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Location Based Plant Selection through Augmented Reality

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Abstract - *This review paper delves into the convergence of cutting edge augmented reality (AR) technology and location-based services for the refinement of plant selection in residential and decorative contexts. The need for informed and visually captivating plant choices becomes paramount in interior and exterior design. This paper conducts an exhaustive survey of the current landscape of AR applications in design aesthetics, spotlighting the emerging paradigm of location-based plant selection tailored for decorative purposes.*

This project aims to revolutionize the way people select and care for plants by leveraging augmented reality (AR) technology. With the increasing popularity of indoor and outdoor gardening, our system provides a user-friendly AR interface that allows individuals to identify and choose the perfect plants for their specific location. By simply pointing their mobile device at a spot, our AR app provides real-time information on the best plant options based on factors like sunlight, soil type, climate, and available space. Users can visualize how selected plants will look in their environment and receive care instructions. Online E-commerce application is a multi-user software where users can log in and buy different products online. Our project aims to allow customers to preview products or experience services in their own environment and on their own time, before electing to make a purchase.

Key Words: *Augmented Reality (AR), User Interface (UI), Virtual Plant Selection, E- commerce Web Application, COM Algorithm.*

1.INTRODUCTION

The location-based plant selection through augmented reality (AR) in the context of an e-commerce application represents a groundbreaking fusion of technology and nature. In the digital age, where online shopping is increasingly prevalent, this innovative approach revolutionizes the way individuals engage with and purchase plants. By leveraging the power of augmented reality, users can transcend the traditional limitations of online shopping and make informed decisions about plant selection based on their specific geographical location.

The significance of this project lies in its ability to bridge the gap between the virtual and physical worlds, offering users a unique and immersive experience. Traditional online plant shopping often lacks the personalized touch of physically examining and placing plants in one's living space. However, with the integration of augmented reality, users can virtually visualize how different plants would look in their specific environment, taking into account factors such as sunlight, space, and overall aesthetics. This project's potential impact is far-reaching. It not only enhances the user experience in plant selection but also contributes to the broader goals of environmental sustainability and urban greening. By encouraging users to explore and incorporate a variety of plants into their surroundings, the application promotes biodiversity, improves air quality, and fosters a deeper connection between individuals and nature.

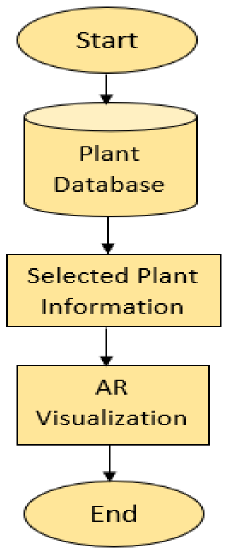

Fig -1: Flow Chart of System

Furthermore, the integration of an e-commerce platform adds a layer of convenience, allowing users to seamlessly transition from selecting and visualizing plants to making secure online purchases. This could potentially lead to increased interest in gardening and plant ownership, fostering a community of plant enthusiasts. The implementation of the application merges a 3D view of the plant using location-based AR and online money transaction features to present the most suitable solution to the problem. The implementation provides various features to the users so that they can also check how it would look, before buying it. An online payment option is also available to solve the problem of physical transactions of money. It's like having a tool that helps professionals create better and more eco-friendly landscapes for everyone to enjoy.

In essence, the location-based plant selection through AR stands at the intersection of technology, user experience, and environmental consciousness, offering a trans-formative way for individuals to connect with and cultivate their living spaces.

2. METHODOLOGY

Concurrent Odometry & Mapping Algorithm

Implementing ARCore Concurrent Odometry and Mapping (COM) algorithms in AR-based online shopping web applications offers a significant enhancement to the user experience and spatial understanding. The concurrent operation of odometry and mapping allows for more accurate tracking of the user's surroundings in real-time. In an online shopping context, this technology could be leveraged to provide users with a highly immersive and context-aware augmented reality experience.

Concurrent odometry and mapping algorithms are used in robotics for simultaneous localization and mapping tasks. The primary goal of such algorithms is to enable a robot to build a map of its environment while simultaneously estimating its own position within that environment.

ARCore likely employs SLAM techniques to create and update a 3D map of the environment. Concurrent mapping involves building and updating this map concurrently with estimating the camera pose. The ARCore Concurrent Odometry and Mapping algorithm, developed by Google, combines visual odometry and simultaneous localization and mapping (SLAM) techniques. Visual odometry enables the system to estimate the device's movement by analyzing changes in the visual scene captured by the camera. Simultaneously, mapping constructs and refines a 3D model of the environment as the user moves through it. This concurrent approach enhances tracking accuracy, especially in dynamic environments common in online shopping scenarios.

Working

Sensor Data Fusion: The algorithm typically fuses data from multiple sensors, such as wheel encoders, inertial measurement units (IMUs), cameras, lidars, or depth sensors. Each sensor provides different types of information, such as odometry (movement estimates), visual features, or depth measurements.

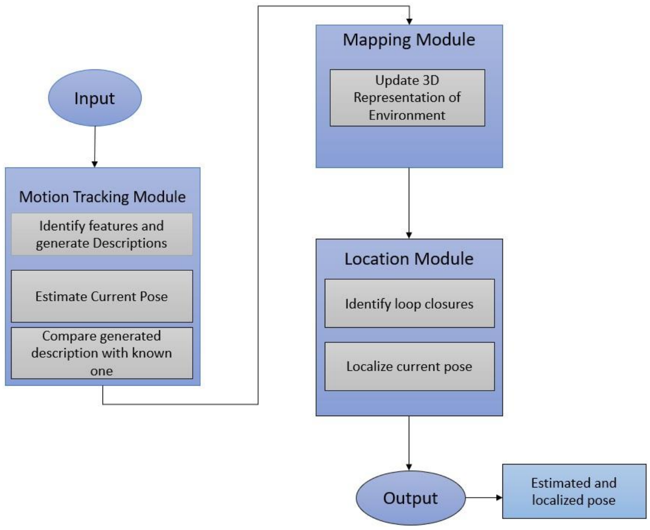

Fig -1: ARCore COM Algorithm

State Estimation: The algorithm maintains an estimate of the robot's current state, including its position, orientation, and velocity. This estimate is usually represented as a probabilistic distribution, such as a Gaussian distribution, and is updated over time based on sensor measurements and motion models.

Mapping: Concurrently with state estimation, the algorithm builds a map of the environment using sensor data. This map can be represented in various forms, such as occupancy grids, feature maps, or point clouds, depending on the type of sensor data available.

Sensor Fusion and Optimization: The algorithm integrates sensor measurements and motion models into a unified estimation framework using techniques such as Kalman filtering, particle filtering (e.g., Monte Carlo localization), or graph-based optimization (e.g., pose graph optimization). This step involves combining odometry data with measurements from other sensors to refine the robot's pose estimate and update the map.

Loop Closure Detection: To improve map consistency and accuracy, the algorithm may incorporate loop closure detection techniques to identify and correct errors in the estimated trajectory. This involves detecting when the robot revisits previously visited locations based on sensor data and matching features or landmarks between different parts of the map.

Online Operation: The algorithm operates in real-time, continuously processing sensor data and updating the robot's state estimate and map as it navigates through the environment. This requires efficient data processing and computational techniques to handle the high-dimensional, noisy sensor data typically encountered in robotic SLAM applications.

Fig -1: Visualize plant using AR Feature

For an online shopping web application, integrating ARCore COM can revolutionize the product visualization process. Users can view virtual products in their physical space with remarkable precision. The algorithm's real-time mapping capabilities enable persistent object placement, allowing users to leave and return to their augmented shopping environment seamlessly.

This technology has the potential to boost user engagement and confidence in purchasing decisions by providing a more realistic and contextually aware representation of virtual products. However, it's essential to consider potential challenges, such as computational intensity and device compatibility, when implementing ARCore COM in a web-based environment. Nonetheless, the benefits of a more accurate and immersive augmented reality experience make it a promising avenue for the evolution of online shopping applications.

3. ARCHITECTURE

The AR-based online plants shopping web application is built on a modern and scalable architecture designed to seamlessly integrate augmented reality into the user's online shopping experience. At its core, the application employs a microservices architecture, allowing for modular development and flexibility. The front end is developed using popular web technologies, ensuring compatibility across devices. The application relies on ARCore's Concurrent Odometry and Mapping (COM) algorithm for accurate tracking and mapping of the user's environment. The backend incorporates a robust database to manage plant information, user profiles, and order history.

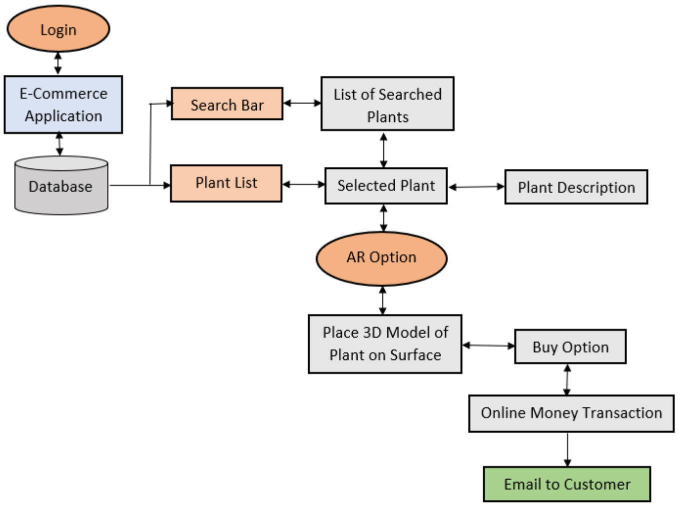

Fig -5: Architecture of System

APIs facilitate communication between the front end, AR features, and the backend. Location-based plant selection through augmented reality involves the integration of digital information and virtual elements into the physical environment, creating an immersive and contextually relevant experience for users. This innovative architectural approach leverages the precise positioning capabilities of augmented reality (AR) technologies to overlay data, graphics, and interactive content onto real-world locations. Security measures, including encryption and authentication protocols, are implemented to ensure user data privacy. Cloud services are leveraged for scalable storage and computing power, optimizing performance. The overall architecture prioritizes a user-centric design, offering a seamless blend of augmented reality and e-commerce functionalities for an immersive and efficient online plant shopping experience.

CONCLUSION

The location-based plant selection through augmented reality application not only revolutionizes the way people approach gardening but also fosters a deeper connection between individuals and the natural world. AR enables users to visualize how different plants would look in their actual surroundings in real time. This visualization can help users make informed decisions about the placement and arrangement of plants, allowing them to design their gardens or landscapes more effectively.

Augmented reality allows users to visualize plants in their real surroundings, helping them make well-informed decisions based on their preferences and space constraints. The scope of location-based plant selection through AR in e-commerce is vast, offering an opportunity to transform how customers engage with plants online. By providing personalized, interactive, and educational experience, this integration holds the potential to enhance customer satisfaction, promote sustainability, and drive business growth.

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