Aerial Robotics Kharagpur task2

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***Abstract*— This work addresses the challenges of image reconstruction from a distorted image. The implementation involves applying a filter derived from pi digits to the distorted image and template matching to locate a known object within a collage. This has potential applications in image restoration and object localization.**

Using a corrupt image of pi we find the points were it is dissorted.We create a 2*2 filter using the distorted pi points and it is used along with 3 bitwise operation.This filter is applied on a corrupt image to retrieve a the potrait back. We use this this to unlock a passowrd for a zip file on which path tracking algorithm rrt is applied.

image distortion and dilter are very important part and corrupting images happen in day to day activities.retrieving them back my reverse engineering plays a very vital role.

I. INTRODUCTION

The primary objective of this task is to solve a series of interconnected puzzles to extract information necessary for obtaining the password to a zip file. The zip file contains an image on which a path-planning algorithm, specifically RRT, is to be implemented.

PROBLEM STATEMENT

The problem, titled "2 Gebe dich nie auf," comprises the following tasks:

1) **Filter Recovery from Pi Image:**
   - A distorted image, *pi.image.png*, contains distorted digits of π.
   - Recover these digits by multiplying each pixel value by 10π and applying the floor function.
   - Arrange the recovered digits in descending row-major order to form a 2×2 filter.
2) **Restoring Picasso's Artwork:**
   - Picasso's artwork is a distorted copy of a famous portrait.
   - The distortion is achieved using a 2×2 filter and bitwise operations (OR, AND, XOR).
   - Apply the filter (derived from the pi image) to the distorted Picasso image to recover the original portrait.
   - This recovered portrait will serve as a template for the next step.
3) **Template Matching:**
   - An image, *collage.png*, contains the recovered portrait (template).
   - Scale this template to 100×100 pixels.
   - Implement template matching from scratch to find the top-left corner coordinates of the template in *collage.png*.
4) **Password Calculation:**
   - Add the abscissa and ordinate of the top-left corner obtained from template matching.
   - Multiply the sum by π.
   - Round the result down to the greatest integer to obtain the password for a zip file.
5) **RRT-connect Algorithm:**
   - Apply the RRT-connect path planning algorithm to provided images (likely from Task 1).
   - Attach the image of the resulting path.

*Write anyone who might have helped you accomplish this eg any senior or someone

II. FINAL APPROACH AND WORKFLOW

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1)In the distorted pi image we can see there are 4 white points.Our aim is to find those 4 points.We find the first 2600 digits of pi for this purpose and iterate to find the following. The found 4 digits are 0 3 8 9 .Using this we create a filter which will be used in the upcoming parts of the task.

Fig. 1. pi.image

The 2d filter is : [[282 251][94 0]]

2) We apply this filter on the artwork window by window.The only logical bitwise operator is XOR because it is its own inverse.Applying it in on the artwork we get a template as follows.

Fig. 2. Template

3) After which we use this template and do template matching to find the coordinates of the top left coordinates:
The password is : 628

4)we use this password to open the zip file and the image in the file is the following maze

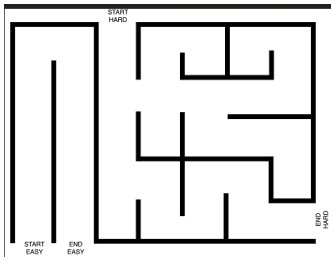

Fig. 3. maze

5)we run the rrt algortihm on it inorder to get the path as shown in the result section. rrt algorithm and its implementation in the reference.

III. Results and Observation

image obtained after applying filter

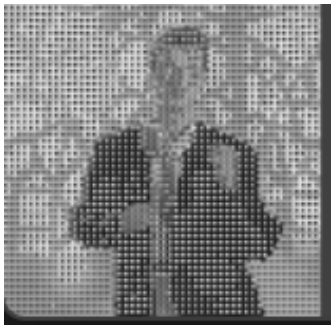

Fig. 4. rickroll

the final path tracking algorithm result :

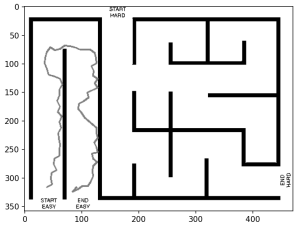

Fig. 5. path tracking using rrt

CONCLUSION

This task presented a combined challenge in image processing and computer vision. It required the continuous application of various techniques, including the extraction of information from a image to construct a filter. the usage of this filter for image restoration, and the following application of template matching for object localization. The successful completion of these steps culminated in the extraction of the desired output, demonstrating the interplay of different image processing methodologies.

REFERENCES

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References

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