Customized Gamification Design in Augmented Reality Training for Manual Assembly Task

Diep Nguyen, Gerrit Meixner

Presenter: Diep Nguyen
Email: diep.nguyen@hs-heilbronn.de
Affiliation: Heilbronn University, Heilbronn, Germany
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].
- Based on the taxonomy, different types of users should be considered in designing the application.
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:

- Users 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.
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*

02 Place the mainboard in the case

Training Step Display
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


Thank you