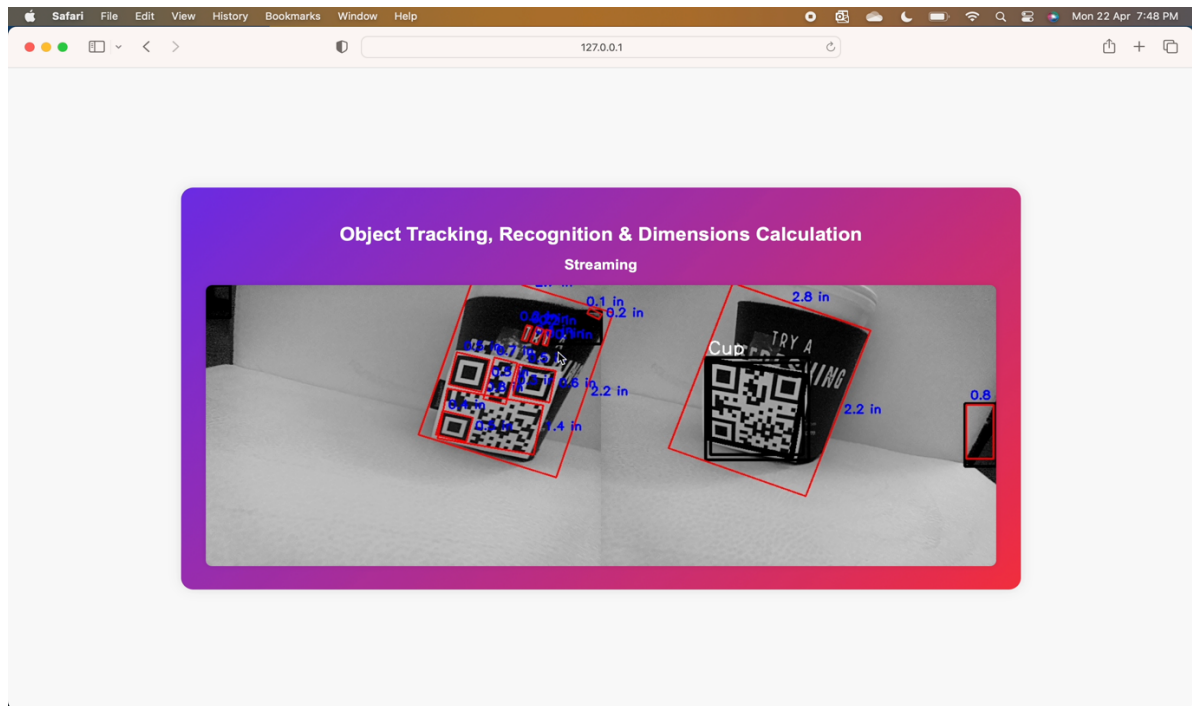


## CV Assignment 4 : Vamsi Krishna Reddy Devireddy (002793151)

1. Implement an application (must run on web or as an app on mobile device) using the stereo camera where it will recognize, track and estimate dimensions (at least 2D) of any object within 3m distance and inside field-of-view to the camera. You can use barcodes or text recognition tools for identification. However, the entire object must be tracked (not just the barcode or text). **Machine/Deep learning tools are NOT allowed.**



I started by setting up the stereo camera system to ensure both cameras captured synchronized images seamlessly.

Next, I delved into the calibration process for the stereo camera, a crucial step that provided essential parameters needed for precise image analysis.

To estimate the depth of objects within the camera's field of view, I utilized stereo vision techniques, particularly stereo matching, enhancing spatial understanding significantly.

For effective object detection, I explored various methods such as contour detection and background subtraction, allowing me to detect and outline objects accurately within captured frames.

Implementing object tracking was another key step, where I utilized algorithms like centroid tracking to monitor and track identified objects across successive frames, ensuring smooth continuity and precise tracking.

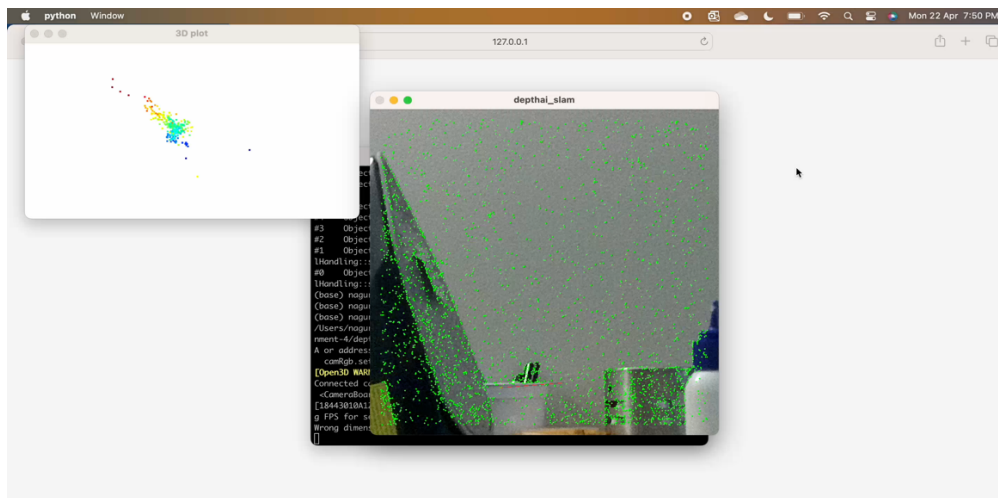
Object recognition was also integrated, utilizing text recognition software and barcode readers to identify and categorize items, including QR codes, present within the captured frames.

To enable accurate size estimation, I configured the camera system for pixel-to-metric conversion, converting pixel data into real-world dimensions for precise measurement accuracy.

Object measurement techniques such as bounding box measurements and contour analysis were then employed to provide detailed dimensions of recognized objects, which were presented alongside processed frames with tracked object dimensions for thorough analysis.

Finally, I integrated all these components into a unified application, ensuring seamless functionality suitable for various platforms such as mobile devices or online interfaces, creating a cohesive and user-friendly experience.

**2. Use the DepthAI SDK or use ORB3-Visual SLAM ([https://github.com/UZ-SLAMLab/ORB\\_SLAM3](https://github.com/UZ-SLAMLab/ORB_SLAM3)) to execute the scripts on your depth camera and run experiments in two different locations. Provide snapshots of your SLAM output and what limitations/corner cases do you observe.**



- 1. Getting Ready:** I kicked things off by setting up either the DepthAI SDK or ORB-SLAM3 and ensuring my depth camera was finely calibrated and correctly connected. This step was crucial to align the camera settings with what the software needed, like getting the resolution and color sequence right.
- 2. Planning Out the Experiment:** I carefully chose two different locations, one indoors with controlled lighting and another outdoors with changing light conditions. This way, I could test how well the SLAM algorithms handled various environments.

**3. Capturing Data:** Using the provided scripts, I grabbed RGB-D frames at each location, making sure to capture a rich variety of features and textures. This variety was important for the algorithms to accurately track and map the surroundings.

**4. Recording and Reviewing:** After running the SLAM scripts, I recorded the output—mapped environment, camera movement, and identified landmarks or features. I also documented this visually with images and videos to have a clear record.

**5. Digging Into the Data:** With all the media in hand, I dove into analyzing how the SLAM algorithms performed in both locations. I paid close attention to any differences or similarities in mapping accuracy, how well it tracked movement, and how it recognized features.

**6. Taking Notes:** Throughout the experiment, I kept detailed notes in a journal. This included everything from setup details to any unexpected behaviors or patterns I noticed during the SLAM process.

**7. Putting It All Together:** Once I had all the data and observations, I compiled everything into a thorough report. This report covered the experiment setup, execution, findings, and insights gained, offering a comprehensive view of how the SLAM algorithms handled different real-world scenarios.

**<https://github.com/krishnadv97/CV-Assignments>**