DOCUMENT SCANNER

Group-13

Submitted for third review as part of J component in Digital Image Processing

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ABSTRACT

By definition, a document scanner is a device, which converts a document or text from its paper form into digital data. The basic idea behind this project is to make a scanner which scans the

document to be scanned and gives a top-down view alongwith enhancement. For scanning a document we follow mainly three steps i.e. edge detection, finding contours and applying perspective transform and thresholding. Storing and managing paper documents is expensive, especially if you rely on file cabinets for document storage and retrieval. Document scanning allows you to store and retrieve your documents online. This reduces your storage costs and provides greater work efficiency. Paper-based systems are inherently inefficient. Documents need to be printed or photocopied so several people can view them at the same time. Document scanning enables your information to be shared digitally for enhanced employee collaboration and improved customer response times.

1.INTRODUCTION

1.1 THEORETICAL BACK GROUND

A scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display. Scanners come in hand-held, feed-in, and flatbed types and for scanning black-and-white only, or color. In our scanner we can scan a coloured image and convert it into a black and white image. The code is in python and OpenCV library has been used for the predefined functions.

The first step to building our document scanner app using OpenCV is to perform edge detection. Here we first convert our RGB image to a grayscale image and perform Gaussian blurring to remove high frequency noise aiding in contour detection and perform Canny edge detection. Since edge detection is susceptible to noise in the image, first step is to remove the noise in the image with a 5x5 Gaussian filter. Smoothened image is then filtered with a Sobel kernel in both horizontal and vertical direction to get first derivative. OpenCV puts all the above in single function, cv2.Canny().

After we have successfully utilized the edge detected image to find the contour (outline) of the document we go for the last step i.e. to apply perspective transform to get a top-down view. All of this has also been explained with the help of the architectural diagram. Contours can be explained simply as a curve joining all the continuous points (along the boundary), having same color or intensity. The contours are a useful tool for shape analysis and object detection and recognition. To draw the contours, cv2.drawContours function is used. It can also be used to draw any shape provided you have its boundary points. Its first argument is source image, second argument is the contours which should be passed as a Python list, third argument is index of contours (useful when drawing individual contour. To draw all contours, pass -1 and remaining arguments are color, thickness etc.

And then we use four point transform and apply perspective transform. The function used in this project have been derived from the libraries i.e. numpy, scipy and matplot library

1.2 AIM OF THE PROPOSED WORK

To make a document scanner using opencv which enhances the it and get perspective transformed image of the document.

1.3 OBJECTIVE(S) OF THE PROPOSED WORK

(i) Edge detection

(ii) Contour detection

(iii) Image enhancement

(iv) Perspective transformation

2. LITERATURE SURVEY

2.1 Survey of the Existing Models/Work

Group 1(Edge detection)

1. A Comparison of various Edge Detection Techniques used in Image Processing

In this paper the important problem is to understand the fundamental concepts of various filters and apply these filters in identifying a shark fish type which is taken as a case study. In this paper the edge detection techniques are taken for consideration. The software is implemented using MATLAB. The main two operators in image processing are Gradient and Laplacian operators.

2. An improved Canny edge detection algorithm for color image

In this paper, an improved Canny algorithm is proposed to detect edges in color image. The proposed algorithm is composed of the following steps: quaternion weighted average filter, vector Sobel gradient computation, non-maxima suppression based on interpolation, edge detection and connection.

Group 2(Contour detection)

1. Image Segmentation Based on Active Contours without Edges

They designed a new segmentation algorithm based on active contours without edges. The algorithm was tested on very noisy images, and the results were compared to those

obtained with known methods, like segmentation using active contours without edges and graph cuts.

2. Contour Detection and Hierarchical Image Segmentation

This paper investigates two fundamental problems in computer vision: contour detection and image segmentation. They present state-of-the-art algorithms for both of these tasks.

Group 3(Image Enhancement)

1. Review of Image Enhancement in Spatial Domain

Digital images contain various types of noises which reduce the quality of images. Noises can be removed by various enhancement techniques. Digital images can be either spatial domain or frequency domain. This paper investigates various techniques used in spatial domain image processing.

2. Resolution Enhancement from Document Images for Text Extraction

Text extraction from low resolution document image sequences suffers from high error rate for most character recognition systems. To address this problem, an effective and efficient interpolation-based resolution enhancement algorithm is proposed and applied in this paper.

3. Enhancement of old images and documents by Digital Image Processing Techniques

A approach is proposed in this paper for improving the quality for the old documents. Combination of global and local thresholding techniques are used for the same. Initially, a technique named global thresholding is applied to the whole image. The image area that still has background noise are detected and the technique is again re-applied to each area separately. Therefore, a better adaptability is achieved for the algorithm where various kinds of noise re exist in different areas of same image.

4. Image Enhancement and Image Restoration for Old Document Image using Genetic Algorithm

This paper presents the use of genetic algorithm in old document image enhancement and restoration. The term of ‘old document’ is document coming from hundreds years ago. The purpose of the study is to preserve the information contained in old documents into

a digital form, because the process to rescue the old images using physical approach is too slow.

Group 4(Algorithms and techniques for analysis and detection of images)

1. Progress in Camera-Based Document Image Analysis

Camera captured images can suffer from low resolution, blur, and perspective distortion, as well as complex layout and interaction of the content and background. In this paper it is shown that a survey of application domains, technical challenges and solutions for recognizing documents captured by digital cameras.

2. Analytical Analysis of Image Filtering Techniques

This paper presents a survey on different image filtering techniques. Image filtering is a crucial part of vision processing as it can remove noise from noisy images. There are many filtering techniques to filter an image.

3 Overview of the Proposed System

3.1 Framework, Architecture or Module for the Proposed System

●We are going to execute our project document scanner code using opencv extension and python.

●We will import all the necessary python packages that we need.

●Now we will perform edge detection. To make our edge detection more accurate, we will resize our scanned image.

●We will convert the image from RGB to grayscale.

●To enhance the image we perform Gaussian blurring to remove high frequency noise and perform canny edge detection.

●Find the contours in edged image, keeping only largest one. It will actually sort the contours by area and keep the largest one. We then start looping over the contours and approximate the number of points. If the approximated contour has four points, we assume that we have found the document in the image. The largest contour in the image with exactly four points is our piece of paper or document to be scanned.

●Display the contours of the document we want to scan.

●Apply the four point transform to obtain a top-down view of the original image.

●To obtain black and white feel to the image, convert it to grayscale and apply adaptive thresholding.

●Finally, we will display our output image which will have top-down, 90 degree view of the image.

4. System Requirements

4.1 H/W Requirements(details about Application Specific Hardware)

1.camera

2.sample document

4.2 S/W Requirements(details about Application Specific Software)

1.python shell

2. matlab

5. SOURCE CODE:

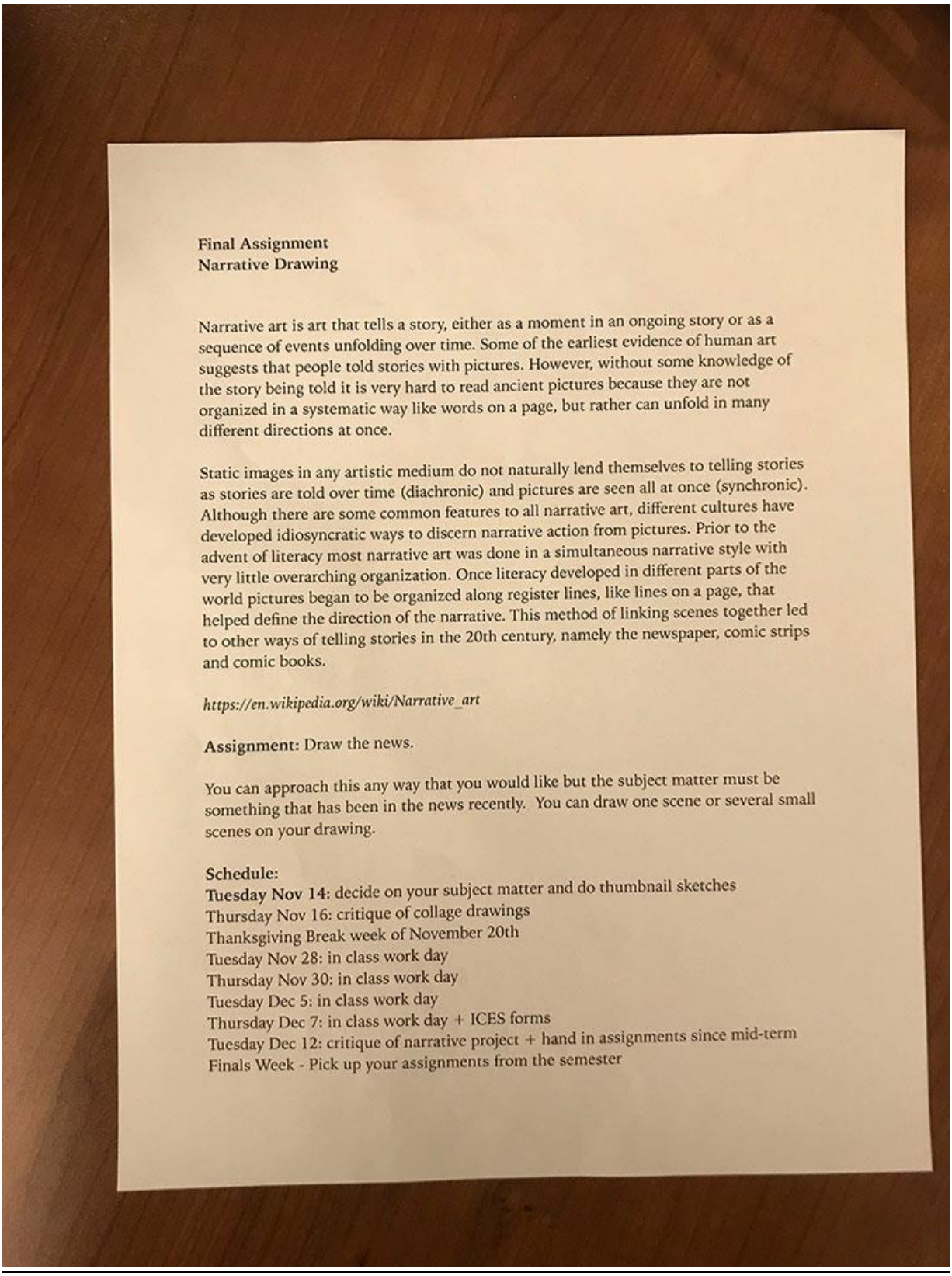
```
# import the necessary packages

from pyimagesearch.transform import four_point_transform

from skimage.filters import threshold_local

import numpy as np

import cv2

import imutils


# reading

image = cv2.imread("F:\document-scanner\images\img4.jpg")

ratio = image.shape[0] / 500.0

orig = image.copy()

image = imutils.resize(image, height = 500)
```

```
# convert the image to grayscale, blur it, and find edges
# in the image
gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
gray = cv2.GaussianBlur(gray, (5, 5), 0)
edged = cv2.Canny(gray, 75, 200)

# show the edge detected image
print("STEP 1: Edge Detection")
cv2.imshow("Edged", edged)

# find the contours in the edged image, keeping only the
# largest ones, and initialize the screen contour
cnts = cv2.findContours(edged.copy(), cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)
cnts = cnts[0] if imutils.is_cv2() else cnts[1]
cnts = sorted(cnts, key = cv2.contourArea, reverse = True)[:5]

# loop over the contours
for c in cnts:
        # approximate the contour
        peri = cv2.arcLength(c, True)
        approx = cv2.approxPolyDP(c, 0.02 * peri, True)

        # if our approximated contour has four points, then we
        # can assume that we have found our screen
        if len(approx) == 4:
                screenCnt = approx
```

```
                break

# show the contour (outline) of the piece of paper
print("STEP 2: Find contours of paper")
cv2.drawContours(image, [screenCnt], -1, (0, 255, 0), 2)
cv2.imshow("Outline", image)

# apply the four point transform to obtain a top-down
# view of the original image
warped = four_point_transform(orig, screenCnt.reshape(4, 2) * ratio)

# convert the warped image to grayscale, then threshold it
warped = cv2.cvtColor(warped, cv2.COLOR_BGR2GRAY)
T = threshold_local(warped, 11, offset = 10, method = "gaussian")
warped = (warped > T).astype("uint8") * 255

# show the original and scanned images
print("STEP 3: Apply perspective transform")
cv2.imshow("Original", imutils.resize(orig, height = 650))
cv2.imshow("Scanned", imutils.resize(warped, height = 650))
cv2.waitKey(0)
```

6 OUTPUT

6.1 TEST IMAGE:



Final Assignment
Narrative Drawing

Narrative art is art that tells a story, either as a moment in an ongoing story or as a sequence of events unfolding over time. Some of the earliest evidence of human art suggests that people told stories with pictures. However, without some knowledge of the story being told it is very hard to read ancient pictures because they are not organized in a systematic way like words on a page, but rather can unfold in many different directions at once.

Static images in any artistic medium do not naturally lend themselves to telling stories as stories are told over time (diachronic) and pictures are seen all at once (synchronic). Although there are some common features to all narrative art, different cultures have developed idiosyncratic ways to discern narrative action from pictures. Prior to the advent of literacy most narrative art was done in a simultaneous narrative style with very little overarching organization. Once literacy developed in different parts of the world pictures began to be organized along register lines, like lines on a page, that helped define the direction of the narrative. This method of linking scenes together led to other ways of telling stories in the 20th century, namely the newspaper, comic strips and comic books.

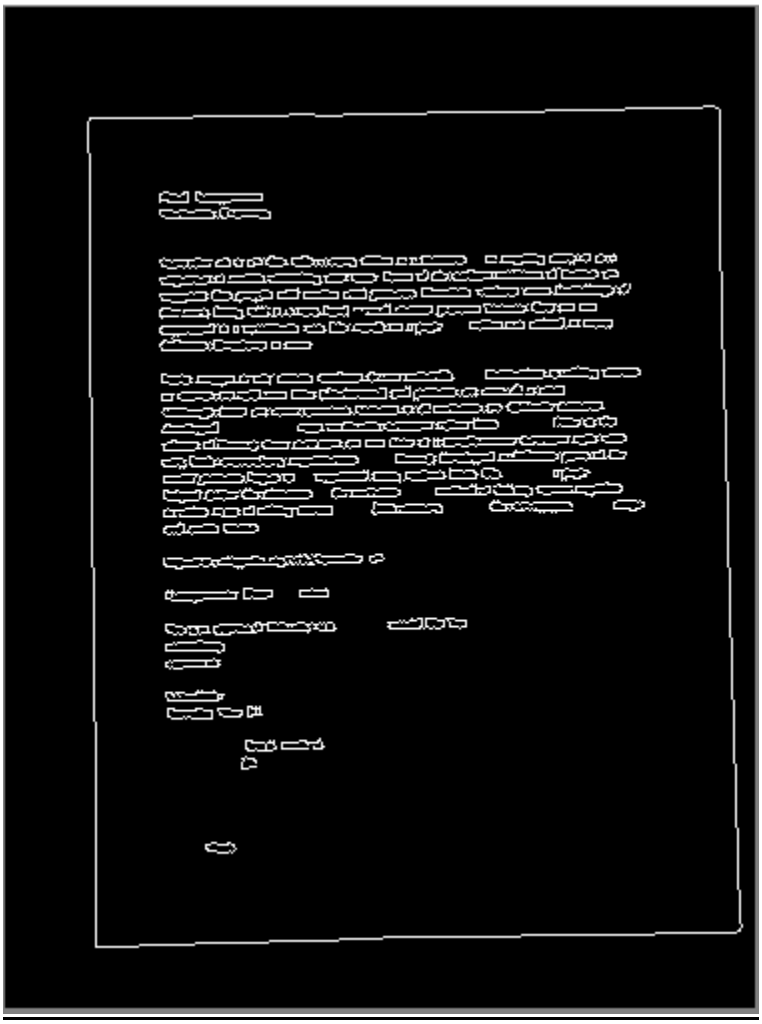
https://en.wikipedia.org/wiki/Narrative_art

Assignment: Draw the news.

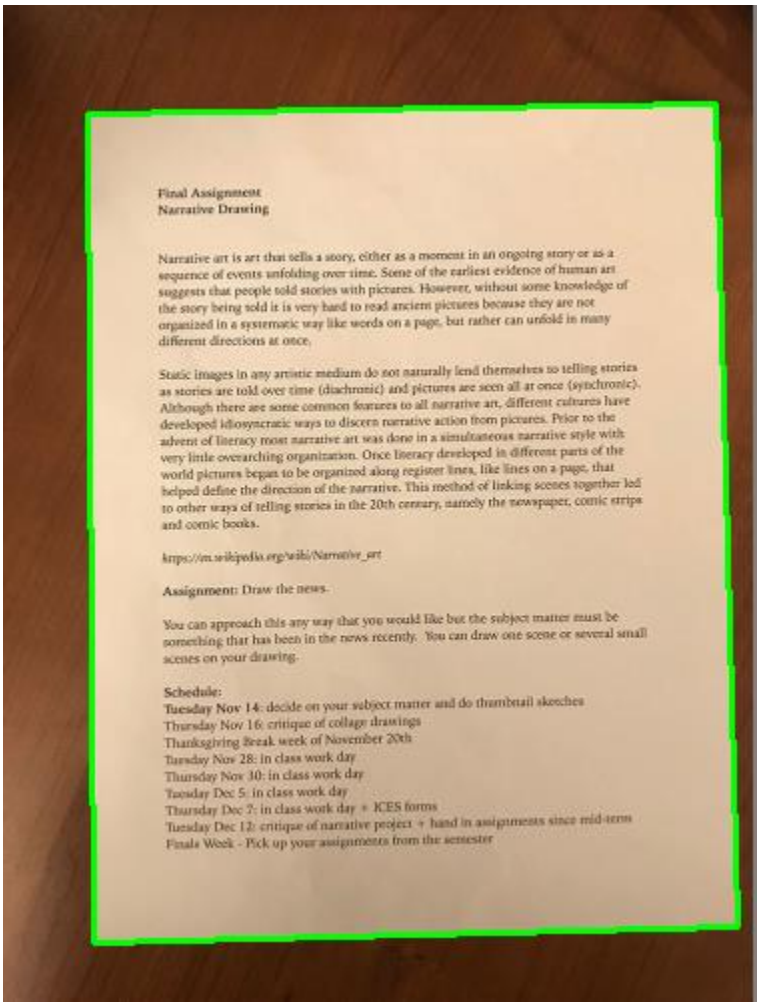
You can approach this any way that you would like but the subject matter must be something that has been in the news recently. You can draw one scene or several small scenes on your drawing.

Schedule:
Tuesday Nov 14: decide on your subject matter and do thumbnail sketches
Thursday Nov 16: critique of collage drawings
Thanksgiving Break week of November 20th
Tuesday Nov 28: in class work day
Thursday Nov 30: in class work day
Tuesday Dec 5: in class work day
Thursday Dec 7: in class work day + ICES forms
Tuesday Dec 12: critique of narrative project + hand in assignments since mid-term
Finals Week - Pick up your assignments from the semester

6.2 Edge detection



6.3 Contour detection



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6.4 Perspective transformation

Final Assignment
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6.5 Summary of result:

All of the sample images taken have been scanned by the document scanner and the output we got is a grayscale thresholded image on which many techniques have been applied such as edge detection, contour detection and the perspective transform. The result images are theoutput of all these techniques which were carried out in a step-by-step manner.

7.Conclusion:

All of the images scanned gave us the same transformed output which we wanted. All of the techniques were successfully implemented without any errors

7.1 Scope for future work

In our project, we introduced an improved canny edge detection. Seeing this we think that there is scope to further improve the techniques or to make the existing techniques more efficient.

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