HOCHSCHULE HEILBRONN

TECHNIK WIRTSCHAFT INFORMATIK

Customized Gamification Design in Augmented Reality Training for Manual Assembly Task

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About me

- From Vietnam, moved to Germany since 2016.
- Background: Software Engineering
- Ph.D Student at Stuttgart University, Germany
- Research fellow at UniTyLab, Heilbronn University, Germany
- Interested in Usability, User Experience topics.

Agenda

1. Introduction
2. Motivation
3. Related Works
4. Application Design
5. Proposed Gamification Design
6. Conclusion & Future Work

Introduction

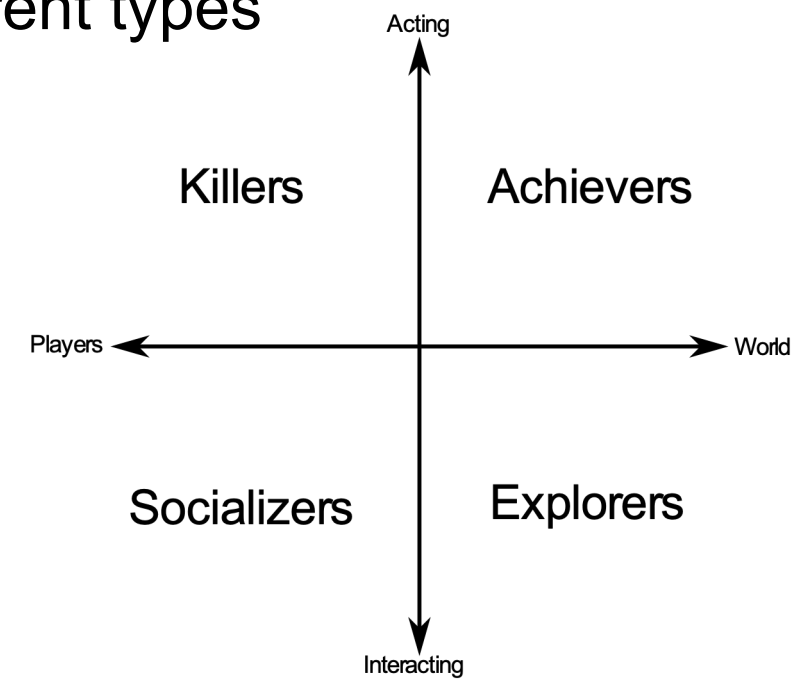
- User engagement in training has always been a concern of organizations.
- Augmented Reality (AR) allows the user to experience the physical world in combination with virtual content in real-time.
- Gamification - ”the use of game design elements in non-game contexts” [1] – helps in training design and user experience design to create a captivating environment for the trainees.
- The combination of these two concepts can help to optimize the user’s efficiency and experience.

Motivation

- Existing works dismiss the role of individual in designing gamified training.
- Gamification is all about design for people's motivation and engagement. Thus, gamification can be and should be personalized, tailored based on one's preferences for the best results.

Motivation

- Richard Bartle proposed a classification of player types - the Bartle taxonomy [2].
- Base on the taxonomy, different types of user should be consider into design the application.



The Bartle Taxonomy

Related Works

- The use of game-like design first was intended to engage and motivate students to learn. Taking an example from the historic role playing AR game ”Re-living the Revolution” [3].
  - Students had developed better skills in problem-solving, collaboration via working together.
- Works that combine AR and gamification for training [4,5,6,7] reveal:
  - Uers showed openness and acceptance for the new design.
  - Performance was also improved.
  - Homogeneous effect in user engagement.

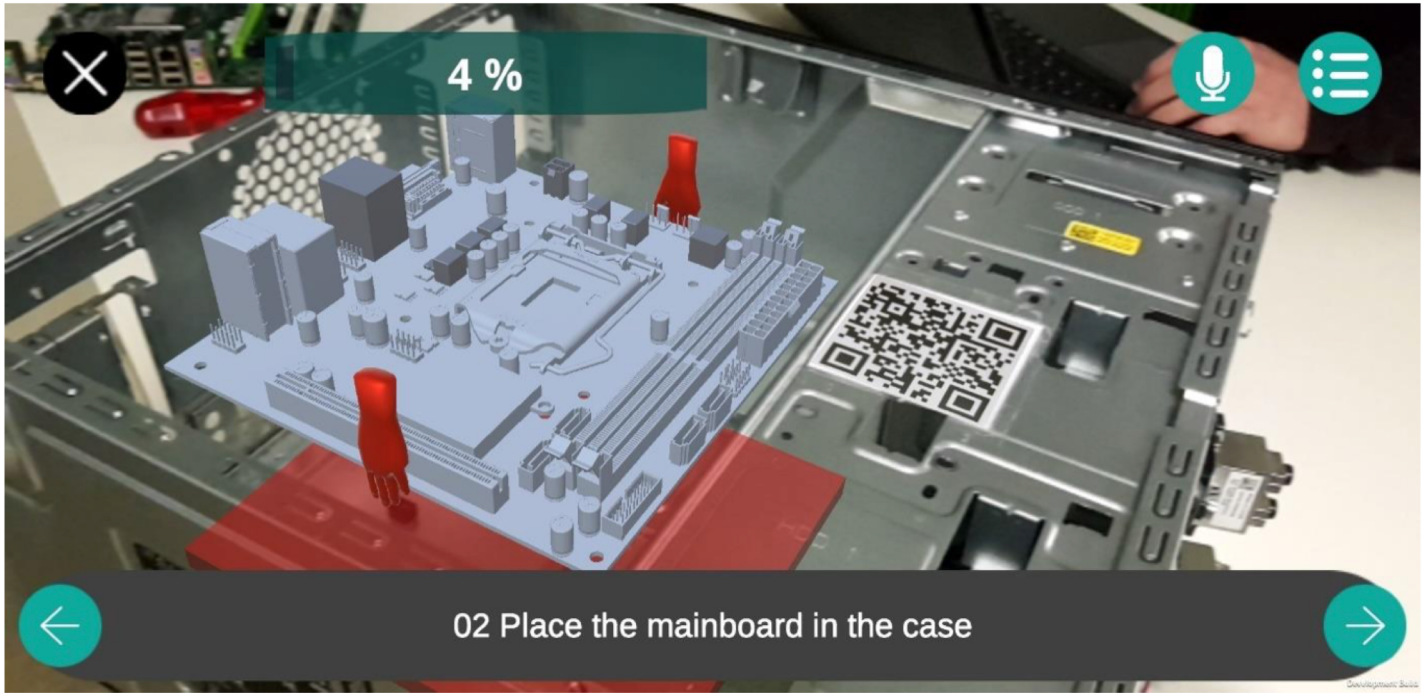
Application Design

- Mobile AR application:
  - Android platform.
  - Device: Samsung Galaxy S9.
- The application is used for training users on how to perform an entire assembly and disassembly of a computer which includes a motherboard, power supply, the Central Processing Unit (CPU), the Random-access Memory (RAM), Hard Disk Drive, Video Card, Optical Drives.
- Three main modules: Assembly, Disassembly for procedural training, and Component Learning.

Application Design - *Procedural Training*

- 47 assembly steps and 32 disassembly steps.
- 03 main actions: removing a component, putting a component in the right position, pushing /pressing a component.
- A step instruction includes five main components:
  - text description
  - CAD model of the components
  - 3D model of the required tool
  - A hologram of the target destination
  - in-situ guidance of the corresponding action.

Application Design - *Procedural Training*



Training Step Display

Application Design - *Component Learning*

- This function of this system is particularly interesting for this area.
- Offers the possibility to get to know the individual hardware components of the computer.
- The learning module is built using the object recognition function.
  - a component is placed into the field of view of the mobile camera, then a detailed description of the component is displayed. It describes the elements in the detail of what it is and what are the functionalities. A 3D model database of all the computer components was built in advance for extracting the learning content.

Proposed Gamification Design

- *Points System*
  - A certain number of points (50, 100, or 200) is awarded per assembly step. The number of points depends on how quickly an assembly step has been carried out.
  - After each step, the score is animated to the trophy and added to the previous score.
  - The trophy represents the total number of points and which changes to a silver or gold trophy the higher it is.
- *Badges*
- *Leader Board*

Proposed Gamification Design

- *Competitive mode vs Non-competitive mode*
- We bring the player types into consideration for providing customized user experiences.
- A user can select either the ”Competitive Mode” or the ”Normal Mode” for his training session.
- By allowing the freedom of choice, the hypothesis is that the user will experience the most suitable gamified design for his predominant characteristic.

Proposed Gamification Design

- Competitive Mode
  - Is designed for users who are highly competitive, predominantly Achiever and Killer.
  - In this mode, the user will experience the points system, badges, and also leader board.
  - The training also is designed with time pressure.
  - -> provide a sense of competition with others which suits the player type.
- Non-competitive Mode
  - There are no time limits and therefore no points or leader board.
  - Badges are available to simulate the sense of achievement without pressing users into the competitive mode.

Conclusion & Future Work

- We introduce an approach to gamifying the training process with the integration of player types concept.
  - The ability to select a play mode that allows the training to be modified, visualized to fit one's predominant nature.
- The proposed design approach will be tested in the next step
  - evaluate its effectiveness as well as its impact on the user's performance.

References

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Thank you