Team Members:

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Project Idea:

Grade Auto Filler

Project Needs:

1. **Python 3.10.7**
2. **OpenCV**
3. **Vscode**
4. **Numpy**
5. **Matplotlib**
6. **PyTesseract**
7. **Tesseract-ocr**
8. **Skimage**

Methods:

[Open CV]

1. **contourArea**
2. **findContours**
3. **GaussianBlur**
4. **threshold**
5. **getStructuringElement**
6. **morphologyEx**
7. **getPerspectiveTransform**
8. **warpPerspective**
9. **cvtColor**
10. **adaptiveThreshold**
11. **drawContours**

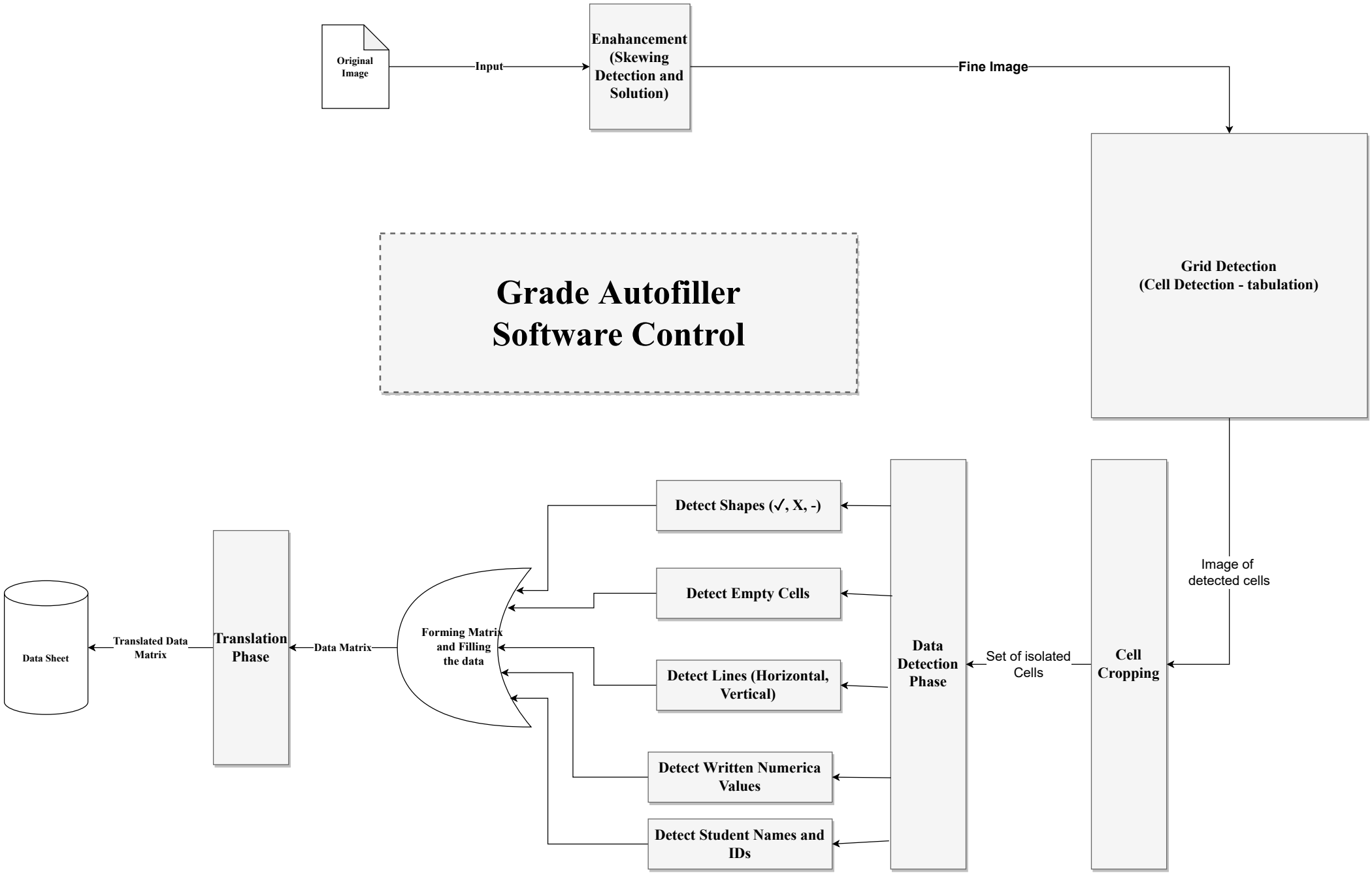
12. **erode**
13. **dilate**
14. **Canny**
15. **HoughLines**
16. **rectangle**
17. **resize**
18. **getRotationMatrix2D**

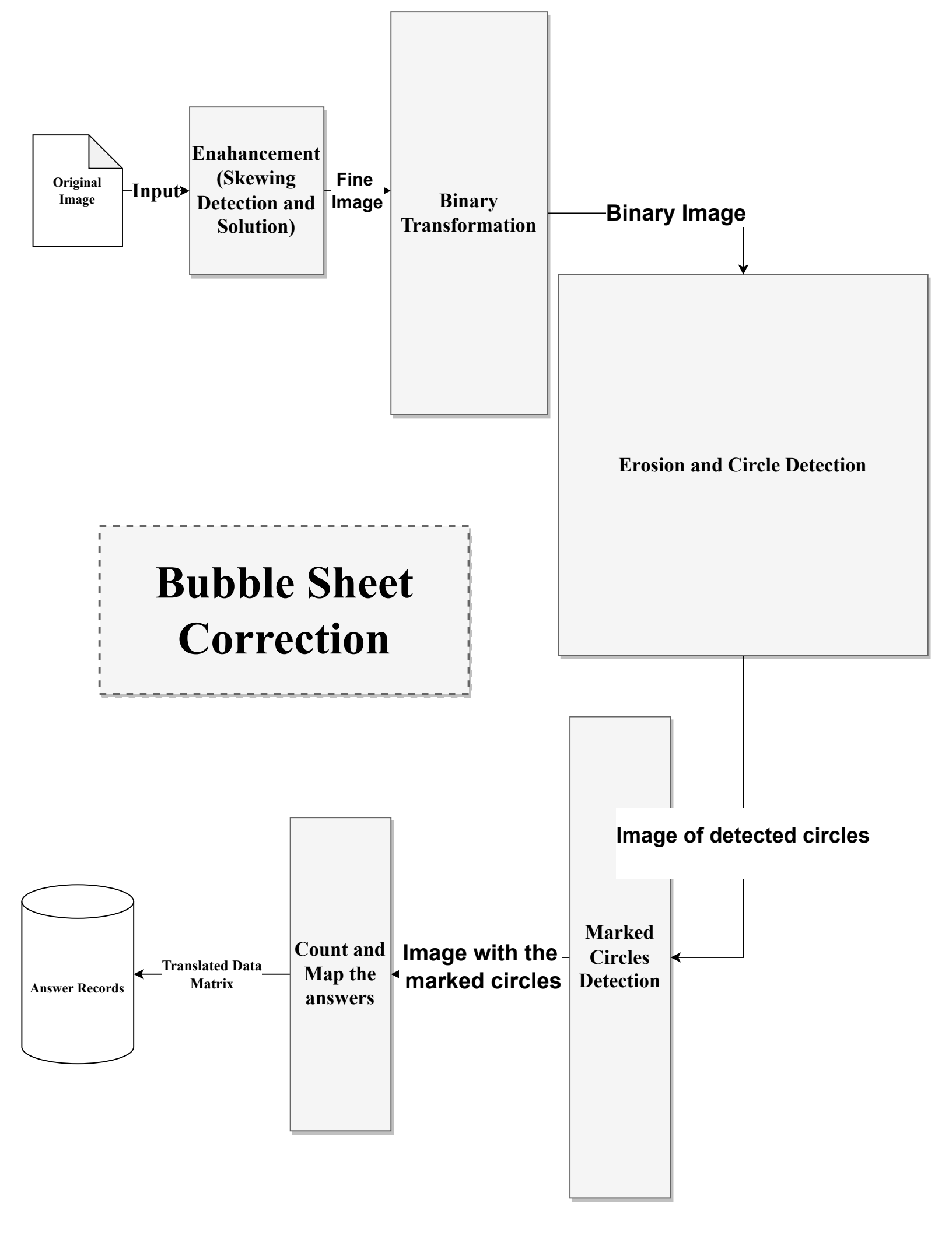
[PyTesseract]

1. **image_to_string**
2. **image_to_boxes**
3. **image_to_data**
4. **image_to_osd**

Scientific paper(s) as references

1. https://stackoverflow.com/questions/72465878/opencv-omr-sheet-detect-marked-answers-in-python-getting-proper-binarization
2. https://stackoverflow.com/questions/8667818/opencv-c-obj-c-detecting-a-sheet-of-paper-square-detection
3. https://pyimagesearch.com/2014/08/25/4-point-opencv-getperspective-transform-example/
4. https://maker.pro/raspberry-pi/tutorial/grid-detection-with-opencv-on-raspberry-pi
5. https://docs.opencv.org/3.4/d9/db0/tutorial_hough_lines.html
6. https://learnopencv.com/cropping-an-image-using-opencv/#cropping-using-opencv
7. https://pypi.org/project/pytesseract/
8. https://builtin.com/data-science/python-ocr
9. https://www.kaggle.com/code/tareksherif/arabic-ocr-using-pytesseract


Original Image
Input
Enahancement (Skewing Detection and Solution)
Fine Image
Grid Detection (Cell Detection - tabulation)
Grade Autofiller Software Control
Image of detected cells
Cell Cropping
Set of isolated Cells
Data Detection Phase
Detect Shapes (✓, X, -)
Detect Empty Cells
Detect Lines (Horizontal, Vertical)
Detect Written Numerica Values
Detect Student Names and IDs
Forming Matrix and Filling the data
Data Matrix
Translation Phase
Translated Data Matrix
Data Sheet


Original Image
Input
Enahancement (Skewing Detection and Solution)
Fine Image
Binary Transformation
Binary Image
Erosion and Circle Detection
Bubble Sheet Correction
Image of detected circles
Marked Circles Detection
Image with the marked circles
Count and Map the answers
Translated Data Matrix
Answer Records