3D Wildlife AR: Augmented Reality-Based Wildlife Visualization for Learning

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Abstract

The integration of Artificial Intelligence (AI) and Augmented Reality (AR) has revolutionized educational technology, offering new ways to visualize and interact with digital content. This paper introduces 3D Wildlife AR, an intelligent wildlife learning system that combines real-time animal recognition with immersive 3D visualization to promote interactive education. The system allows users to capture an animal image using a mobile device, which is transmitted to a Python-based server for analysis. The machine learning model, trained locally on the developer's laptop, identifies the animal species from the image and retrieves detailed information such as its name, scientific classification, and behavioral characteristics. The identified data are then sent to a Unity-based mobile application, where they are dis- played through an intuitive user interface. An integrated text-to-speech (TTS) feature narrates the information aloud, enhancing accessibility and engagement. Utilizing the Vuforia Engine's ground plane detection, the system projects a realistic 3D animated model of the recognized animal into the user's real-world environment. Users can interact with the model by rotating, resizing, and animating it to explore its features in detail. The application further includes an interactive quiz module that generates five context-based questions related to the detected animal, reinforcing learning through curiosity and play. By combining AI-driven recognition with AR- based visualization and gamified learning, 3¨D Wildlife ARo¨ffers an innovative platform that transforms traditional wildlife education into an engaging, multisensory experience for students and young learners.