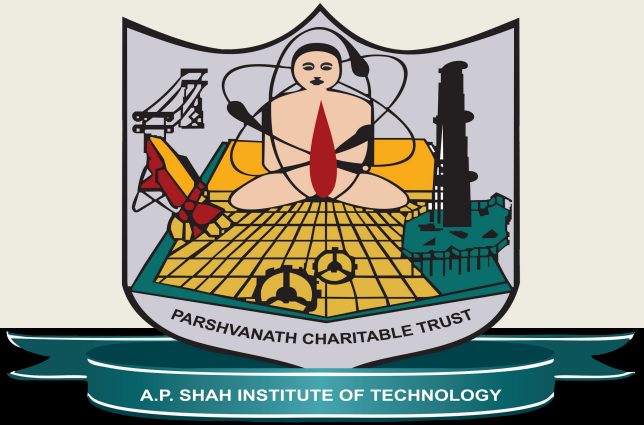

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UNIVERSITY OF MUMBAI

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A Project Report on

Handwriting to Conversion using Neural Networks

Submitted in partial fulfillment of the degree of
Bachelor of Engineering(Sem-8)

in

INFORMATION TECHNOLOGY

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1.Project Conception and Initiation

1.1 Abstract

- The current world of automation, everything is getting automated as reducing manual labor is the key to efficiency. Handwriting Recognition is the process of extracting text from handwritten scripts, the proposed system can be used to recognize handwritten characters and convert them into the text from the scanned image of a page.

1.2 Objectives

- To recognize and convert the handwritten characters and numbers into digitized text characters.
- To convert text to handwritten characters using LSTM.
- To export the text file to a page.

1.3 Literature Review

Author	Research Paper	Findings
Md. Rabiul Islam , Chayan Mondal, Md. Kawsar Azam, and Abu Syed Md. Jannatul Islam	Text Detection and Recognition Using Enhanced MSER Detection and a Novel OCR Technique	The work of different text detection methods on how they extract text from an image such as MSER and canny edge integration, stroke width variation and OCR for text recognition
Dan Claudiu Cires¸an and Ueli Meier and Luca Maria Gambardella and Jurgen Schmidhuber	Convolutional Neural Network Committees For Handwritten Character Classification	How using CNNs and their training with GPUs to train models can reduce character recognition error rates in offline handwriting
J.Pradeep , E.Srinivasan , S.Himavathi	Diagonal Based Feature Extraction For Handwritten Character Recognition System Using Neural Network	Use of techniques such as preprocessing, segmentation, and feature extraction that are used to improve the accuracy of text recognition and identification.
Patrick Doetsch, Michal Kozielski and Hermann Ney Lehrstuhl für Informatik	Fast and robust training of recurrent neural networks for offline handwriting recognition	LSTM-RNN with Backpropagation Through Time training can be used to speed up the process while increasing the accuracy of recognition process
Dewi Suryani, Patrick Doetsch and Hermann Ney	On the Benefits of Convolutional Neural Network Combinations in Offline Handwriting Recognition	Combination of CNN and LSTM showing a better performance for Offline Handwriting Recognition

1.4 Problem Definition

- We identified that in some cases it is difficult to read students handwriting for the teachers.

1.5 Scope

- Can be useful to Students and Teachers for academics.
- Can be used in Offices for digitizing letters,forms & applications.

1.6 Benefits for environment & Society

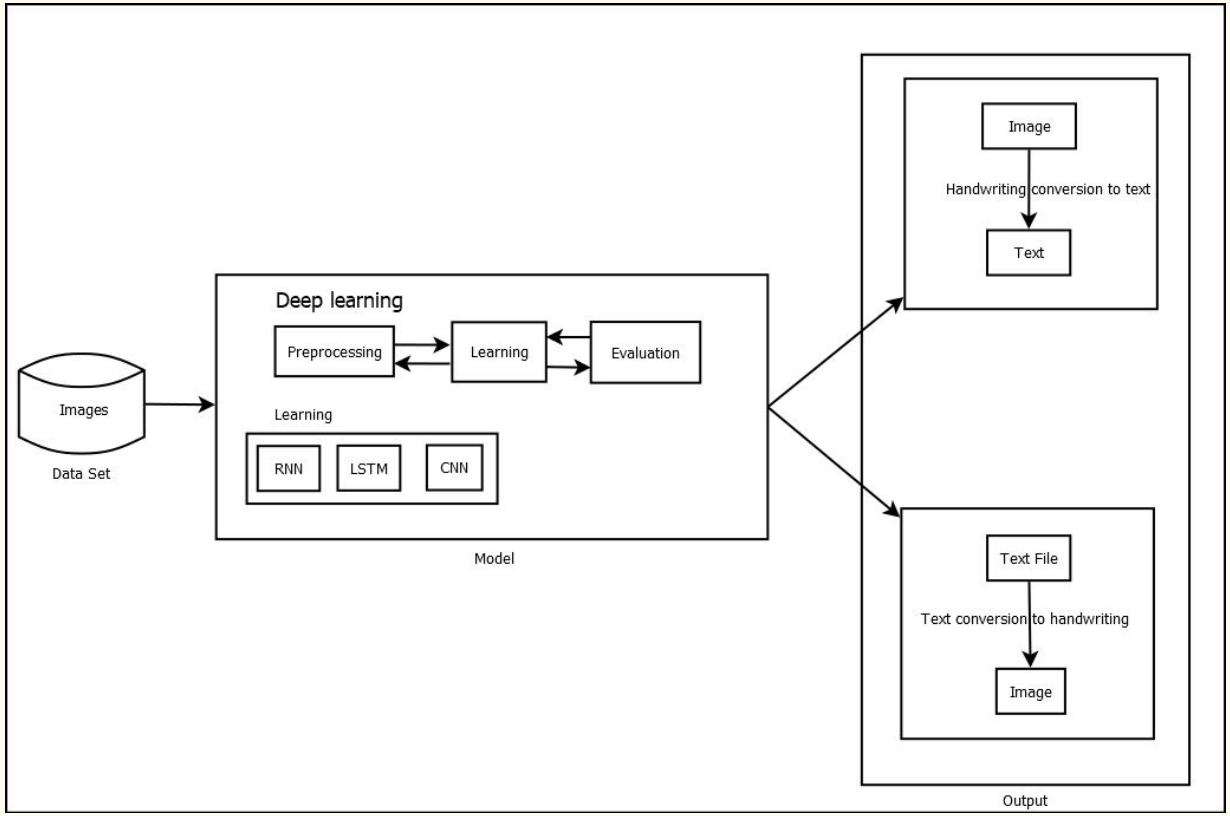
- Can reduce use of paper for written work
- Can help save the image into a computerized text for easy searchability
- Convert user input handwriting into a better handwriting

1.7 Technology stack

- Python3, Anaconda, Jupiter Notebook
- Numpy, SciKit, Pandas, TensorFlow
- FeatureTool

2. Project Design

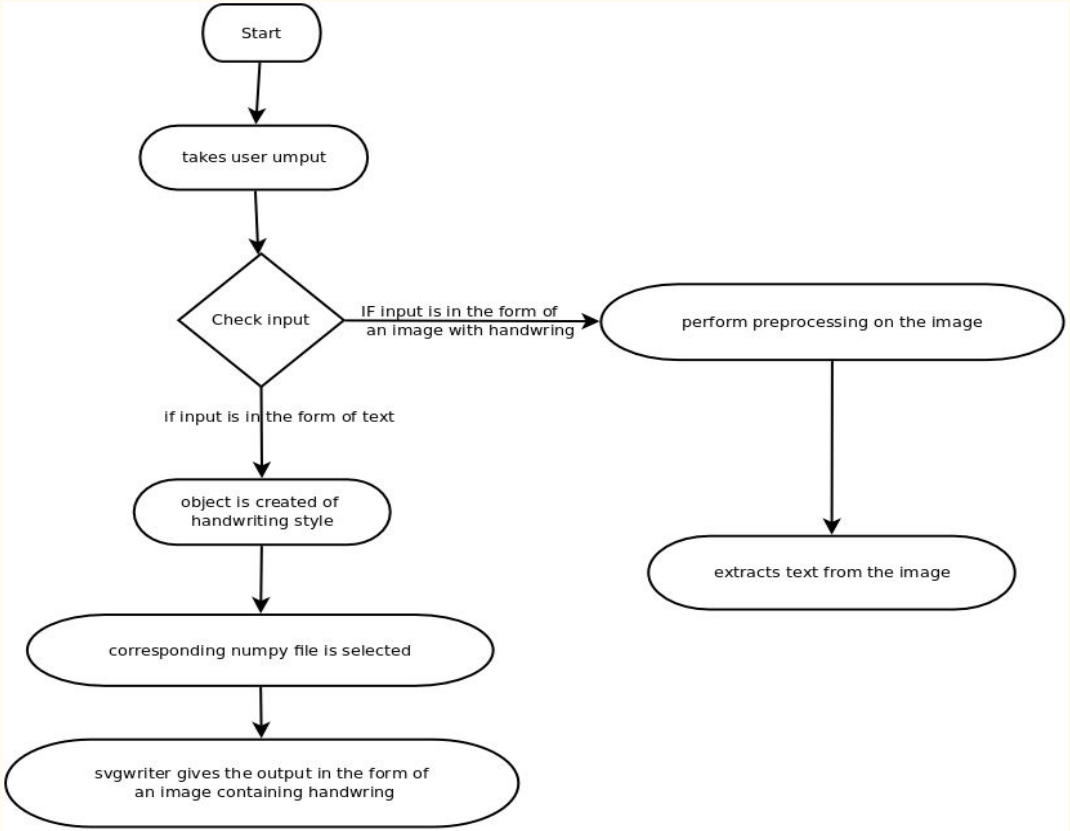
2.1 Proposed System



2.2 Design(Flow Of Modules)

- The system takes input in the form of image
- It recognizes the text from the image
- Gives output in the form of text
- Takes the text from the user
- Converts the text into handwriting
- Gives output in image form

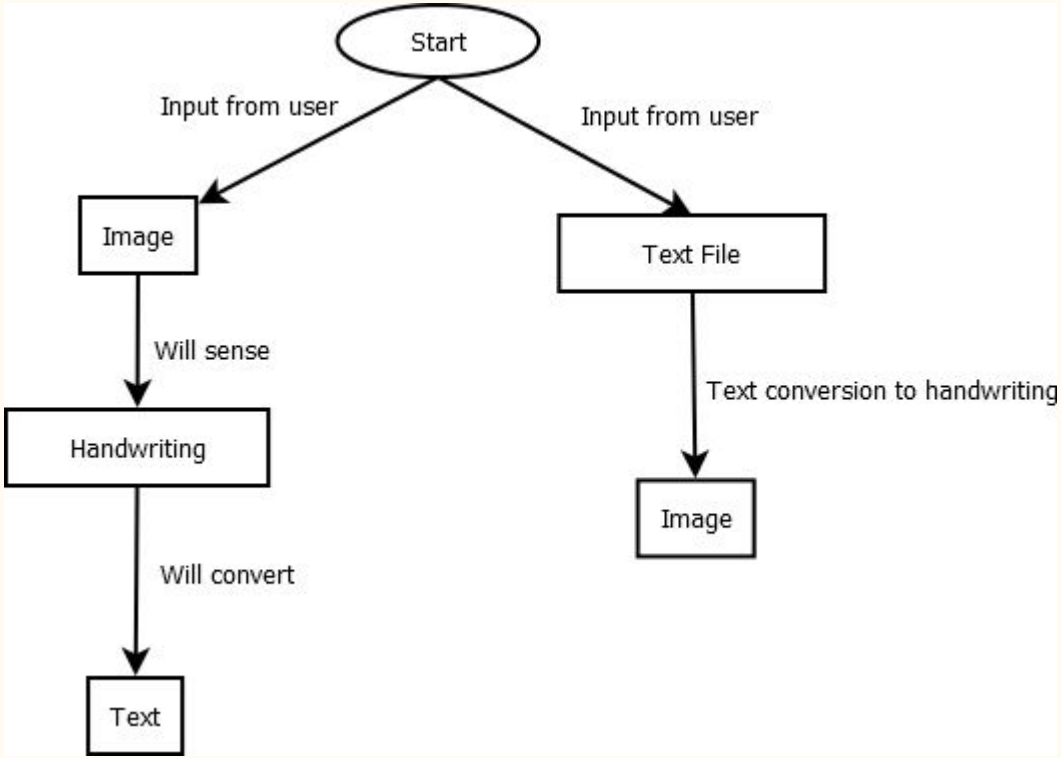
2.2 Design(Flow Of Modules)



2.3 Description Of Use Case

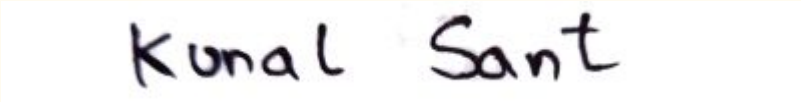
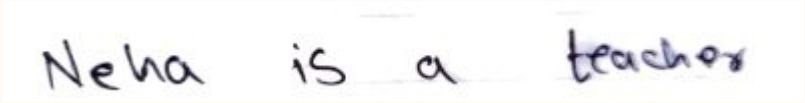
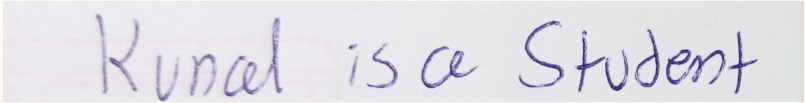
A user can go to 2 separate module
1.Giving a handwritten text in the form of an image as an input to application, this module gives digitized text as an output.
2.Giving digitized text as an input and converting it to a handwritten text in the form of an image

2.4 Activity diagram

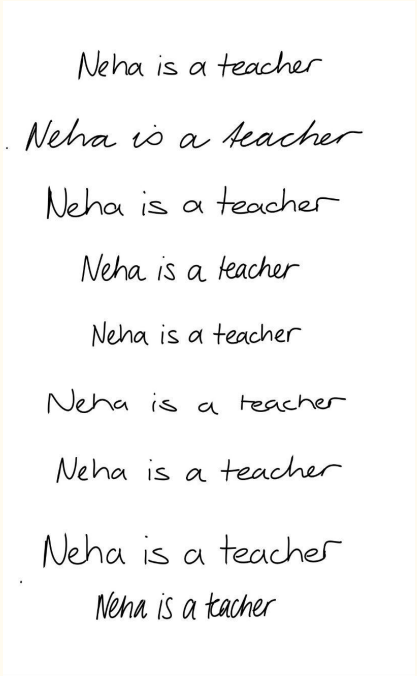


3. Implementation

3.1 Implementation of Handwriting to Text

Image	Text
	Recognized: "Kunal Sant" Probability: 0.17584793269634247
	Recognized: "Neha is a teaches" Probability: 0.059063810855150 22
	Recognized: "Kunel is ce Student " Probability: 0.025477349758148193

3.2 Implementation of Text to Handwriting



4. Testing

4.1 Unit Testing

- Unit Testing is the first level of testing, which is typically performed by the developers themselves.
- We tested the working of both modules, text to handwriting and handwriting to text
- It helped us understand the desired output of each module, which we had broken down into separate units.

4.2 Integration Testing

- Integrated tests are usually made up of a mix of automated functional and manual tests, and they can be carried out by developers or independent testers.
- The next step is to put them all together into one module. This testing is essential for establishing which devices will perform flawlessly together.

4.3 Compatibility Testing

- The system does not require more than 4GB RAM even when both of the modules are running.
- The system can run on very low specification devices.

5. Result

5. Result

- We have created a model which converts user inputed handwriting into computerised text and then into a better handwriting using neural networks.

6. Conclusion and Future Scope

6.1 Conclusion

- We aim to create a more effective handwriting recognition model.
- We discussed a Neural Network which is able to recognize text in images

6.2 Future Scope

- The accuracy of the handwriting recognition model can be improved.
- The model can be trained to recognize cursive characters and special characters.
- Scanning full page for handwriting recognition.
- Changing output file of text to handwriting to a ruled page.
- This model can be used for filling up forms which can be tedious to do in handwritten form For eg. PAN Card, Passport.

References

- A. Senior and T. Robinson, "An Off-Line Cursive Handwriting Recognition System", IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 20, no. 3, Mar. 1998
- M. R. Islam, C. Mondal, M. K. Azam and A. S. M.J. Islam, "Text detection and recognition using enhanced MSER detection and a novel OCR technique", Informatics Electronics and Vision (ICIEV) 2016 5th International Conference, 2016.
- D. Suryani, P. Doetsch and H. Ney, "On the benefits of convolutional neural network combinations in offline handwriting recognition", 2016 15th International Conference on Frontiers in Handwriting Recognition (ICFHR), 2016.

Paper Publication

Submitted to ICCIIT, ICICIT & ICT4SD

Thank You