

School of Engineering and Applied Science (SEAS), Ahmedabad University

ECE501: Digital Image Processing

Group Name: NetraByte

Project: 11. Automated Object Counting (Coins, Cells, etc.)

Team Members:

- Aashi Shah (AU234041)
- Bansi Mahkana (AU2340191)
- Diya Patel (AU2340010)
- Nirjara Jain (AU2340184)

I. Introduction

Object counting is the process of counting unique objects in images. Segmentation is achieved by separating single objects from the background of the image and labeling the pixels as object or non-object regions. Connected component identification picks out and labels clusters of interconnected pixels that represent single objects. By utilizing these methods, the system can calculate the total object count and produce annotated images with each object highlighted.

II. Objectives

This project aims to apply image pre-processing and segmentation methods for finding multiple identical objects in images, use connected component analysis to mark and count separated object regions, and generate annotated images with highlighted objects for visual validation.

III. What has been done so far (Progress)

During the first week, we are exploring the fundamentals and ongoing research on automated object detection. We went through several reference papers on Google Scholar to understand various approaches, algorithms, and applications that feature in this area of study. The core aim was to look at the popular techniques that feature, for example edge detection methods (for instance, canny edge detection), and their performance across multiple contexts.

Based on the literature review, we are currently shortlisting a certain object or group of objects on which to focus for implementation. This review assisted in narrowing down certain datasets, evaluation metrics, and associated techniques that can be utilized in subsequent project stages.

IV. What is planned for next week

- Discuss with the professor and confirm the class of the object under the "Automated Object Counting" field.
- Determine the finer methodology for the detection and counting of objects.
- Begin working on various image pre-processing operations (grayscale conversion, filtering, thresholding) for object segmentation.
- Plan the approach for implementation (software/tools selection: MATLAB or Python OpenCV).

References

- [1] C. Edlund, T. R. Jackson, N. Khalid, N. Bevan, T. Dale, A. Dengel, S. Ahmed, J. Trygg, and R. Sjögren, "LIVECell—A large-scale dataset for label-free live cell segmentation," *Nature Methods*, vol. 18, no. 9, pp. 1038–1045, 2021. [Online]. Available: <https://www.nature.com/articles/s41592-021-01249-6>
- [2] Nitya123-Github, "Automation of Counting Objects Using Image Processing Techniques," 2023. [Online]. Available: <https://github.com/nitya123-github/Automation-of-counting-objects-using-Image-processing>
- [3] Majumder M, Wilmot C. Automated Vehicle Counting from Pre-Recorded Video Using You Only Look Once (YOLO) Object Detection Model. *Journal of Imaging*. 2023; 9(7):131. <https://doi.org/10.3390/jimaging9070131>
- [4] C. Edlund, T. R. Jackson, N. Khalid, N. Bevan, T. Dale, A. Dengel, S. Ahmed, J. Trygg, and R. Sjögren, "LIVECell—A large-scale dataset for label-free live cell segmentation," *Computers in Biology and Medicine*, vol. 162, p. 107206, 2024. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S187705092402605X>