CONTENT AWARE RESIZE

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ABSTRACT

THIS PROJECT IMPLEMENTS CONTENT-AWARE IMAGE RESIZING, A TECHNIQUE THAT SELECTIVELY REMOVES PIXELS FROM AN IMAGE WHILE PRESERVING ITS CONTENT STRUCTURE. THE KEY ALGORITHM USED IS DYNAMIC PROGRAMMING TO FIND THE VERTICAL PATH WITH MINIMUM TOTAL ENERGY, THUS IDENTIFYING THE SEAM TO BE REMOVED. THE REPORT PROVIDES DETAILED METHODOLOGY, RESULTS, AND CONCLUSIONS, SHOWCASING THE EFFECTIVENESS OF THE IMPLEMENTED APPROACH.

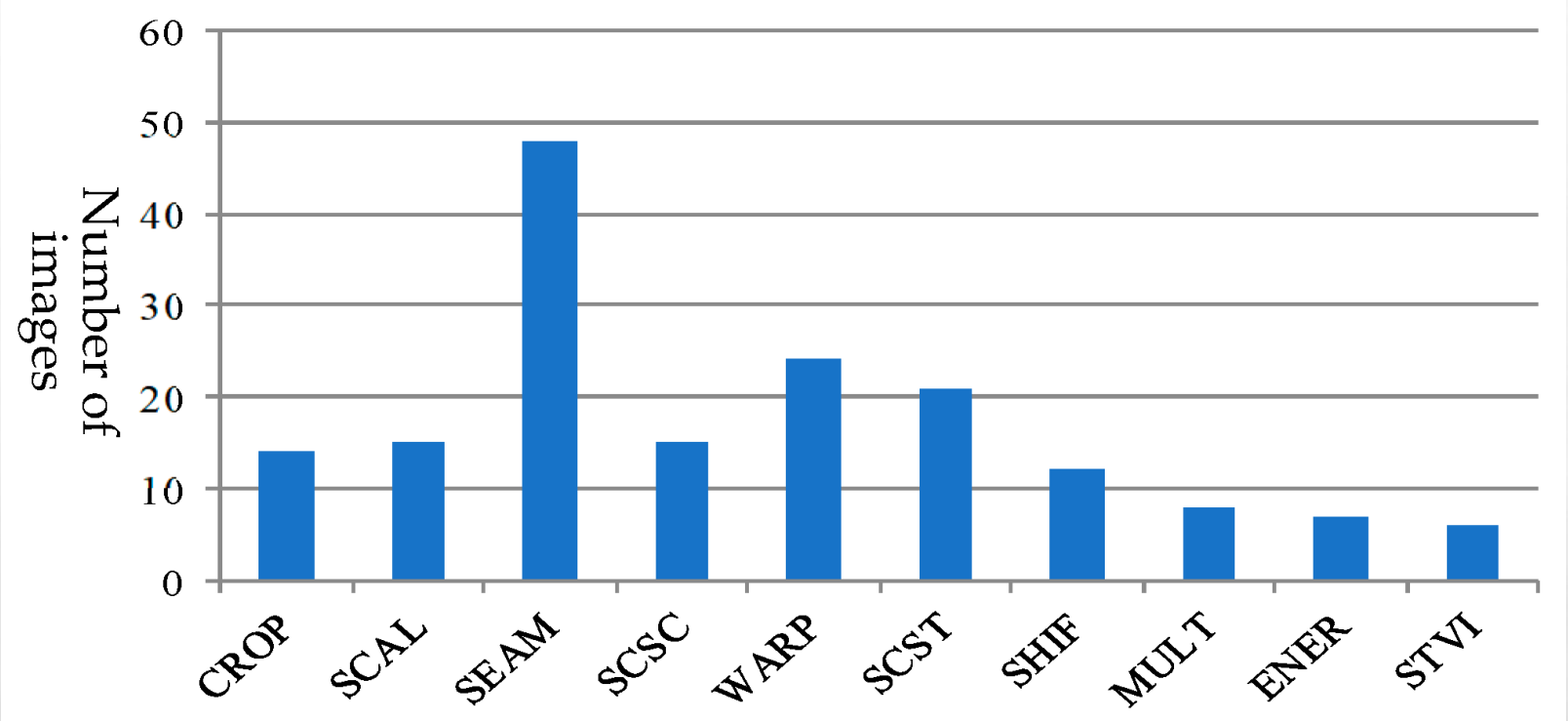
INTRODUCTION

IMAGE RESIZING IS A COMMON TASK IN IMAGE PROCESSING, OFTEN PERFORMED TO ADAPT IMAGES FOR VARIOUS DISPLAY DEVICES OR TO MEET SPECIFIC SIZE REQUIREMENTS. TRADITIONAL RESIZING TECHNIQUES SUCH AS SCALING CAN DISTORT IMPORTANT VISUAL CONTENT, LEADING TO UNSATISFACTORY RESULTS. THE MOTIVATION FOR THIS PROJECT STEMS FROM THE NEED FOR AN EFFICIENT AND EFFECTIVE IMAGE RESIZING TECHNIQUE THAT CAN ADAPT IMAGES TO DIFFERENT DISPLAY SIZES WITHOUT DISTORTING THEIR CONTENT. THE OBJECTIVE OF THIS PROJECT IS TO IMPLEMENT THE SEAM CARVING ALGORITHM USING DYNAMIC PROGRAMMING AND EVALUATE ITS PERFORMANCE IN RESIZING IMAGES.

METHODOLOGY

THE IMPLEMENTED ALGORITHM UTILIZES DYNAMIC PROGRAMMING TO CALCULATE THE CUMULATIVE ENERGY OF SEAMS IN AN IMAGE. THE ENERGY MATRIX IS COMPUTED BASED ON IMAGE GRADIENTS OR OTHER FEATURES THAT INDICATE THE IMPORTANCE OF EACH PIXEL. THE ALGORITHM THEN IDENTIFIES AND REMOVES LOW-ENERGY SEAMS ITERATIVELY UNTIL THE DESIRED IMAGE WIDTH OR HEIGHT IS ACHIEVED.

THE PROGRAMMING LANGUAGE USED FOR IMPLEMENTATION IS C#, AND THE ALGORITHM TAKES AS INPUT AN ENERGY MATRIX REPRESENTING THE IMPORTANCE OF EACH PIXEL IN THE IMAGE. THE PARAMETERS CHOSEN INCLUDE THE WIDTH AND HEIGHT OF THE IMAGE, WHICH DETERMINE THE FINAL SIZE AFTER RESIZING. ASSUMPTIONS MADE INCLUDE THE INDEPENDENCE OF PIXEL ENERGIES AND THE VALIDITY OF THE DYNAMIC PROGRAMMING APPROACH FOR SEAM IDENTIFICATION.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RESULTS

EXAMPLE 1:

1.CALCULATE ENERGY FOR EACH PIXEL IN THE INPUT MATRIX.

1. ENERGY CALCULATION:

1. FOR EACH PIXEL, COMPUTE THE ENERGY BASED ON COLOUR GRADIENTS.

2. THIS CAN BE DONE USING ALGORITHMS SUCH AS SOBEL OR PREWITT OPERATORS.

2.FIND THE VERTICAL PATH WITH MINIMUM TOTAL ENERGY.

1. USE DYNAMIC PROGRAMMING TO CONSTRUCT A TABLE OF CUMULATIVE ENERGIES.

2. TRACE BACK THROUGH THE TABLE TO IDENTIFY THE PATH WITH THE LEAST TOTAL ENERGY.

3.IDENTIFY THE SEAM PATH COORDINATES.

1. RECORD THE COORDINATES OF THE PIXELS ALONG THE IDENTIFIED PATH.

4.REMOVE PIXELS ALONG THE IDENTIFIED SEAM.

1. REMOVE THE PIXELS CORRESPONDING TO THE SEAM PATH COORDINATES.

2. THIS RESULTS IN A RESIZED IMAGE WITH REDUCED WIDTH WHILE PRESERVING IMPORTANT CONTENT.

EXAMPLE 2:

1.CALCULATE ENERGY FOR EACH PIXEL IN THE INPUT MATRIX.

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2. THIS CAN BE DONE USING ALGORITHMS SUCH AS SOBEL OR PREWITT OPERATORS.

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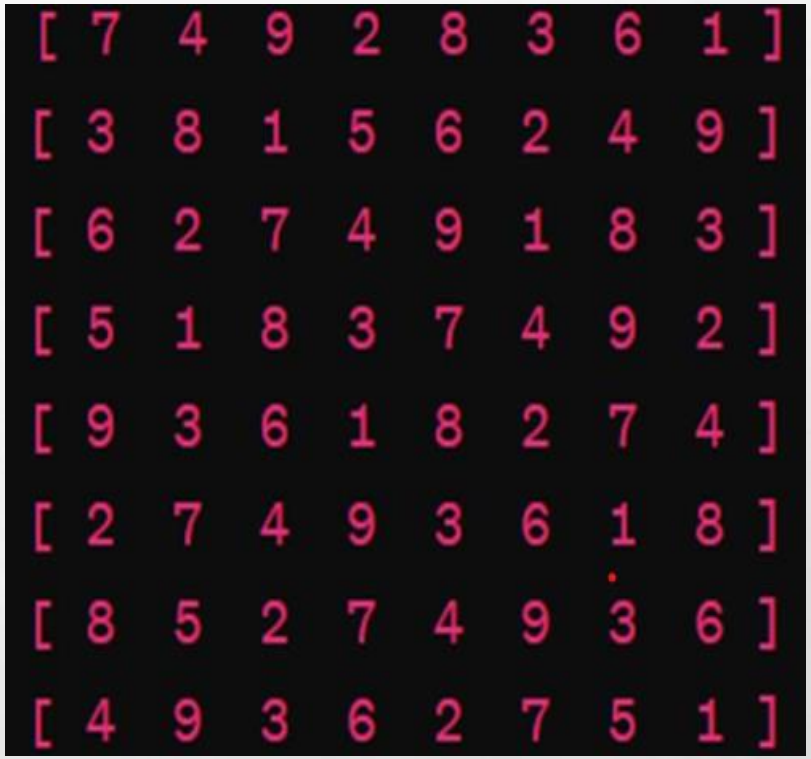

CONCLUSION

IN CONCLUSION, THE PROJECT SUCCESSFULLY IMPLEMENTED THE SEAM CARVING ALGORITHM USING DYNAMIC PROGRAMMING. THE ALGORITHM EFFECTIVELY RESIZES IMAGES WHILE PRESERVING IMPORTANT VISUAL CONTENT, MAKING IT SUITABLE FOR VARIOUS APPLICATIONS IN IMAGE PROCESSING AND COMPUTER VISION. FUTURE WORK MAY INVOLVE OPTIMIZING THE ALGORITHM FOR REAL-TIME APPLICATIONS AND EXPLORING ADDITIONAL FEATURES FOR SEAM IDENTIFICATION.

REFRENCES

AVIDAN, S., & SHAMIR, A. (2007). SEAM CARVING FOR CONTENT-AWARE IMAGE RESIZING. ACM TRANSACTIONS ON GRAPHICS (TOG), 26(3), 10.