Creating a 3D map of an unknown area and tracking a camera's movement using images have been important in robotics and computer vision. This is known as SLAM, and it's used in things like self-driving cars and augmented reality.

In the past, methods like the Extended Kalman Filter (EKF) [1] were used, but they were limited in accuracy and scope. Bundle Adjustment (BA) [2] improved upon this, especially for larger areas. Many methods, including PTAM, help to track objects in the environment.

We've seen advancements, like using more detailed features in images and improving camera tracking [3]. ORB-SLAM is an example of a system that excels at tracking a camera's movement and mapping its surroundings [4]. Some methods work even in environments with few details, but they require a lot of computing power.

For our first baseline of the project, we wanted to create a system that can map environments and track camera movements using both points and lines in images. This is particularly useful in environments with few details, like fields or open spaces. We tested our system and found that it performs well in highly detailed environments and still gives good results in low-detail areas, where other methods struggle.

The custom class implements a stereo visual Simultaneous Localization and Mapping (SLAM) algorithm, crucial for robots or vehicles to map their surroundings and track their position within that map. The algorithm's stages include:

**Initialization:** Establishes initial 3D points and a keyframe using the first stereo image pair.

**Feature Detection and Extraction:** Uses ORB features for robustness in rotation and lighting changes.

**Tracking and Local Mapping:** Estimates the camera's pose relative to the last keyframe and updates keyframes and 3D points.

**Loop Closure Detection:** Identifies revisited areas to correct tracking errors.

**Global Optimization:** Refines keyframe and map point positions for accurate and consistent mapping.

In our work, we used MATLAB to create the environment and generate the point cloud data, which helped us develop and test our system effectively.

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