IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2025

DOI: 10.17148/IJIREEICE.2025.13435

IMAGE READING AND INTERPRETATION USING OCR

M.SABARI[1], Dr.R.SENTHIL KUMAR[2]

Student, Dept of Computer Science with Cognitive Systems, Dr. N.G.P Arts and Science College, Coimbatore, India[1]

Professor, Dept of Computer Science with Cognitive Systems,

Dr. N.G.P Arts and Science College, Coimbatore, India[2]

Abstract: Optical Character Recognition (OCR) is a predominant aspect to transmute scanned images and other visuals into text. Computer vision technology is extrapolated onto the system to enhance the text inside the digitized image. This preliminary provisional setup holds the invoice's information and converts it into JSON and CSV configurations. This model can be helpful in divination based on knowledge engineering and qualitative analysis in the nearing future. The existing system contains data extraction and nothing more. In a paramount manner, image pre-processing techniques like black and white, inverted, noise removal, grayscale, thick font, and canny are applied to escalate the quality of the picture.In the very next step, three different OCRs are used: Keras OCR, Easy OCR, and Tesseract OCR, out of which Tesseract OCR gives the precise result.

Keywords: Optical Character Recognition (OCR), Computer Vision,Image Pre-processing,Data Extraction,Invoice Processing

INTRODUCTION

1.1 OBJECTIVES

The "Image Reading Interpretation using OCR" project focuses on using Optical Character Recognition (OCR) to extract text from images, whether printed or handwritten. The process begins with uploading an image, followed by preprocessing steps like resizing and adjusting contrast to improve clarity. The OCR engine then analyzes the image to recognize text, converting it into machine-readable data. Tools like Tesseract OCR or Google Cloud Vision API are commonly used for this task. While OCR works well with printed text, it can struggle with handwritten text or distorted fonts, requiring further adjustments or advanced techniques. This technology has various applications in industries such as healthcare, finance, education, and logistics.

2.SYSTEM STUDY

2.1 EXISTING SYSTEM

The existing OCR systems rely on traditional image processing techniques and rule-based algorithms, which often struggle with complex or distorted text, non-standard fonts, and varying handwriting styles. These systems also tend to have limitations in accuracy, especially when dealing with poor-quality images or intricate layouts.

2.2 PROBLEM IDENTIFICATION

Low Accuracy with Poor Image Quality

- **Problem**: OCR systems tend to perform poorly when the quality of the input image is suboptimal. Issues such as blurred images, poor lighting, noise, or low resolution significantly reduce the accuracy of text extraction.
- **Impact**: In real-world scenarios, documents are often scanned using devices with varying quality, or photos taken from mobile phones might not have the required resolution. This leads to misinterpretations, errors in extracted text, or complete failure in recognizing certain parts of the document.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2025

DOI: 10.17148/IJIREEICE.2025.13435

Handwritten Text Recognition

- **Problem**: OCR systems struggle to accurately recognize handwritten text, especially when the handwriting is cursive, irregular, or sloppy. The variability in human handwriting styles presents a significant challenge for OCR engines.
- **Impact**: Many use cases, such as reading handwritten forms, notes, or even business cards, require recognition of handwritten text. Without accurate recognition, the utility of OCR is limited, particularly in fields like education, healthcare, or legal documentation where handwritten records are common.

2.3 PROPOSED SYSTEM

The proposed system integrates advanced deep learning models and AI-driven techniques to enhance OCR accuracy. By utilizing neural networks, the system can recognize a wider variety of fonts, handwriting styles, and even damaged or low-resolution text, providing more reliable and consistent text extraction.

Main Advantages:

1. Higher accuracy in text recognition, even with varied fonts and handwriting.
2. Improved handling of noisy, distorted, or low-resolution images.
3. Enhanced capability to recognize complex document layouts.
4. Faster processing time, enabling real-time OCR tasks.
5. Greater adaptability to different languages and character sets.

3.SYSTEM SPECIFICATION

3.1 HARDWARE SPECIFICATION

1. **Processor**: Intel Core i5 or higher (quad-core or more).
2. **RAM**: 8GB
3. **Storage**: Minimum 500GB HDD \ outputs.
4. **Graphics Card**: Optional,

3.2 SOFTWARE SPECIFICATION

1. **Operating System**: Windows 10/11
2. **OCR Software**:
   - Tesseract OCR (open-source)
   - TensorFlow, PyTorch, or Keras for deep learning-based text recognition models.
3. **Programming Languages**:
   - Python
4. **Libraries and Tools**:
   - OpenCV for image preprocessing tasks (e.g., noise reduction, resizing, thresholding).
   - Pandas for data manipulation and text extraction.
   - NLTK or spaCy for natural language processing tasks (e.g., text cleaning, error correction).

3.3 SOFTWARE DESCRIPTION

OCR Engine Integration:

- The software integrates powerful OCR engines (e.g., Tesseract, ABBYY FineReader, or Google Vision OCR) to accurately extract text from images and scanned documents.
- It supports multiple languages, enabling it to interpret a wide variety of scripts and characters, such as Latin, Cyrillic, Chinese, Arabic, etc.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2025

DOI: 10.17148/IJIREEICE.2025.13435

Text Extraction:

- The software can recognize printed and handwritten text from various image formats (JPEG, PNG, TIFF, etc.).
- It automatically detects and extracts text blocks, including titles, paragraphs, tables, and numbers.

Image Preprocessing:

- Built-in preprocessing algorithms enhance the quality of images before OCR processing, improving accuracy. Features include noise reduction, image deskewing, thresholding, and contrast adjustment.
- Users can manually or automatically crop images to focus on relevant areas, further improving OCR results.

Text Interpretation and Formatting:

- Extracted text is formatted according to the original layout, preserving the structure, such as bullet points, headers, paragraphs, and tables.
- The software includes advanced algorithms to interpret handwriting, especially for forms or documents with mixed content.

Post-Processing and Error Correction:

- Post-processing tools help fix common OCR errors, such as misrecognized characters or missing words. It includes a dictionary feature to automatically replace misspelled words.
- Users can manually correct extracted text through an intuitive editor.

4.SYSTEM DESIGN

4.1 DATA FLOW DIAGRAM

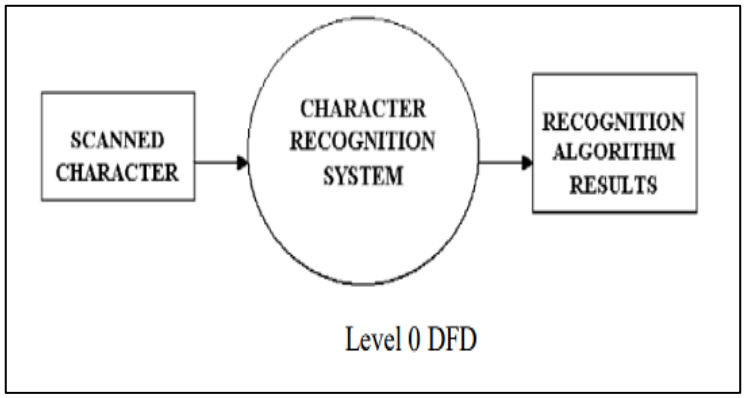

FIG:1

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2025

DOI: 10.17148/IJIREEICE.2025.13435

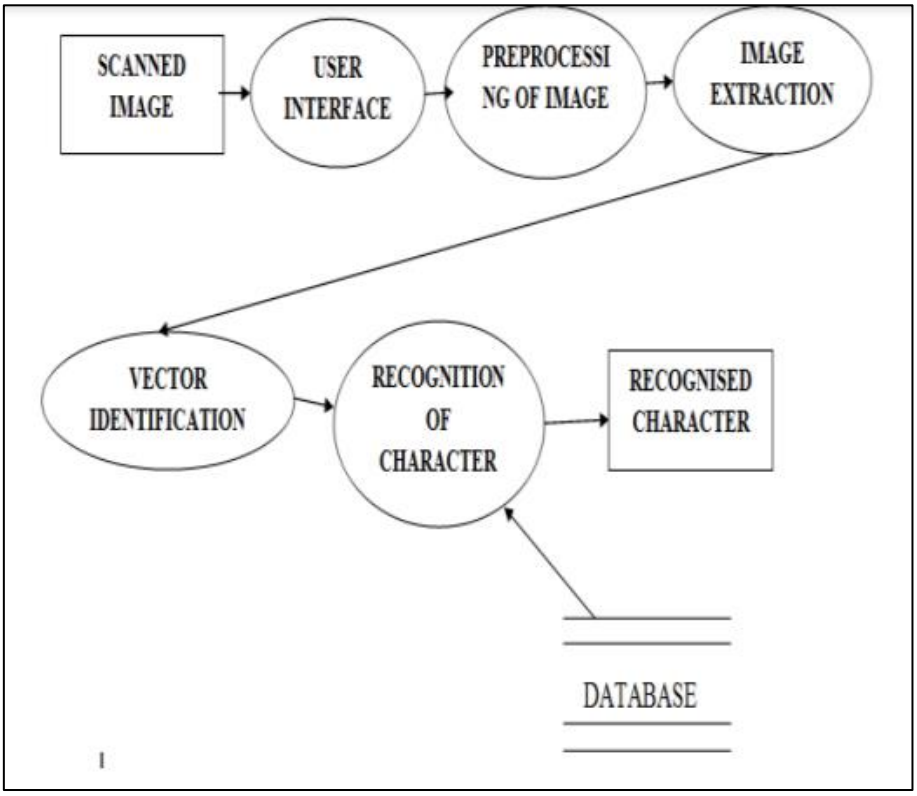

FIG:2

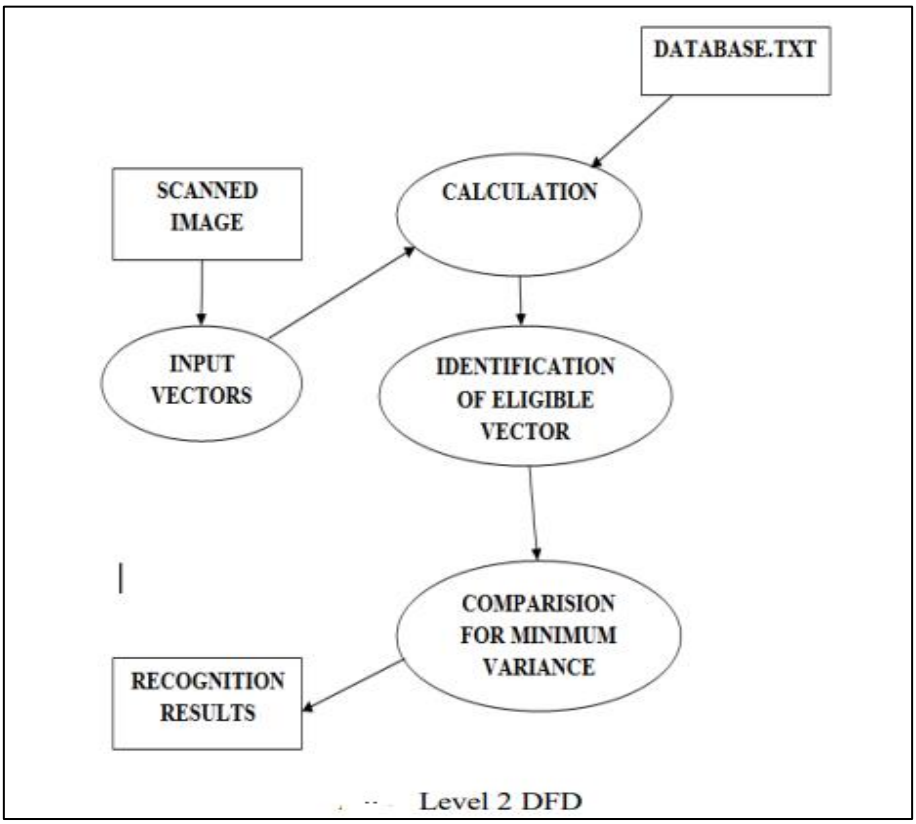

FIG:3

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2025

DOI: 10.17148/IJIREEICE.2025.13435

5. SYSTEM IMPLEMENTATION

System implementation is the phase where the image reading and OCR interpretation solution is built, deployed, and made operational. This involves various activities including setup, deployment, and post-deployment support.

1. **Environment Setup**:
   - **Development Environment**: Set up local environments for developers with tools such as Docker for containerization and virtual environments (e.g., Python virtualenv).
   - **Production Environment**: Set up cloud infrastructure using AWS, Google Cloud, or Azure for hosting the application, databases, and file storage.
2. **Backend Implementation**:
   - **OCR Engine Integration**: Integrate the selected OCR engine (e.g., Tesseract, Google Vision API) into the backend to handle image processing.
   - **Image Preprocessing Module**: Develop preprocessing algorithms for image enhancement (e.g., noise reduction, rotation, binarization)..
3. **Frontend Implementation**:
   - **Web Interface**: Develop the web application using frameworks like React, Angular, or Vue.js for an intuitive user experience.
   - **File Upload Interface**: Implement functionality to upload files from the user's device to the server or cloud storage.
4. **Database Implementation**:
   - **Schema Design**: Design the database schema to store user data, OCR results, and metadata related to processed images.
   - **Integration with Storage**: Connect the database with cloud storage (e.g., AWS S3) for storing large images and OCR results.
5. **Cloud Infrastructure Setup**:
   - **Cloud Storage**: Set up cloud services (e.g., AWS S3 or Google Cloud Storage) to store images and processed results.
   - **Auto-Scaling**: Set up auto-scaling for backend services to handle varying workloads, especially for batch processing..

6.CONCLUSION

The project demonstrates the use of OCR technology to extract text from images, specifically invoices, by applying image processing techniques like grayscale conversion and pixel thresholding. Tesseract OCR was used for text recognition, yielding good results with black-and-white images. The extracted text is then cleaned and organized into JSON and CSV formats. The system currently works only with a specific format and is limited to English. Future improvements could focus on detecting spaces in text, handling different invoice types, and supporting multiple languages. This system can simplify workflows for users through app integration.

7.SCOPE FOR FUTURE ENHANCEMENTS

1. **Improved OCR Accuracy**:
   - Use deep learning models to enhance text recognition accuracy, especially for handwritten and complex fonts.
   - Expand multilingual support for more languages and scripts.
2. **Handwriting Recognition**:
   - Improve handwriting detection for diverse styles and allow user-customizable models.
3. **Smart Document Parsing**:
   - Auto-detect document types (invoices, forms) and extract specific fields like dates and totals.
   - Better layout understanding for tables and paragraphs.
4. **Real-Time OCR**:
   - Implement live OCR for camera-based text capture and integrate Augmented Reality (AR) for real-time text overlay.
5. **AI and Cognitive Services**:
   - Integrate sentiment analysis, automatic translation, and intelligent data extraction from unstructured documents.

DOI: 10.17148/IJIREEICE.2025.13435

6. **Business Workflow Integration**:
   - Automate document processing for business systems (e.g., accounts payable, CRM).
7. **Data Privacy and Compliance**:
   - Enhance privacy features for GDPR/CCPA compliance, including sensitive data redaction and end-to-end encryption.
8. **Cloud and Edge Processing**:
   - Offer OCR as a cloud service for scalability.
   - Implement edge computing for local text processing on mobile or IoT devices.
9. **User Experience**:
   - Allow users to train and fine-tune OCR models and provide interactive feedback for system learning.

REFERENCES

[1]. Smith, R. (2007). An Overview of the Tesseract OCR Engine. *Proceedings of the Ninth International Conference on Document Analysis and Recognition (ICDAR 2007)*. IEEE, 629-633.
[2]. Google Cloud Vision API Documentation. (n.d.). Retrieved from https://cloud.google.com/vision
[3]. Yamaguchi, T., & Kato, T. (2012). Handwritten Character Recognition Using Convolutional Neural Networks. *International Journal of Computer Applications*, 48(12), 47-54.
[4]. Rani, S., & Kumar, R. (2013). A Review on Optical Character Recognition. *International Journal of Computer Science and Information Technologies*, 4(5), 793-796.
[5]. Optical Character Recognition: A Survey. (2015). K. S. Rajasekaran & R. L. Ramesh, *International Journal of Engineering Trends and Technology*, 29(5), 262-268.
[6]. Image Preprocessing for OCR. (2014). S. P. S. S. R. Anjaneyulu, *Journal of Signal and Image Processing*, 7(2), 94-100.
[7]. Savoy, J. (2012). Text Recognition in Image and Video Documents. *Journal of Computer Science and Technology*, 27(2), 421-436.
[8]. Improving OCR Accuracy with Image Preprocessing Techniques. (2011). E. S. R. P. R. Jadhav & M. S. Yadav, *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)*, 1(5), 167-173.
[9]. Optical Character Recognition and Its Applications in Image Processing. (2016). R. K. Gupta, *International Journal of Advanced Research in Computer Science and Software Engineering*, 6(5), 249-254.
[10]. Handwritten Text Recognition Using Deep Learning. (2019). Z. Zhang, S. Kang, & Z. Liu, *Journal of Machine Learning Research*, 20, 1-14.
[11]. Character Segmentation and Recognition in OCR. (2018). M. I. M. Bhuiyan & S. K. Saha, *International Journal of Computer Applications*, 174(9), 15-22.
[12]. OCR System for Handwritten Text Recognition: A Review. (2017). P. G. Nagesh, V. S. Naidu, & N. L. Chandrasekar, *International Journal of Computer Applications*, 156(4), 29-35.
[13]. OCR and Its Applications in Real-Life Scenarios. (2020). M. A. Khan & S. Khan, *International Journal of Engineering and Technology*, 7(6), 387-394.
[14]. Performance Evaluation of OCR Tools. (2014). H. M. Ali, M. M. A. El-Sayed, & A. H. El-Bakry, *International Journal of Computer Applications*, 98(13), 25-31.

APPENDIX

Screenshots

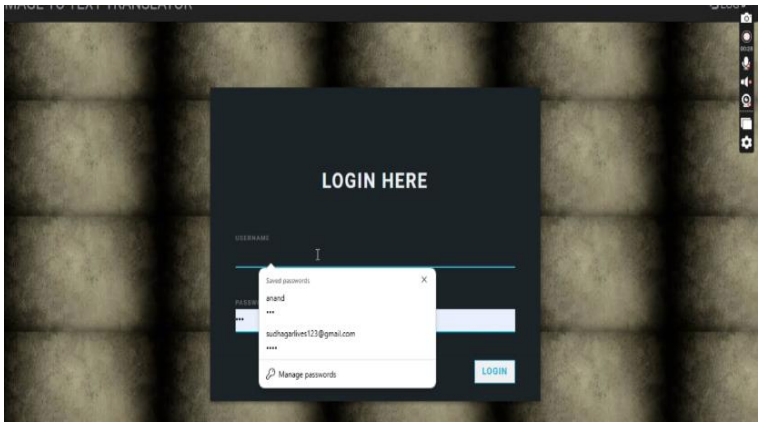

FIG:4

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2025

DOI: 10.17148/IJIREEICE.2025.13435

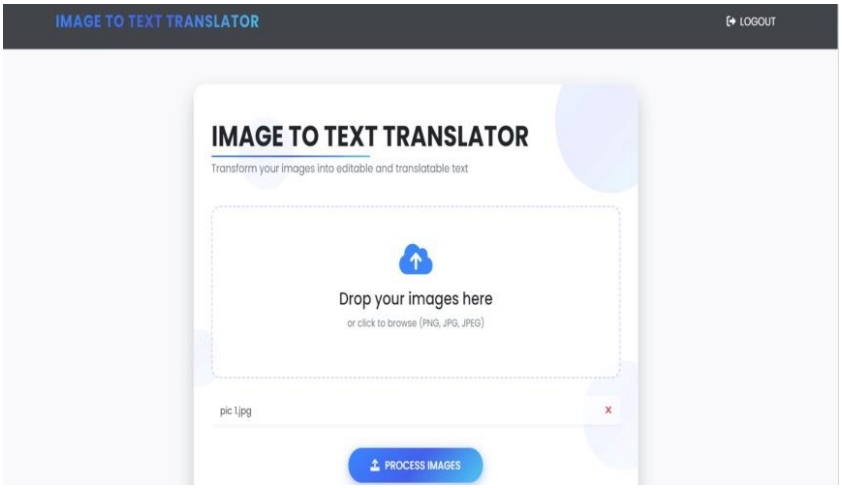

FIG:5

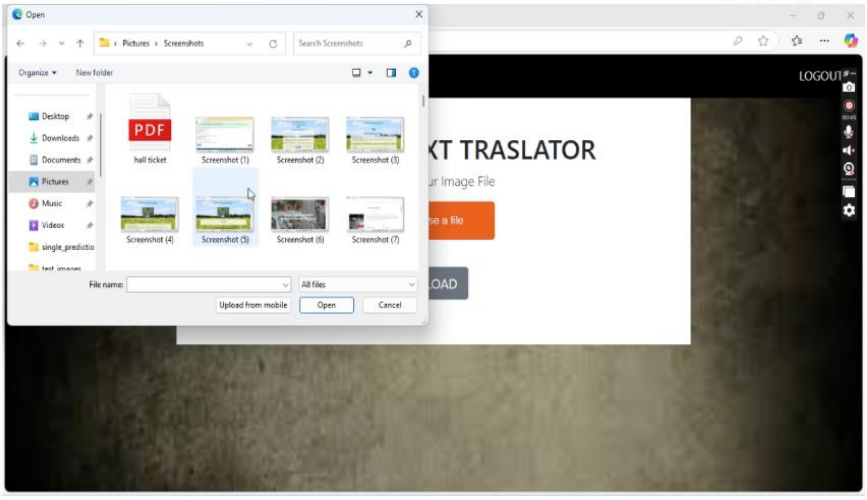

FIG:6

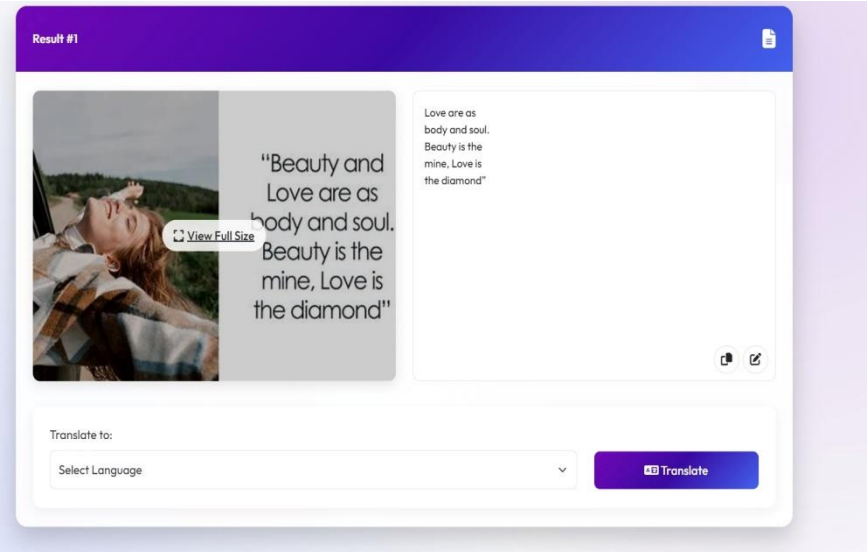

FIG:7