

G.2. DESIGN AND IMPLEMENTATION OF AN IMAGE TRACKING-BASED AUGMENTED REALITY SYSTEM FOR INTERACTIVE EDUCATIONAL APPLICATIONS

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Abstract. This paper presents the design and implementation of an augmented reality (AR) solution aimed at optimizing educational processes by creating interactive learning environments. The proposed system employs advanced image recognition techniques to identify graphical elements in the physical environment through mobile device cameras and trigger associated digital content. The recognition algorithm is based on feature detection and matching, converting physical images into unique digital feature sets that allow precise activation of AR elements. Within the content creation workflow, augmented elements are developed using graphics engines and digital content editors, including interactive application platforms (Unity), 3D modeling software (Blender), and graphic design and animation tools (Figma, Adobe Illustrator, Adobe After Effects). These tools enable the integration of 3D objects, animations, and interactive visual content into a coherent environment compatible with image recognition techniques. The paper details the system architecture, development and integration stages of AR content, as well as usage scenarios applied in real educational contexts. The analysis demonstrates that introducing interactive digital elements increases engagement, motivation, and accessibility of information, contributing to the efficiency of the learning process. Moreover, the proposed solution is scalable and adaptable, allowing rapid development of innovative educational applications and providing a technical framework for the future expansion of AR platforms in education. The obtained results confirm that image recognition and AR integration technologies constitute a viable direction for

modernizing educational systems, offering both flexibility in instructional material design and the possibility of interactive assessment of user progress.

Keywords: augmented reality, image tracking, computer vision, interactive educational applications, learning process optimization, interactive digital content, mobile technologies