Augmented Reality Based Human Computer Interaction

BTP Code - B23PBN02

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PROBLEM STATEMENT

The project aims to create an AR application that can detect and accurately map hand gestures to display designs or tattoos upon them.

Additionally, the application must provide a user-friendly interface to enable users to select and customize the designs to be applied to their hands.

The success of the project depends on the ability to provide a seamless AR experience that enables users to visualize their desired designs on their hands realistically.

MOTIVATION

Our Motivation

AR technology allows users to interact with the digital world in a more intuitive and natural way, by overlaying virtual objects onto the real world. This opens up a wide range of possibilities for applications that can benefit from this technology,

- Recognizing hand and displaying designs on it.
- Detecting environments and placing objects upon it i.e. Interior Design.
- Create immersive experiences that blend the physical and digital objects.

Detecting Hands and Displaying Designs upon it

By detecting the user's hands and tracking their movements, artists can create immersive and engaging experiences that blend the physical and digital worlds.

BLAZE PALM MODEL

Placing virtual objects in real world

This involves overlaying computer-generated images on top of the user's view of the physical world, creating the illusion of virtual objects existing in the same space as real-world objects.
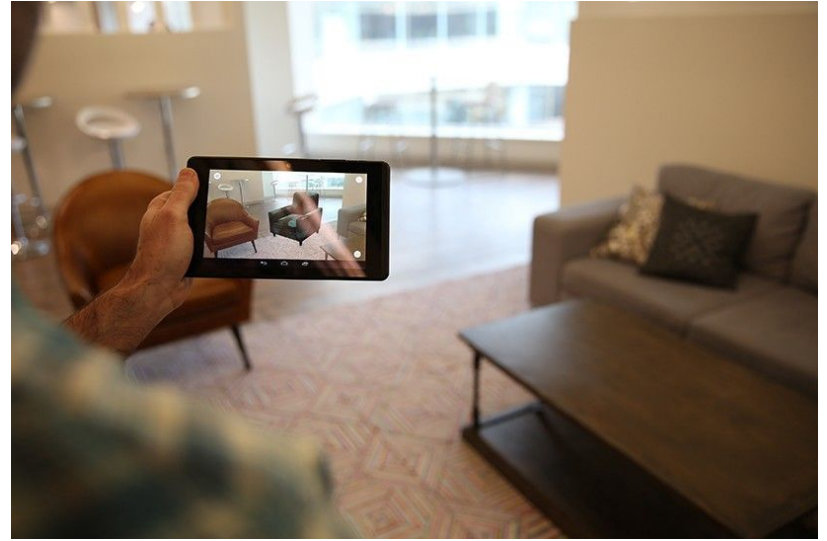
SOLUTION DESIGN

Design of the AR Application

Hand Recognition: The application must first detect and recognize the user's hands. This can be achieved using various computer vision techniques such as color-based tracking, depth sensing.

Hand Tracking: Once the hands are detected, the application needs to track their movement in real-time.
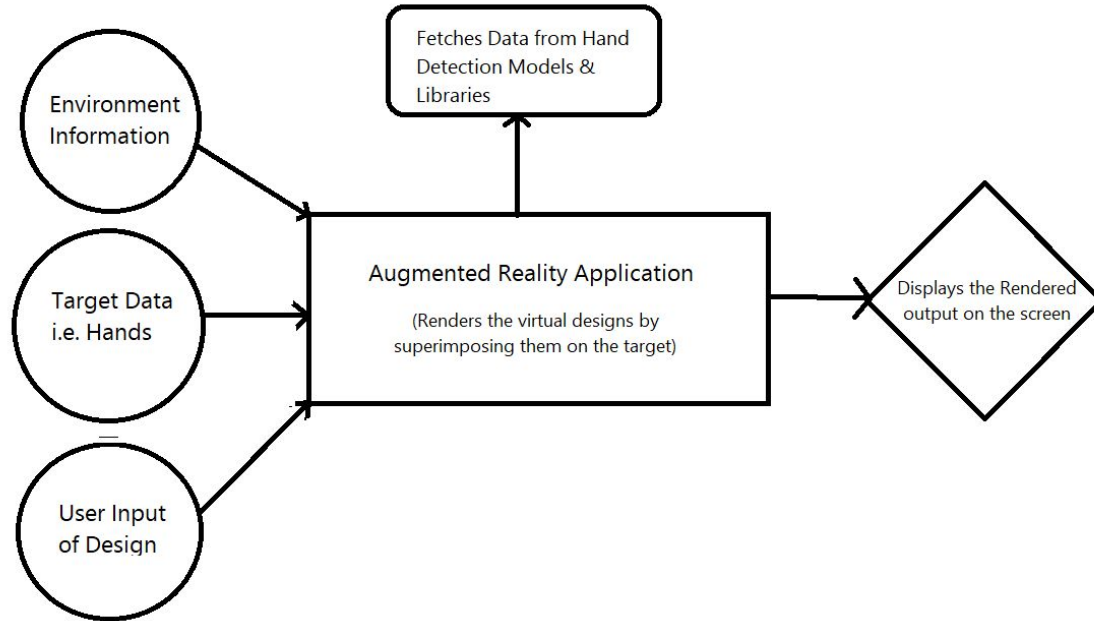
Virtual Design/Tattoo Overlay: After the hands are detected and tracked, the application can overlay virtual designs or tattoos on top of them.

User Interaction: The user needs to interact with the virtual designs or tattoos to change their appearance or location on the hand. This can be achieved using hand gestures or touch-based input, depending on the application's design.

Rendering and Display: The final step is to render the virtual designs or tattoos and display them on the user's screen in a realistic and engaging way. This requires careful attention to details such as lighting, shadows, and texture mapping to create a convincing and immersive experience.

Calibration and Testing: To ensure accurate and consistent hand tracking, the application needs to be calibrated and tested thoroughly.

Low Level Design

Fetches Data from Hand Detection Models & Libraries

Environment Information

Target Data i.e. Hands

User Input of Design

Augmented Reality Application

(Renders the virtual designs by superimposing them on the target)

Displays the Rendered output on the screen

Approach

Determine the hardware and software requirements

- You will need a computer with high end graphics card, a webcam or a camera , a display device such as smartphone or a tablet and an augmented reality software development kit.
- You may also need image recognition software or machine learning models to accurately detect and track the human hand .

TECH STACKS

Design the User Interface

- The next step is to design the user interface for your augmented reality application .
- We need to decide the design of the tattoos, as well as the placement and sizing of the tattoos on the human hand .
- We will be adding customization options for the user (placement of the tattoo).

Developing the Application

- This will involve creating the 3D models for the tattoos, programming the image recognition and tracking algorithms, and integrating all the components into a functional application.
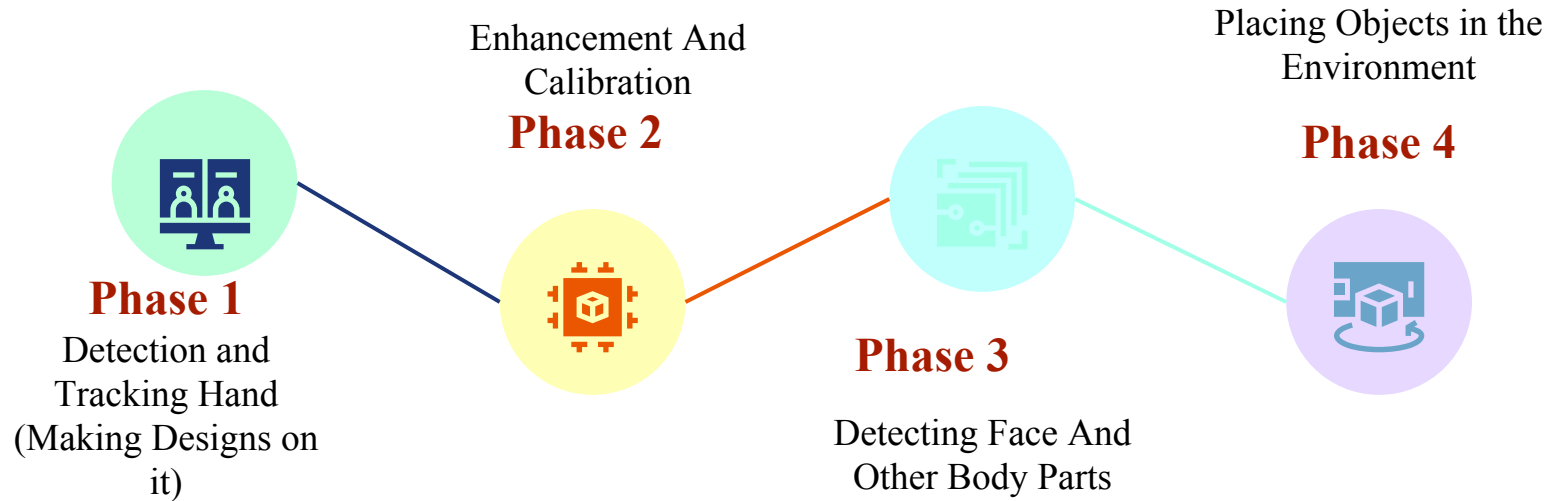
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Test and refine the application

After developing the application, it's important to test it thoroughly to ensure it works as intended. You may need to make adjustments to the image recognition and tracking algorithms, as well as the user interface, based on user feedback and testing results.

Project Timeline

Enhancement And Calibration
Phase 2

Placing Objects in the Environment
Phase 4

Phase 1
Detection and Tracking Hand (Making Designs on it)

Phase 3
Detecting Face And Other Body Parts

LITERATURE REVIEW

Architecture

- AR systems typically consist of three main components: a tracking system, a display device, and a user interface.

- The tracking system is responsible for determining the position and orientation of the user's device or camera in relation to the real-world environment.

- The display device overlays virtual information or objects onto the user's view of the real world.

- The user interface allows the user to interact with the virtual objects or information.

Parameters

- The paper discuss different types of AR Technology Intelligent display technology,3d registration Technology and Intelligent Interaction Technology.
- The paper also discuss about its potential impact on education,training, and marketing.
- It also discuss Limitations of AR.
- AR Development tools.

Limitations

- The paper may not provide the most up-to-date information on AR technology.

- The paper Does not compare AR technology with the other technologies. Like VR and MR.

- Lack of Empirical Evidence.

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Azuma, R. T. (1997). A survey of augmented reality. Presence: Teleoperators & Virtual Environments, 6(4), 355-385. doi: 10.1162/pres.1997.6.4.355

Parameters

- The survey may focus on a specific type of augmented reality, such as mobile AR or headset-based AR and six potential AR applications.

- The survey may involve a specific sample size or a particular selection criteria for the participants or survey respondents, such as AR developers, users, or researchers.

- Registration The objects in the real and virtual worlds must be properly aligned with respect to each other, or the illusion that the two worlds coexist will be compromised.

Limitations

- The survey may suffer from bias, such as sampling bias, response bias, or researcher bias, which may limit the generalizability of the findings.

- The findings of the survey may only be applicable to a specific population or context and may not be generalizable to other populations or contexts.

Mekni, M., & Lemieux, A. (n.d.). Augmented Reality: Applications, Challenges and Future Trends. University of Minnesota, Crookston Campus TANYT, Quebec (QC), Canada 978-960-474-368-1.

Architecture

- Types of AR Systems
- Components of AR Systems
- Applications of AR Technology
- Technical difficulties in creating realistic AR experiences
- Advancements in AR hardware
- New applications in emerging fields

Parameters

- There are many technical parameters that can affect the performance and quality of an AR system, including the accuracy and reliability of the tracking system, the resolution and brightness of the display device, and the responsiveness and usability of the user interface.

Limitations

- One of the main limitations of AR technology is its dependence on hardware and software limitations, such as the quality of the tracking system or the processing power of the user's device.

- Another limitation is the challenge of designing intuitive and effective user interfaces that can seamlessly integrate virtual and real-world interactions.

Thank You