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NATIONAL UNIVERSITY
OF SCIENCES & TECHNOLOGY

Robotics-1 (Group-1)

Project Report

Submitted to: Mr. Munadi Sial

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Project Title:

"Document scanning and text detection in images using OpenCV and pyTesseract"

Objective:

The goal of this project is to develop a document scanner and text detector using OpenCV, an open-source computer vision library, and PyTesseract, a Python wrapper for the Tesseract OCR engine. The document scanner will be able to take an image of a document and automatically straighten and crop it to remove any excess background. The text detector will then be able to identify and extract any text present in the document image.

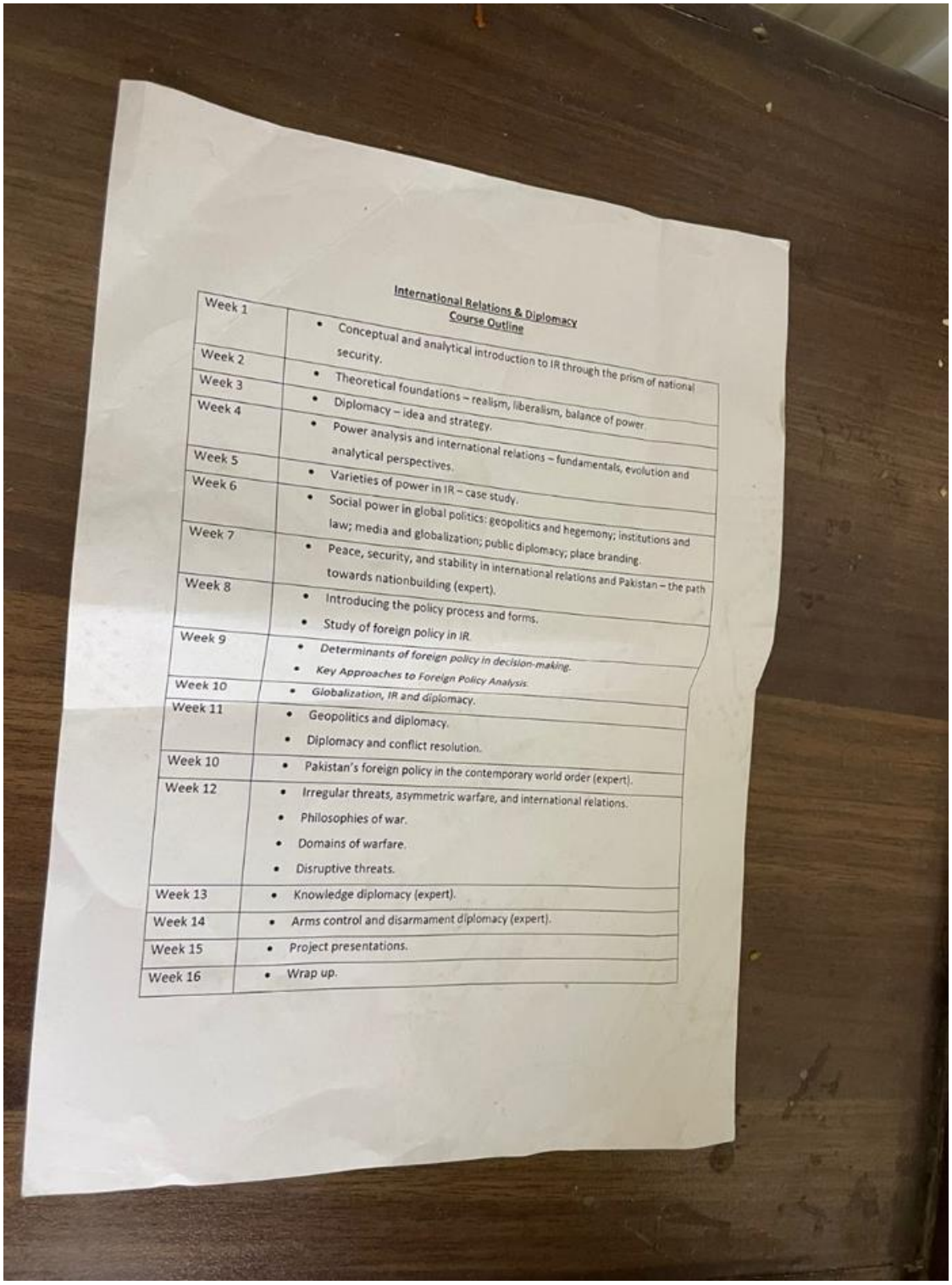
Methodology:

1. Preprocessing: The input image is first converted to grayscale and then filtered using a Gaussian blur to reduce noise and improve the quality of the image.
2. Edge Detection: The Canny edge detection algorithm is then used to detect the edges in the image. This is used to identify the boundaries of the document in the image.
3. Contour Detection: The contours in the image are then detected using the find Contours function in OpenCV. The largest contour is assumed to be the outline of the document.
4. Perspective Transformation: A perspective transformation is then applied to the image to straighten and crop it to a top-down view of the document.
5. Text Detection: The text in the document is then detected using PyTesseract and the Tesseract OCR engine. PyTesseract is a Python wrapper for Tesseract, which is an open-source OCR engine that is capable of recognizing text in multiple languages.

Results:

The document scanner and text detector were tested on a variety of images and were able to accurately detect and extract text from the documents. The extracted text was also found to be of high quality, with minimal errors.

We used the scanner on the following image:

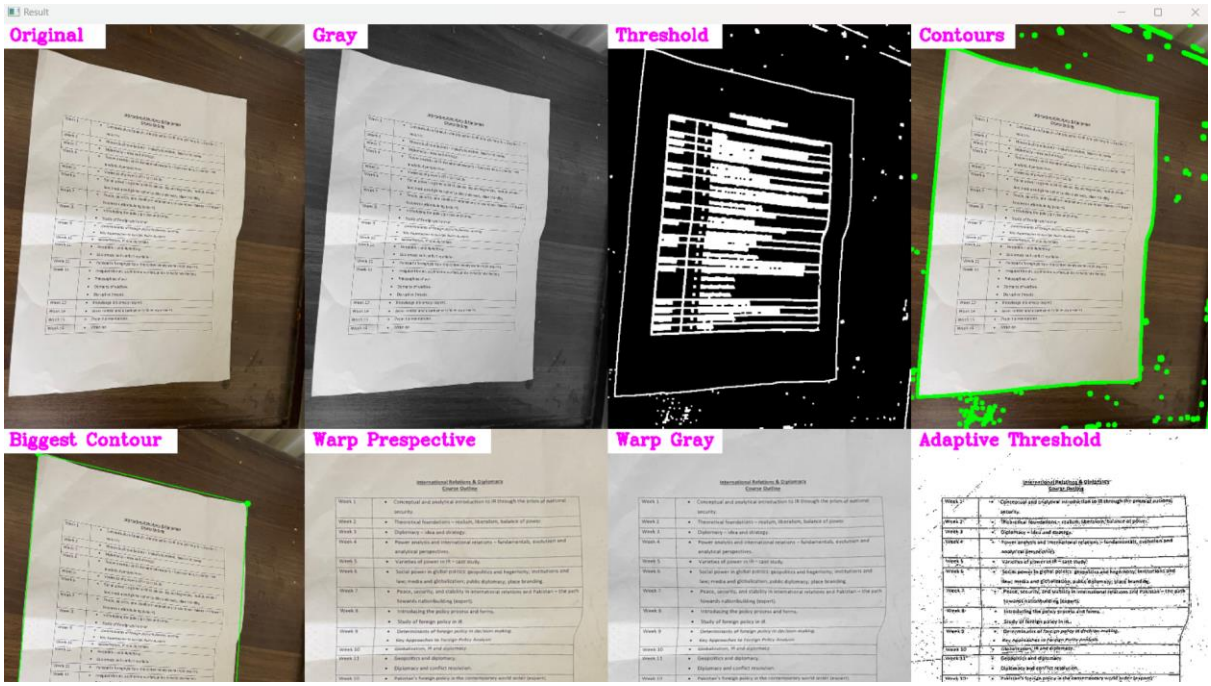


International Relations & Diplomacy
Course Outline

Week 1	• Conceptual and analytical introduction to IR through the prism of national security.
Week 2	• Theoretical foundations – realism, liberalism, balance of power.
Week 3	• Diplomacy – idea and strategy.
Week 4	• Power analysis and international relations – fundamentals, evolution and analytical perspectives.
Week 5	• Varieties of power in IR – case study.
Week 6	• Social power in global politics: geopolitics and hegemony; institutions and law; media and globalization; public diplomacy; place branding.
Week 7	• Peace, security, and stability in international relations and Pakistan – the path towards nationbuilding (expert).
Week 8	• Introducing the policy process and forms. • Study of foreign policy in IR.
Week 9	• *Determinants of foreign policy in decision-making.* • *Key Approaches to Foreign Policy Analysis.*
Week 10	• *Globalization, IR and diplomacy.*
Week 11	• Geopolitics and diplomacy. • Diplomacy and conflict resolution.
Week 10	• Pakistan's foreign policy in the contemporary world order (expert).
Week 12	• Irregular threats, asymmetric warfare, and international relations. • Philosophies of war. • Domains of warfare. • Disruptive threats.
Week 13	• Knowledge diplomacy (expert).
Week 14	• Arms control and disarmament diplomacy (expert).
Week 15	• Project presentations.
Week 16	• Wrap up.

The scanner loads the image and performs contour detection and perspective transform on it.

This image gave the following results:



Finally, text detection is performed using the Tesseract OCR and the resulting text is obtained in a separate text file giving fairly accurate results.

Applications in Robotics:

1. Digitizing paper documents: A robotic system equipped with a document scanner and text detector could be used to scan and digitize paper documents, such as invoices or contracts. This could be useful for automating the process of converting paper documents into electronic formats.
2. Extracting text from images: A robotic system equipped with a text detector could be used to extract text from images, such as signs or labels, for further processing or analysis. This could be useful for tasks such as object recognition or localization.
3. Document analysis: A robotic system equipped with a text detector could be used to analyze the contents of documents, such as extracting key information or identifying specific patterns or trends. This could be useful for tasks such as data mining or business intelligence.
4. Automating tasks: A robotic system equipped with a text detector could be used to automate tasks that involve processing or interacting with text-based information. For example, a robotic system could be used to automatically fill out forms or enter data into a database based on the text it detects in documents or images.

Conclusion:

The document scanner and text detector developed using OpenCV and PyTesseract was able to effectively scan and extract text from document images. The system was able to accurately identify the boundaries of the document and straighten and crop the image, as well as accurately detect and extract the text from the document using the Tesseract OCR engine.

Tools Used:

- Python
- OpenCV
- Tesseract OCR