PROJECT PROPOSAL

IP

Prepared By:

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Deliverables:

GITHUB IP REPO

GITHUB UI REPO

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USED ALGORITHMS

1. **Corner Arrangement:**
   - Purpose: Arrange the corners of a quadrilateral.
   - Algorithm: Perspective transformation using four corners.
2. **Perspective Transformation:**
   - Purpose: Transform an image based on perspective.
   - Algorithm: OpenCV's cv2.getPerspectiveTransform and cv2.warpPerspective.
3. **Paper Extraction:**
   - Purpose: Extract a paper-like region from an image.
   - Algorithms:
     - Adaptive thresholding.
     - Contour detection and approximation.
     - Find the largest contour by area.
4. **Bubble Code Extraction:**
   - Purpose: Extract a segment from the paper containing bubble codes.
   - Algorithms: Image cropping.
5. **Digit Segmentation:**
   - Purpose: Segment individual digits from a binary image.
   - Algorithms:
     - Contour detection.
     - Bounding rectangle extraction.
6. **Student Code Extraction:**
   - Purpose: Extract the student code from a paper image.
   - Algorithms:
     - Adaptive thresholding.
     - Contour detection and approximation.
7. **Handwritten Code Processing:**
   - Purpose: Preprocess the extracted code image.
   - Algorithms:
     - Gray-scaling.
     - Gaussian blur.
     - Adaptive thresholding.
     - Negative transformation.
     - Erosion and dilation.

USED ALGORITHMS

8.Digit Classification Model Training:

- Purpose: Train machine learning models to classify digits.
- Algorithms:
    - Support Vector Machines (SVM) - LinearSVC.
    - Histogram of Oriented Gradients (HOG) feature extraction.

9.Digit Classification:

- Purpose: Predict the digit from an input image.
- Algorithms:
    - HOG feature extraction.
    - Support Vector Machines (SVM) Classifier prediction.

10.Student Answers Correction:

- Purpose: Check student answers and compare it to model answer
- Algorithms:
    - Contours Sorting
    - Draw Contours

11.Line Detection:

- Purpose: Detect vertical and horizontal lines
- Algorithms:
    - Hough line transformations.

12.Cell Cropping:

- Purpose: Extract cells
- Algorithms:
    - Hough line transformations with Finding contours.

EXPERIMENT RESULTS & ANALYSIS

- **Level of variety for test cases used in experimental results.**
  - **Grade Sheets:** We test our system for more than 20 paper that provided by TA included zoomed in and out, different brightness conditions ,slanted photos.
  - **Bubble Sheet** : We test our bubble sheet system for more than 8 papers.
- **Complete analysis for the system elaborating points of strengths and weakness.**
  - **Weakness:**
    - **Grade Sheets:** We take a long processing time for outputs.
    - **Bubble Sheet:** We can't read student name we read ID instead (**Not Required**).
  - **Strengths:**
    i. Dealing with slanted photos.
    ii. Dealing with different brightness conditions.
    iii. Dealing with bad quality photos and different sizes.
    iv. Our shapes and digits model is accurate enough for user.

PERFORMANCE & ACCURACY

Grade Auto-Filler:

Five random samples were tested, and their respective production times were recorded as follows:

6.622937917709351
6.178053140640259
6.232712507247925
6.029067516326904
6.267528295516968

The calculated average production time across these samples is approximately **6.266 seconds**.

Bubble Sheet:

Five random samples were tested, and their respective production times were recorded as follows:

0.24936866760253906
0.2868771553039551
0.23034882545471191
0.32736659049987793
0.26333117485046387

The calculated average production time across these samples is approximately **0.271 seconds**.

Accuaracy:

Our project is highly accurate with all the samples given from the TA

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CONCLUSION & REFERENCES

Conclusion

Our automated grading system minimizes the risk of human error in manual grading. The scalability of our project allows for easy integration of additional applications and functionalities which opens the door for future enhancements and the incorporation of new features to meet evolving educational needs. As we move forward, we envision further using our project as a product for teachers to use.

References

We have successfully incorporated key components from the OpenCV (cv2) library and Tesseract, augmenting our solution with robust computer vision capabilities and advanced optical character recognition and our own manual made datasets.

WORK DIVISION

Name	Roles
Ahmed Bassem ELKady	• Module1 • UI
Daniel Nabil Khalil	• Module1
Mohamed Yasser Mohamed	• Module2
Mustafa Tarek Salah	• Module2 • UI

BONUS

1. Two-tier application integration between flask framework in python and fancy react UI.
2. Reading written code & bubble sheet code in bubble sheet correction.
3. Draw green contours around right choices of student answers & red contours around wrong ones.