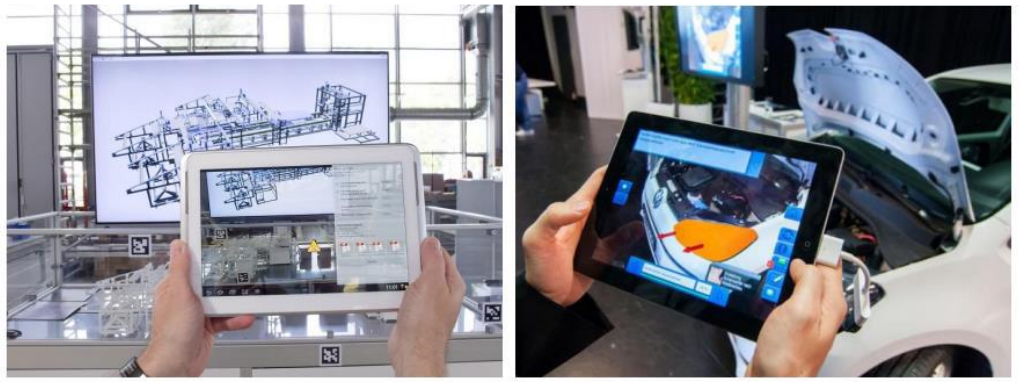
Virtual Reality (VR)

- Virtual reality technology supports collaborative design between people located in remote locations.
- Alternative tool for understanding and assimilating different scenarios regarding the creation of a 3D model:
  - prototyping process
  - demonstration of different features and processes related to its functionality
  - its observation and interaction with the surrounding space.

Example of using VR technology in footwear design Source: https://www.cadcrowd.com/blog/how-virtual-reality-rendering-is-changing-the-design-industry/

Augmented Reality (AR)

- Combines the real and virtual worlds, augmenting the real world with digital information, such as images or 3D models, with the aim of enhancing the immersive experience.
- Giving the user the ability to interact with the digital object in the real world.
- Used in product design, as it can:
  - prevent errors in the early stages of design
  - reduce the number of physical prototypes needed



Examples of using AR technology in product design (Cukovic et al., 2016)

Augmented Reality (AR)

- 3D modeling for designers
- Integration of a 3D digital model into the real world, through an AR application, helps understanding,geometric shapes, relationships and proportions with the real world, as well as the constraints and parameters for the design of the object.
- AR used to interact with the 3D model in real time, evaluate and present it at various stages of the design cycle, as well as to assemble the 3D model from its individual parts.

Augmented Reality (AR)

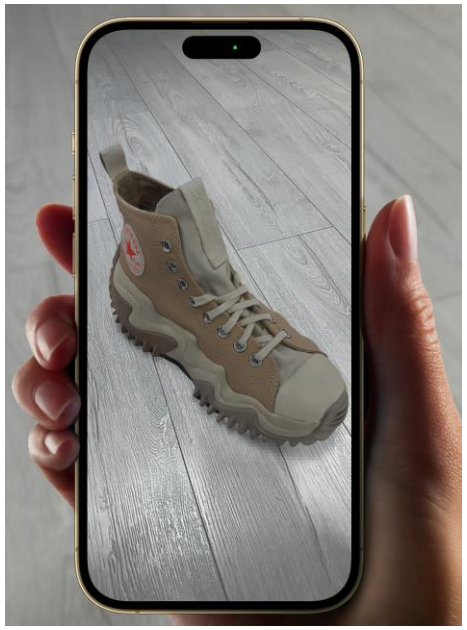
- Important pillar of Industry 4.0:
  - quality control
  - safety management
  - maintenance of an object and remote support
  - training and design
- Offers a collaborative design environment between designers/engineers or designers and customers regarding a product
  - simultaneously explore solutions regarding aesthetics, improvement or necessary changes to a design.

Virtual reality (VR) 3D shoe modeling

- Innovative technology on the shoe design and production.
- Important insights into the application of VR in the field of shoe design are:
  - Creating 3D Shoe Models
  - Interactive Design and Improvements
  - Visualization and Virtual Testing
  - Customization and Prototyping for Special Needs
  - Accelerate the Design Process
  - Virtual Presentation and Collaboration
  - Connecting with 3D Printing Technologies
  - Improving the Consumer Experience
  - Cost and Time Reduction

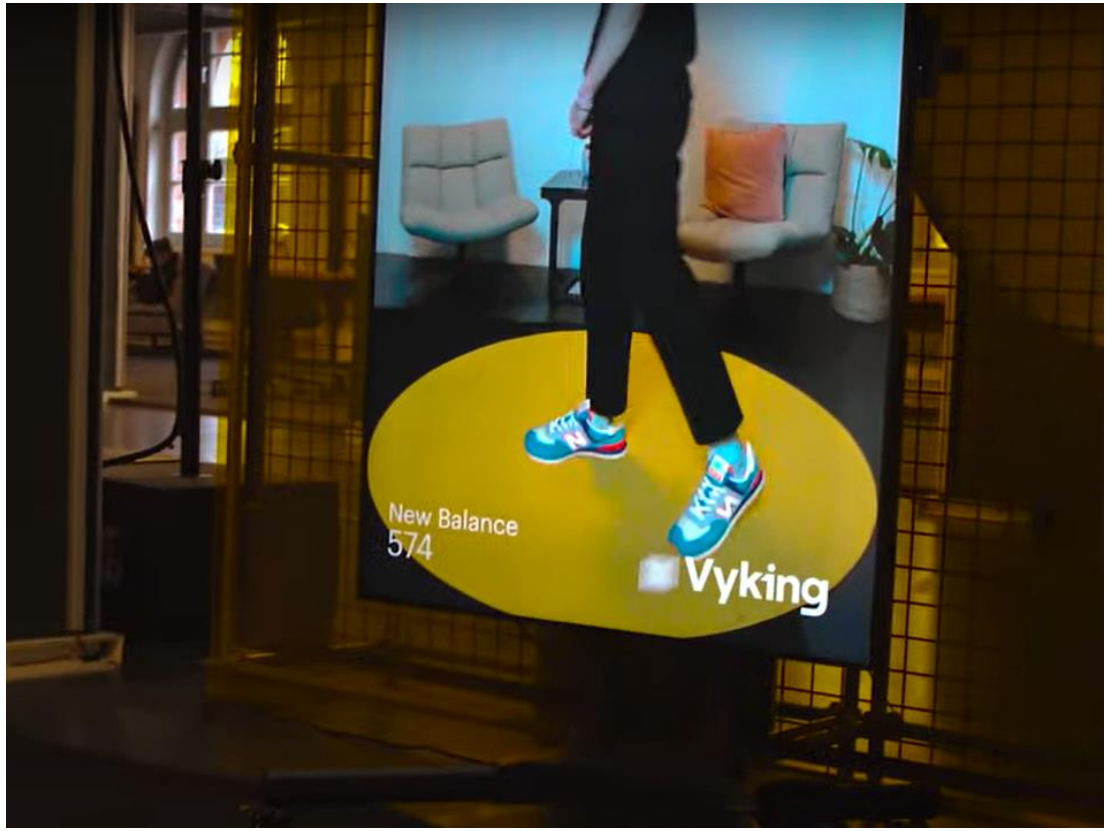
Augmented Reality (AR) 3D shoe modeling

- Augmented Reality (AR) has dynamically entered the field of footwear design, similar to virtual reality, and the benefits are the same.
- Key applications:
  - Virtual Shoe Try-On: e.g. WEARFITS platform and WANNA FASHION
  - Design Creation and Customization: e.g. SNEAKAR app
  - Enhancement of the Consumer Experience.
  - Accurate Measurements and Fitting: e.g. PerfectCorp
  - Technological Innovations
  - Retail Applications: e.g. Vyking.io mirror



Example of using AR technology in footwear design
Source: https://wearfits.com/ar-shoes-try-on?utm_source=chatgpt.com

Augmented Reality (AR) 3D shoe modeling



Vyking.io mirror
source: https://www.youtube.com/watch?v=eFmW-6dGSHs&ab_channel=Vyking%7CVirtualTry-On%263DExperiences

Questions

- What are the five key characteristics of Industry 4.0?
- Industry 4.0 contributes to the autonomy of businesses in terms of the services they can offer. **True** or **False**
- Virtual reality technology does not support collaborative design between people in remote locations. **True** or **False**
- Augmented reality is an important pillar of Industry 4.0. **True** or **False**
- The Augmented reality environment can be used to interact with the 3D model in real time. **True** or **False**
- Augmented Reality (AR) and Virtual Reality (VR) offer several benefits in the design and manufacturing of footwear. **True** or **False**
- With Augmented Reality (AR) or Virtual Reality (VR), users cannot create or customize a shoe. **True** or **False**

References

- An S., Che G., Guo J., Zhu H., Ye J., Zhou F., Zhu Z., Wei D., Liu A., and Zhang W. (2021). Arshoe: Real-time augmented reality shoe try-on system on smartphones, CoRR, vol. abs/2108.10515, 2021. [Online]. Available: https://arxiv.org/abs/2108.10515
- *CAD Crowd. https://www.cadcrowd.com/blog/how-virtual-reality-rendering-is-changing-the-design-industry/*
- Chu CH, Chen YA, Huang YY, Lee YJ. (2022). A comparative study of virtual footwear tryon applications in virtual and augmented reality. J Comput Inf Sci Eng 2022;22(4): 041004.
- Cukovic, S., Devedzic, G., Ghionea, I., Fiorentino, M., & Subburaj, K. (2016). Engineering Design Education for Industry 4.0: Implementation of Augmented Reality Concept in Teach CAD Courses. In *Proc. of 2016 International Conference on Augmented Reality for Technical Entrepreneurs (ARTE'16), 01.04.2016, Bucharest, Romania.*
- Jimeno-Morenilla, A., Sánchez-Romero, J. L., and Salas-Pérez, F. (2013). Augmented and virtual reality techniques for footwear, Computers in Industry, Vol. 64 No. 9, pp. 1371- 1382.
- Perfect corp. https://www.perfectcorp.com/business/products/augmented-reality-shoes
- *Render that. https://www.renderthat.com/en/blog-posts/augmented-reality-und-3d-fuer-das-marketing-von-schuhen*
- Skywell software. https://skywell.software/blog/ar-vr-benefits-use-cases-in-footwear-industry/
- SNEAKAR app. https://sneakar.io/
- Virtual Prototyping. HQ Software lab. https://hqsoftwarelab.com/services/virtual-reality-for-prototyping/
- Virtual Prototyping. Science Direct (10/2025) https://www.sciencedirect.com/topics/engineering/virtual-prototyping
- Virtual prototyping. Wikipedia (10/2025) https://en.wikipedia.org/wiki/Virtual_prototyping
- Vyking io. https://www.vyking.io/

References

- *Vyking.io mirror.* *https://www.youtube.com/watch?v=eFmW-6dGSHs&ab_channel=Vyking%7CVirtualTry-On%263DExperiences*
- Wanna. https://wanna.fashion/footwear
- Wearfits. https://wearfits.com