

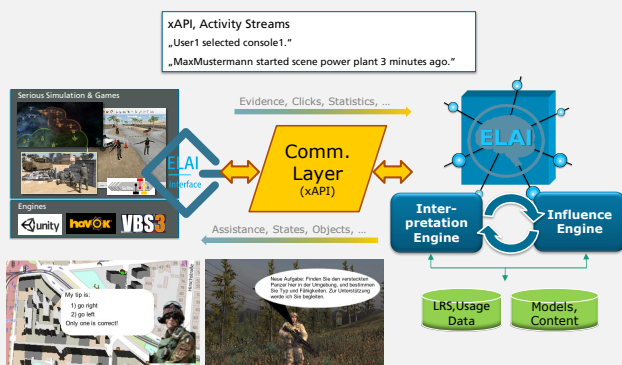
# Application of Adaptive Game-Based Learning in Image Interpretation

A. Streicher, W. Roller, C. Biegemeier

## Introduction & Objectives

- Increase of learning outcome in aerial and satellite image interpretation; increase motivation (Flow)
- Adaptive serious games for education and training
- Artificial Intelligence (A.I.) for automatic adaptation
- Interoperability for multi-/cross-system applications

## Solution Approach & Concept



Interoperable, externalized e-learning adaptivity for game-engines based applications

- Decentralized software architecture and externalized adaptivity logic "E-Learning A.I." (ELAI)
- Minimal-invasive, bi-directional game engine adapter
  - Usage data collection (xAPI) → Learning Analytics
  - Genre-specific adaptation strategies → Adaptivity
- Usage of interoperability standards, e.g. xAPI, HLA
- Applicable to heterogeneous application scenarios and different game engines (e.g. Unity, Unreal)
- Related work e.g. ALIGN, RAGE, TLA

[Pierce08] [VanDerVeg16] [Fotom-Kovarik16]

## Application

- Application in a map-based Seek & Find serious game for aerial image interpretation
  - Game objectives: identify and differentiate various vehicle types, orientate and learn surroundings
- Adaptivity according to domain-specific models, e.g.,
  - Injection of Intelligent Virtual Agents (IVA) for context-adaptive help & recommendations
  - Dynamic Difficulty Adjustments, e.g. generated clouds, model-based image modifications, etc.
- Rules-based information extraction (Didactic Factors); basis for A.I., e.g., clustering, classification, etc.

## Usage Data Analysis



Data extraction flow from raw usage data to user model by using Didactic Factors

- Small user study, n=12, test + control groups

Learning Assessment (H <sub>3</sub> )	Result
H <sub>1</sub> : recognition of adaptivity	OK ☺
H <sub>2</sub> : feeling of 'increased motivation'	OK ☺
H <sub>3</sub> : measurable learning effect	inconclusive ☹

Learning Assessment (H <sub>3</sub> )	Score
Correct (1)	0,57
Wrong (0)	0,6

Legend: ■ With ELAI ■ Without

## Conclusion

- Successful application of the interoperable adaptivity framework "ELAI" for simulations and serious games
- Small user study indicates acceptance for adaptivity and increased motivation, but learning outcome inconclusive



### References