<link: https://github.com/ShakibaMashini/ComputerVision-csc8830/tree/main/hw1>

This document summarizes my submission for Homework 1.

It includes the problem description, methodology, validation experiment, and GitHub repository link.

This homework involves estimating real-world object dimensions from a single calibrated image using perspective projection equations.

The assignment includes:

1. Computing real-world dimensions from one image.

2. Creating an interactive measurement tool.

3. Validating results via experiment.

**Method Summary**

Given a calibrated camera and a known distance Zc:

Rescale intrinsic matrix K if image resolution differs.

Click two points (u1,v1) and (u2,v2) on the image.

Convert them into camera coordinates using:

(x, y, 1)^T = K^{-1} (u, v, 1)^T

Back-project at depth Zc:

P = Zc \* K^{-1} [u, v, 1]^T

Compute Euclidean distance:

L = ||P1 - P2||

The script generates:

- Pixel distance

- Real-world estimated distance

- Annotated visualization saved as measure\_depth\_result.png

**Validation Procedure**

1. Place an object at a known measured distance from the camera.

2. Capture an image.

3. Run the script and click two object points.

4. Compare estimated vs. true measurement.

A book on a desk

Description automatically generated

**Web Application**

A browser-based measurement tool was developed to complement the Python implementation. The web app allows users to load an image, click two points, and compute the real-world distance using the same projection equations.

### ****Files Included****

* **index.html** — Main interface displayed in the browser
* **script.js** — Handles image loading, point selection, and distance computation
* **style.css** — Provides layout and visual styling

### ****How to Run****

### ****Functionality****

The app:

* Loads an image
* Allows the user to click two points
* Computes the real-world distance using perspective projection
* Displays the result and overlays it on the image

A computer screen with a message

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A computer screen with a book on it

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