Final Project Proposal

CS 5330 - Pattern Recognition and Computer Vision

Spring 2024

AR Spatial Interaction with Physical Scale Objects Using Optical Flow

Objective:

To develop an augmented reality (AR) application capable of projecting virtual objects onto a plane surface with life-size representation. The primary goal is to implement local optical flow methods to accurately track movements in the physical environment and synchronize them with the virtual object, providing users with an immersive and interactive AR experience.

Methodology:

- **Feature Extraction:** Employ feature extraction algorithms such as ORB (Oriented FAST and Rotated BRIEF) to detect distinctive features in the surrounding environment, particularly on plane surfaces like the floor, which serve as reference points for anchoring the virtual object.
- **Virtual Object Placement:** Place a virtual object within the frame, aligning it with the extracted features on the plane surface. Ensure that the virtual object is scaled to match real-world dimensions.
- **Optical Flow Analysis:** Apply local optical flow methods to analyze the movement of pixels in the video stream. This analysis provides information about the motion of the surrounding environment.
- **Object Manipulation:** Utilize the optical flow information to manipulate the virtual object dynamically. Adjust the virtual object's position, orientation, and movement based on the detected optical flow patterns, providing an interactive and responsive augmented reality experience.
- **User Interaction:** Implement user interaction mechanisms to control and influence the behavior of the virtual object, allowing users to engage with the augmented reality environment in meaningful ways.

Project Output:

- An augmented reality application capable of placing virtual objects on plane surfaces detected in the real-world environment.
- Smooth manipulation and movement of virtual objects using local optical flow methods, synchronized with real-world movements.
- Accurate positioning and alignment of virtual objects based on the features extracted from surrounding planes.
- User-friendly interface allowing users to interact with and control the virtual objects seamlessly.

Submitted by

Suriya Kasiyalan Siva

Sai Kiran Juttu

Ruohe Zhou

Poojit Maddineni