Indian Postal Service Automation

*Abstract*— India has the world's most widely distributed postal system, with a collection of around 1.5 lakh post offices. More than 100 million parcels are delivered every year on average. This paper addresses the most common and essential problem in the postal department of parcel segregation tasks by proposing a fully-automated solution. The proposed methodology uses bidirectional LSTM for handwritten address recognition, followed by address parsing techniques and the construction of knowledge graphs to pinpoint the accurate location of the delivery. This proposed solution can bring the parcel segregation process from hours to minutes.

Keywords— Automation, Postal Service Automation

# Introduction

India is one of the world's most significant postal systems, with roughly 1.5 lakh post offices and around 6 lakh post boxes for collecting packages. The suggested solution employs CRNN for handwritten address recognition, then employs address parsing methods and knowledge graph creation to determine the precise location of the delivery.

The Convolutional Recurrent Neural Networks (CRNN) is a recurrent neural network used primarily for natural language processing.

Address parsing is breaking down an address into its parts. Many applications, such as geocoding and record linking, depend on this activity. Determining the various components of a lesson can be helpful when locating a specific location using textual information.

A knowledge graph is a knowledge base that integrates data through the use of a graph-structured data model or topology. Knowledge graphs are frequently used to contain interconnected descriptions of items - objects, events, circumstances, or abstract concepts - as well as the semantics behind the terminology used.

## CRNN ARCHITECTURE

The Convolutional Recurrent Neural Networks are two of most well-known neural networks combined. Convolutional recurrent neural network (CRNN) combines CNN (convolutional neural network) and RNN (recurrent neural networks).

The CRNN architecture consists of four units: a data preprocessing unit, a CNN unit for spatial feature representation learning, an LSTM unit for visual time series modeling, and a SoftMax based classifier for image classification.

## NAMED ENTITY RECOGNITION

Named entity recognition (NER) is a natural language processing (NLP) task that involves identifying and classifying entities in text into predefined categories such as people, organizations, locations, and more. NER is a critical component of various NLP applications, including information retrieval, machine translation, question answering systems, and text summarization.

The process of NER involves identifying all the entities in a given text and classifying them into predefined categories. This task can be performed using various approaches, including rule-based systems, statistical models, and machine learning algorithms. Many state-of-the-art NER systems use deep learning models that have shown superior performance in NER tasks.

In recent years, there has been a growing interest in developing NER systems that can handle more complex entities such as events, relations, and emotions. These systems are referred to as extended NER or entity relation extraction (ERE) systems.

NER has numerous real-world applications, such as named entity disambiguation, entity linking, and entity summarization. Named entity recognition is also used in various fields such as biomedicine, social media analysis, and legal documents.

In conclusion, Named Entity Recognition is an essential natural language processing task, with numerous applications in various fields. As research in NER continues to evolve, there is potential for further improvements and advancements in the field.

## C. MOTIVATION

Every day, millions of letters and couriers are delivered worldwide. Indian postal services earn around 1700 crores per annum. There are almost 6Lac post boxes from which letters are collected.

Usually when a courier or mail is sent to PO, a person manually reads and segregates the letters based on which city and state the letter is supposed to go. Automatic sorting of mailing items plays a crucial role in the postal service system. In such a situation, an OCR module is required to recognise the postal address on mailing items and a parser module to parse the address.

# Proposed methodology

The proposed methodology for the problem of Indian postal automation consists of four modules. An **OCR** module to read the address written on the postal card. The address text read by OCR is passed onto an **Address Parser.** The address parser parse the address into its constituents, for example state name, district name etc. A **Knowledge graph** is built on the constituents of address, this helps in identification of missing constituents in the address. The complete address is used to locate the exact pinpoint location of the addressee and thereby making the process completely automatic.

# Results and Discussions

#### OCR Module:

#### Address Parser Module:

#### Knowledge graph:

# Conclusion

In conclusion, the Indian Postal Automation system can completely change how the postal service in India runs. The proposed methodology can cut delivery times, increase efficiency, and increase accuracy.

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