**Review of An Augmented Reality Application in Healthcare: Coronary Artery Disease (CAD)**

**Introduction and Summary**

The paper by Rusnida Romli et al., published in the Journal of Advanced Research in Applied Sciences and Engineering Technology (Volume 53, Issue 2, 2025), presents the development of a marker-based Augmented Reality (AR) application aimed at educating the public about Coronary Artery Disease (CAD). CAD, identified as the leading cause of death worldwide by the World Health Organization (WHO), is caused by atherosclerosis, leading to plaque buildup in arteries and potential complications like myocardial infarction or stroke. The authors leverage AR technology to disseminate information in an engaging, interactive manner, aligning with Industry 4.0 principles that emphasize enhanced human perceptual experiences.

The research focuses on creating an Android-based AR app using tools such as Vuforia for marker registration (a QR code), Unity3D for designing virtual objects and interfaces, Microsoft Visual Studio with C# for functionality, and Blender for 3D model editing. The app allows users to scan a marker with their smartphone camera to view 3D models of the human heart, learn about its chambers, understand CAD symptoms and risk factors, watch educational videos, and complete self-assessment quizzes. The methodology follows a structured approach: marker registration, virtual object design, user interface development, and evaluation through user surveys. Results from testing with 15 respondents indicate high satisfaction, with over 70% strongly agreeing on knowledge delivery and usability.

In the brief review section, the authors compare their work to existing AR systems in healthcare, highlighting advantages like voice recognition or IoT integration in prior works but noting limitations such as high costs or limited information. The paper concludes that the app successfully raises awareness and suggests AR's potential in other fields, supported by funding from Universiti Malaysia Perlis.

**Strengths**

One of the paper's key strengths is its practical application of AR in public health education. By targeting CAD—a global health crisis—the authors address a real-world need for accessible, engaging information dissemination. The use of marker-based AR makes the app straightforward and user-friendly, especially for non-tech-savvy users like senior citizens, as it requires only scanning a QR code. This aligns well with the paper's goal of reaching "every stratum of society." The integration of multimedia elements (3D models, videos, quizzes) enhances user engagement, moving beyond static text to interactive experiences, which the authors argue improves retention and understanding.

Technically, the methodology is clearly outlined with diagrams (e.g., block diagram, use case diagram), making it reproducible. The choice of tools—Vuforia for robust marker detection, Unity3D for versatile AR development—is appropriate for an Android-focused app, ensuring compatibility with ARCore-supported devices. The evaluation, though small-scale (15 respondents), uses quantitative surveys to measure aspects like knowledge delivery (73.33% strongly agree) and usability (86.67% strongly agree), providing empirical support for the app's effectiveness. The inclusion of pre- and post-use surveys to assess impact is a thoughtful touch, demonstrating a user-centered design approach.

The paper also contributes to the literature by reviewing AR categories (triggered vs. view-based) and comparing with prior systems, such as those using Microsoft HoloLens for transcatheter procedures or web-based AR for anatomy learning. This contextualizes the work within the broader AR-healthcare landscape, emphasizing its novelty in focusing on CAD awareness via mobile AR.

**Weaknesses and Areas for Improvement**

Despite its merits, the paper has notable weaknesses. The sample size for user testing (15 respondents from a residential area) is limited, potentially biasing results and reducing generalizability. A larger, more diverse cohort (e.g., across age groups, regions, or health literacy levels) would strengthen claims about public awareness. Additionally, the evaluation lacks qualitative feedback; while percentages are provided, deeper insights into user experiences (e.g., via interviews) could reveal usability issues, such as marker detection in varying lighting conditions.

Technically, the paper glosses over potential challenges. For instance, it mentions ARCore/ARKit requirements but doesn't discuss compatibility testing across devices or handling low-end smartphones common in developing regions like Malaysia. The reliance on videos and quizzes is positive, but the paper doesn't detail content validation—e.g., were medical experts (beyond KPJ Hospital collaborators) consulted to ensure accuracy of CAD information? References to WHO data are apt, but some citations (e.g., [1,17,18]) appear repetitive or mismatched, and the reference list includes duplicates (e.g., [4] and [9] are the same paper).

The discussion on future works is brief and generic, suggesting AR expansion to other fields without specific proposals, such as integrating AI for personalized risk assessments or markerless AR for broader accessibility. Moreover, while the app promotes early precautions, it risks oversimplifying CAD diagnosis via self-assessments, potentially leading to false reassurances or anxieties—ethical considerations like disclaimers or integration with professional consultations are underexplored.

Opinions and Overall Assessment

In my opinion, this paper represents a commendable effort in democratizing health education through AR, particularly in a post-pandemic era where digital tools for remote learning are vital. The focus on CAD is timely, given its prevalence, and the app's design—combining education with gamification-like quizzes—could indeed foster healthier lifestyles, as the authors claim. It's refreshing to see AR applied beyond entertainment or high-end medical training to public awareness, potentially bridging gaps in healthcare access in regions like Southeast Asia.

However, the work feels somewhat incremental rather than groundbreaking. While it builds on prior AR-healthcare systems (e.g., [5-8]), the novelty lies mainly in the CAD-specific content rather than technological innovation. For instance, voice recognition or IoT integration from reviewed works could have been incorporated to enhance interactivity. That said, the low-cost, mobile-first approach makes it more scalable than expensive setups like HoloLens-based systems.

Overall, the paper is well-structured and accessible, scoring high on clarity but moderate on depth and rigor. It merits publication for its applied value, but revisions could include expanded testing, ethical discussions, and detailed error handling in AR implementation. On a scale of 1-10, I'd rate it 7/10—solid for educational impact but room for more robust validation. This research paves the way for AR in preventive healthcare, and I look forward to seeing iterations with advanced features like real-time heart rate monitoring via wearables.