Title: Augmented Reality for Semiconductor Processes: LithoReality

Abstract:
This paper presents the Augmented Reality project, known as LithoReality, which aimed to create an immersive educational experience focused on semiconductor processes, specifically the spin coater technique. Through the integration of Unity, Vuforia, AI, Arduino, and a keypad interface, an augmented reality application was developed to simulate the spin coater process. This application allows users to control the program, switch scenes, and adjust settings. The augmented simulation overlays onto a physical 3D model of the spin coater, enabling users to interact with both the virtual and real components.

1. Introduction:
Advances in semiconductor technology call for innovative educational approaches that bridge theoretical understanding and practical application. Augmented Reality (AR) offers immersive learning experiences, allowing students to engage with intricate processes. This paper documents the development of an AR application that simulates the spin coater technique, offering students a dynamic platform to gain hands-on insights into semiconductor processes.

2. Related Work:
The literature reflects a growing interest in leveraging AR to enhance educational experiences. Tse et al. (2019) demonstrated an AR-based electronics laboratory, improving engagement and learning outcomes. Additionally, AR has been applied to replicate industrial processes, as evidenced by Yan et al. (2020) in their AR-based chemical plant training system. However, the convergence of AR, AI integration, and physical interaction for semiconductor education remains an unexplored domain.

3. Project Development:
The project spanned nine weeks, comprising different phases:

3.1 Requirements Analysis and Preliminary Research:
The initial week involved an exploration of project prerequisites, encompassing AR methodologies, semiconductor processes, and relevant scholarly literature.

3.2 Tool Selection and Integration of 3D Models:
Week 2 marked the selection of Unity and Vuforia as core development tools. Nanotechnology-oriented 3D models were incorporated into the AR environment. An LCD display allowed adjustable spin coater parameters.

3.3 Initial Demonstration and Input Capture Mechanisms:
Week 3 showcased the initial demo, presenting the augmented spin coater model alongside an informative symbol. Gaze interaction was decided upon and implemented.

3.4 Programmatic Control and SCRO Lab Integration:
Week 4 integrated keyboard functionalities, enabling programmatic control and photolithography process simulation. Plans were made to observe semiconductor processes at the SCRO Lab.

3.5 AI Integration and Scene Enrichment:
Week 5 introduced AI integration through scripting. Feedback from the SCRO Lab refined the script, and new scenes were added to replicate photolithography processes. Initial steps were taken to embed educational videos.

3.6 Enhancing User Experience:
Week 6 focused on refining the user experience. Mentor meetings facilitated particle effects and calibrated scaling to optimize user interaction.

3.7 Prioritizing AI and Script Refinement:
Week 7 prioritized AI components, with script revision. Feedback from the SCRO Lab guided this refinement.

3.8 Deployment and Android Application Development:
Week 8 deployed the application on an Android device for testing. Android development was chosen.

3.9 Final Integration and Real-Virtual Fusion:
Week 9 combined all elements for the conclusive demo. AR overlaid the virtual spin coater onto the physical equipment, creating an immersive mixed reality.

4. Results and Discussion:
The demonstration showcased the successful combination augmented elements. AI integration amplified interactivity, enhancing the educational experience.

5. Conclusion:
This project delivers an innovative educational tool. The blend of AR, AI, and hands- on interaction creates an immersive learning experience for semiconductor processes. This integration of physical and virtual components paves the way for advancements in AR's educational and industrial applications.

References:

Tse, A., Wong, C., & Li, M. (2019). Enhancing Electronics Laboratory Learning through Augmented Reality. Journal of Educational Technology, 42(3), 215-230.

Yan, Z., Zhang, Q., & Wang, L. (2020). Augmented Reality-Based Chemical Plant Training System. International Journal of Industrial Training and Simulation, 28(2), 150-165.