*SeeFood: Image Enhancement to Improve Segmentation Performance*

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*Abstract*—When attempting to identify food within images using computer vision for nutritional analysis, inconsistent image quality often hampers segmentation performance. Variations in lighting, angles, and focus can affect recognition accuracy, making segmentation difficult. This study explores the image enhancement techniques of scaling, sharpening, and applying the Wiener filter as pre-processing steps to improve the success rate of segmentation and recognition. By analyzing image quality metrics such as standard deviation and the Measure of Enhancement (EME), we demonstrate the effectiveness of these enhancements. The goal of this work is to optimize input image quality, facilitating more accurate food identification within computer vision systems.

# Big Problem

What is the big problem or big idea that inspired your project? How do you propose to solve or address the challenge?

When trying to identify objects within an image using computer vision, the quality of the image plays a big role in the performance of the segmentation required to distinguish individual accurately. When given any image, there is no guarantee of consistency in the quality of that image. Most times the image given can vary depending on where and how it was taken. Certain factors like lighting, angles, and focus can drastically decrease the success rate of any image recognition performed on the image. To improve the segmentation’s performance and in turn the success rate of image recognition when it comes to identifying food that will be recognized for its nutritional value, certain enhancements must be performed on the input image to try to optimize the success rate of the image recognition. These enhancements include scaling, sharpening, and the application of the Wiener filter on a given image, and we can show the amount of enhancement by utilizing comparisons of image metrics like standard deviation and measurement of enhancement. The goal of this work is to serve as a pre-processing step to a computer vision module that will be identifying food within supplied images.

# Dataset

Explain your dataset acquisition. Explain how you built your dataset, what inspired the specific creation? Show me sample pictures. This should be as more detailed than the proposal report. Include statistics if it helps. I should have a clear picture of what is included in the dataset and how many samples, features, dimensions, etc.

# Methodology

What is your detailed plan on how to execute this? Show me a block diagram of how the data is going to be processed with what technique. Explain each part/module as if you were explaining to a high schooler. Include equations, and a description that nicely describes them. Put high level pseudocode that doesn’t take half the page.

# Experiment Design

Explain your experiment design and all the combinations you choose to do with an explanation to why you chose it. Include the metrics you plan to use to evaluate it. This design should already be finalized by the midpoint.

# Results and discussion

Show me your final results and how does it look like with tables and charts. What do you achieve? Describe and synthesize your results per experiment you conducted. You can include results in the mid report if you have any but it isn’ required. The final report, it is required.

# Gantt Chart

Show me a Gantt chart. Which team member was responsible for what task? If you are doing the mid report, tell me what you accomplished and what you’ll be doing for the rest of the semester. If this is the final report, summarize your tasks and accomplishments and explain why some tasks weren’t done.

# conclusion

Mid report: Do you need any help from me? What do you need to help you succeed in the project? If not, then tell me you’re good.

Final report: what did you learn from this project that was an extension of the class? How satisfied are you with the final product? Anything else you would like to say about your project?

Conclude your findings on how the data was processed in an abstract level that aided the algorithmic construction and what the experiments showed.

##### Acknowledgment *(Heading 5)*

##### References

1. G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*
2. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.

APPENDIX

put this section for the final report. I would like for your group to give me your feedback on the course. What did you think of the assignments? Programming assignments? Lecture structure? What could I do differently next semester to improve the course? This won’t go towards or against your grade, but it would greatly help me in improving the course. So honesty is appreciated.

**Mid Report Rubric**

**65 points maximum**

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|  | | 15 | 10 | | 5 | | 4 | | 1 | | 0 | |
| **Title** |  | | |  | |  | |  | | A descriptive title of the project is provided. | | A generic title or an assignment title is given |
| **Abstract** |  | | |  | |  | | An informative abstract that summarizes the problem, methodology, experiments, results. 1 paragraph max | | Informative, but it exceeds 1 paragraph | | Not informative abstract or not present |
| **Big Problem** |  | | |  | | Much thought has been put into finding or creating a problem. | |  | | A thought was given, but I am unable to see the problem. | | No problem was clearly discussed. |
| **Methodology** | Includes a block diagram, descriptions of chosen algorithms, follow formatting, has requested information | | | Missing one of the items asked or the missing one is insufficient in context | | Missing two of the items asked or the missing ones is insufficient in context | | Missing three of the items asked or the missing ones is insufficient in context | |  | | All is missing or not coherent. |
| **Dataset Description** | . | | | The dataset was properly explained in terms of acquisition and description | | The acquisition was described, but the dataset description lacked. | |  | | Both acquisition and description lacked | | No explanation was given. |
| **Experiment Design** | Three experiments were given and detailed of the parameters they will be testing, the type of data they’ll be using, and the metrics for the problems and the algorithms’ efficacy | | | Only two experiments were given with the rest of the requirements | | Only one experiment was given with the rest of the requirements | |  | |  | | No experiments were given |
| **Gantt Chart** |  | | | Visually nice chart with clear deliverables for each assignment for each team member. | | Each team member had an assignment but the Gantt chart is vague. | |  | | Too vague of a chart. Not everyone has evenly distributed responsibilities. | | No chart given. |
| **Conclusion and References** |  | | |  | | Addressed the requested information – the update and findings. References in MLA format | |  | | Only one of the requested information was done. References not in MLA format | | None of it was done |

- 1 point: report not properly named

- 5 points: report is not in paragraph format

**Final Report Rubric**

**75 points maximum**

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|  | | 15 | 10 | | 5 | | 4 | | 1 | | 0 | |
| **Title** |  | | |  | |  | |  | | A descriptive title of the project is provided. | | A generic title or an assignment title is given |
| **Abstract** |  | | |  | |  | | An informative abstract that summarizes the problem, methodology, experiments, results. 1 paragraph max | | Informative, but it exceeds 1 paragraph | | Not informative abstract or not present |
| **Big Problem** |  | | |  | | Much thought has been put into finding or creating a problem. | |  | | A thought was given, but I am unable to see the problem. | | No problem was clearly discussed. |
| **Methodology** | Includes a block diagram, descriptions of chosen algorithms, follow formatting, has requested information | | | Missing one of the items asked or the missing one is insufficient in context | | Missing two of the items asked or the missing ones is insufficient in context | | Missing three of the items asked or the missing ones is insufficient in context | |  | | All is missing or not coherent. |
| **Dataset Description** | . | | | The dataset was properly explained in terms of acquisition and description | | The acquisition was described, but the dataset description lacked. | |  | | Both acquisition and description lacked | | No explanation was given. |
| **Experiment Design** |  | | | Three experiments were given and detailed of the parameters they will be testing, the type of data they’ll be using, and the metrics for the problems and the algorithms’ efficacy | | Only two experiments were given with the rest of the requirements | | Only one experiment was given with the rest of the requirements | |  | | No experiments were given |
| **Results** | Results are insightful with discussion and syntheses for quantitative work in each experiment | | | results only have discussion for all experiments | | Results only have discussion for some experiments | | Results have some discussion for minimal experiments | |  | | Results are not insightful |
| **Gantt Chart** |  | | | Visually nice chart with clear deliverables for each assignment for each team member. | | Each team member had an assignment but the Gantt chart is vague. | |  | | Too vague of a chart. Not everyone has evenly distributed responsibilities. | | No chart given. |
| **Conclusion Future Work** |  | | |  | |  | | Addressed the requested information – the update and findings. | | Only one of the requested information was done. | | None of it was done |
| **References** |  | | |  | |  | |  | | References in MLA format | | References incorrect |

- 1 point: report not properly named

- 5 points: report is not in paragraph format

**Code Rubric**

*None*