



# Secure and efficient message transmission in MANET using hybrid cryptography and multipath routing technique

Jayantkumar A. Rathod<sup>1</sup> · Manjunath Kotari<sup>2</sup>

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## Abstract


MANETs, or Mobile Ad hoc Networks, are a group of self-organized mobile devices that can connect with one another without relying on a centralized infrastructure or authority. The key benefit of MANETs lies in their ability to handle mobility while facilitating data communication among users within the network. However, ensuring the security of MANETs is essential for their proper functioning, particularly in terms of maintaining data confidentiality and integrity during transmission. MANETs are highly vulnerable to attacks due to their inherent properties. Clustering is an energetic technique employed in MANETs to handle mobile nodes effectively. It involves dividing the network into sub-networks known as clusters, which can consist of overlapping or disjointed nodes. For each cluster, an enhanced node termed the Cluster Head (CH) is chosen to oversee routing tasks. This approach reduces the operating expense on member nodes and improves the overall system efficiency. However, the relationship between nodes and CHs can change arbitrarily, resulting in re-union and re-grouping in the clustered MANET.

In a MANET, which is characterized by its dynamic and unpredictable nature, multiple path discovery plays a vital role in maintaining connectivity, improving reliability, optimizing resource utilization, and ensuring resilience to network conditions and node failures. This study aims to create multiple paths between a source and destination using a hybrid protocol that combines AODV (Ad hoc On-Demand Distance Vector) and MBOMRP (Multi-Path Byzantine OLSR). Additionally, a hybrid cryptographic technique is applied to securely transmit fragmented data. The primary objective of this proposed solution is to guarantee the appropriate, secure, and accurate delivery of packets. The results of our study demonstrate that the transmission of encrypted messages through multiple paths enhances network performance, efficiency, and the secure transmission of data within these self-configuring and infrastructure-less networks. It achieves these benefits while minimizing bandwidth consumption during routing operations.

**Keywords** Mobile Ad-Hoc Network (MANET) · Clustering · Energy efficiency · Cryptographic techniques · Multipath route discovery · AODV · MBOMRP

Extended author information available on the last page of the article

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## RESEARCH ARTICLE

# TriChain: Kangaroo-Based Intrusion Detection for Secure Multipath Route Discovery and Route Maintenance in MANET Using Advanced Routing Protocol

Jayantkumar A Rathod

Department of Computer Science and Engineering, Alva's Institute of Engineering (Affiliated to Visvesvaraya Technological University, Belagavi), Moodubidire, India.

jayant1977rathod@gmail.com

Manjunath Kotari

Department of Computer Science and Engineering, Alva's Institute of Engineering (Affiliated to Visvesvaraya Technological University, Belagavi), Moodubidire, India.

mkotari@gmail.com

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**Abstract** – Several practical applications are combined in a new paradigm known as 5G-based mobile ad hoc networks (MANET) with cloud. Numerous existing works perform trust assessment, intrusion detection, and route discovery to improve secure data transmission in MANET. Route maintenance was not carried out in several of the existing works, and the absence of enumerating link status and node reliability during route maintenance results in link failure and increases packet loss. By considering the existing issues, a novel Kangaroo-based intrusion detection system was proposed to eliminate malicious nodes from the network using Bidirectional- Long Short-Term Memory (Bi-LSTM). This increases data transmission security. For graphical user authentication, encryption based on ASCII values of the Reflection tree (E-ART algorithm) is employed. In this paper, a divide well merge algorithm was implemented, which is a better approach for hierarchical clustering. This method consists of two phases: a Division and Merging phase. The effective route identification and route maintenance in MANET are implemented by using an Advanced Ad-hoc On-demand Distance Vector Protocol (Advanced AODV), which discovers the route using the Fire Hawk Optimization Algorithm (FHO) to obtain optimal multipath by contemplating trust, node connectivity, throughput, node degree, bandwidth, energy and distance where this protocol offers loop-free operation and enhance its scalability to numerous numbers of terminals. In this way, route discovery and route maintenance are established to enhance secure data transmission, thereby reducing packet loss. The modified blockchain called TriChain is proposed for enhancing data transmission security. For the Proof of Work based on Reputation (PoWR) consensus algorithm is used to reduce transaction confirmation latency and block creation time thereby increasing security. In this way, route discovery and route maintenance are established to enhance secure data

transmission thereby reducing packet loss. The proposed work is evaluated using detection rate, energy consumption, packet delivery rate, throughput, authentication rate and delay.

**Index Terms** – 5G MANET, Kangaroo Intrusion System, Bi-LSTM, Encrypts Based on ASCII Values of Reflection Tree, Advanced AODV, Fire Hawk Optimization Algorithm.

## 1. INTRODUCTION

The distributed wireless connection is acknowledged as a Mobile Ad Hoc Network (MANET), which is without any infrastructure and auto-configured devices (mobile phones, laptops) that are connected wirelessly. The MANET benefits with effortless communication of mobile nodes due to their communication range. A radio transmitter and the recipient are installed in each node of a MANET, enabling wireless communication between the nodes and the system [1-3]. The following are the primary explanations for why MANETs may send data with comparable properties while yet using an active strategy: It is unexpected that the transmission scope of this transmission is more limited than that of the previous transmission, which prevents any number of nodes from exchanging data across the system [4-6]. The fact that portable nodes in Wi-Fi Ad-Hoc networks rely on battery packs, which are typically underpowered in most environments and take an extended period to recharge or replace, is a major problem. Route discovery and data transfer are the two phases of MANET communication, both of which are subject to different types of attacks. Adversaries can obstruct route finding during the initial phase by feigning to be destination, responding with outdated routing information,

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## Classification of Text and Non-Text from Bilingual Document Images Using Deep Learning Approach

Shivakumar G<sup>1</sup>, Ravikumar M<sup>2</sup>, Shivaprasad B J<sup>2</sup>

<sup>1</sup> Assistant professor, Dept. of IT & Computer Application Vignana's University, Guntur, Andhra Pradesh-India.

<sup>2</sup> Professor Dept. of Computer Science, Kuvempu University, Jnanasahyadri, Shivamogga, India.

<sup>2</sup> Assistant professor, Dept. of Computer Sci., and Eng., Alvas Institute of Eng., Technol., Mangalore, India.

**Abstract:** In this work, we have presented an efficient approach for classification of text and non-text document information from real time office documents images printed/handwritten which are bilingual using a deep learning approach i.e., U-net architecture for experimentation purpose. We have created our own dataset containing 2000 document images. Initially pre-processing is applied on the input document images proposed method is compared with other existing methods and obtained accuracy of 99.62% different performance measure i.e., (Specificity, Sensitivity, Precision, F1-Score) used in the experimentation.

**Keywords:** Document Images; Pre-Processing; Filtering; Segmentation (U-Net).

### 1. Introduction

An imperative aspect of computer vision is the selection and classification of areas of interest in scanned images of text documents. Many researchers around the world are studying how to convert document images into editable formats. There needs to be a separation of text zones from non-text zones and a correct ordering of them in reading systems. An image can be analyzed to detect/extract/recognize text. For applications including optical character extraction, human-machine input distinction, spam detection, and machine-to-human input differentiation, text recognition and classification in natural images are very significant. Changes in the environment in which images are taken make it difficult for in-text recognition to recognize valuable full text in images. Image text detection identifies locations that contain meaningful whole text in an image. Taking an image in a different area makes it difficult. In analyzing document layouts, it is important to separate text and non-text elements.

The complex structure of the document has limited the quality of separation results despite several approaches. In order for the printed text to be recognized, it must be separated from non-text areas, such as signatures, handwritten text, logos, and other symbols, in order to be accurate. Most research, however, focuses on converting images of documents into the editable text because of the many ways in which this conversion can be used.

Survey of text / non-text separation using various feature classifier combinations.

Documents written by hand are generally unstructured. They generally lack structure, i.e., they lack organization. Due to the lack of a specific layout, handwritten documents appear very chaotic compared to printed documents [4].

Data extraction and retrieval from digital documents have become nearly impossible with the rapid increase in digital documents. There is a need for automated methods. A variety of tools and methods are available to convert digital documents into text that can be processed. To understand and extract knowledge from documents, graphical elements like tables, figures, and equations are crucial. In the research community, therefore, the detection of these objects from documents has attracted considerable attention. Detecting tables and figures within documents is a challenging problem due to the lack of common dimensions and variations in their layouts. The purpose of this article is to recognize different types of digitally generated documents that contain graphical objects such as tables, diagrams, and equations. An object detection problem in a natural scene is conceptually similar to this problem. In rule-based systems, it is difficult to detect irregularly arranged equations, tables, and diagrams [1] – [8].

We present an end-to-end deep learning-based framework, called Visual Structure Object Recognition (VSOR), for detecting visual objects in document images, such as tables, figures, and