

Thoughts of Learning Poisson Image Editing

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Abstract

Since July 27, I embarked on acquiring knowledge in Poisson Image Editing and have effectively applied this technology to blend various simple images yesterday. In this article I aim to provide a retrospective analysis of my learning experience, along with some reflections derived from this invaluable pursuit.

1 Obstacles

The initial challenge I encountered was comprehending the complex mathematical principles underpinning this technology. The sight of sophisticated and unfamiliar mathematical formulas, including Convolution, Laplacian Operator, Euler-Lagrange Equation, and Discrete Mathematics, overwhelmed me with a sense of desperation, as these were areas of knowledge I had not yet explored. Another block I faced was the translation of these equations into practical code. While I possessed the capability to execute basic operations, I had no idea how to implement concepts like matrices, gradients, divergences, and other related components.

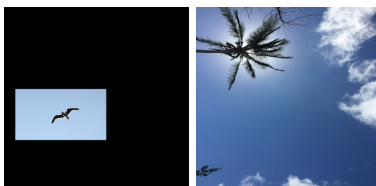
2 Solutions

To address the first issue, I extensively explored resources on platforms like ZhiHu, CSDN, and YouTube. Additionally, I sought assistance from a good friend who was also participating in this training camp. Through collaborative efforts, I eventually grasped the beautiful and ingenious concept behind Poisson Image Editing. However, due to the limitations of my mathematical knowledge, my understanding of the derivation process from the gorgeous idea to solving the linear equation $Ax = b$ remained somewhat rudimentary. To overcome the coding obstacle, I turned to GitHub and discovered valuable dependencies such as numpy, scipy.sparse, and opencv. Leveraging these helpful tools, I successfully developed a basic code to implement image blending.

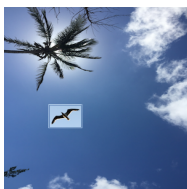
3 Comparison

Here are an example of applying the Poisson Image Editing.

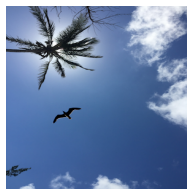
Example1



Directly copy



Poisson Image Editing



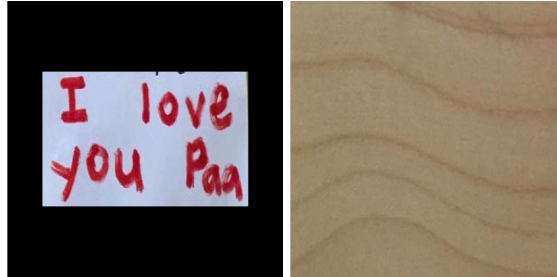
4 Reflections

Upon completing this project, I have come to recognize the immense value of mathematics in scientific research and gained a deeper understanding of what constitutes genuine research. In the past, I held a naive belief that pursuing a computer science major would allow me to avoid the complexities of tedious and abstract mathematical philosophy. However, my experience has proven just the opposite. Mathematics, in fact, lays a solid foundation for scientific research and extends its influence across various fields. It becomes evident that without a firm grasp of mathematics, significant progress becomes unattainable. Conducting research demands an unwavering internal drive to tackle challenging and intricate knowledge. Moreover, courage and creativity are essential qualities. Stepping out of one's comfort zone and daring to explore cutting-edge areas that others have not yet delved into. Embracing creativity and originality

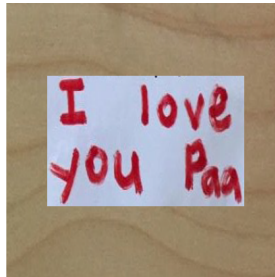
while not being bound by conventional examinations.

5 More examples

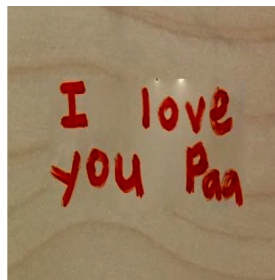
Example2



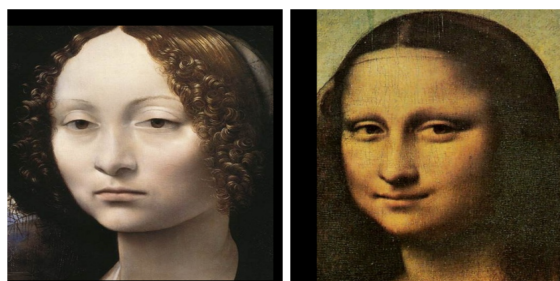
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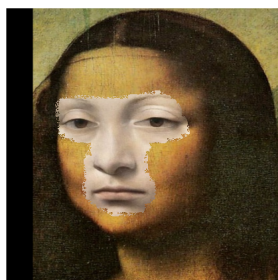
Poisson Image Editing



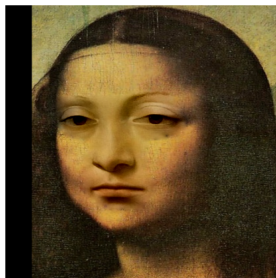
Example3



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Poisson Image Editing



Example4



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Poisson Image Editing

