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# PADaaV: Blockchain-Based Parking Price Prediction Scheme for Sustainable Traffic Management

RIYA KAKKAR<sup>1</sup>, JAFAR ALZUBI<sup>2</sup>, (Senior Member, IEEE), AMIT DUA<sup>3</sup>, (Member, IEEE), SMITA AGRAWAL<sup>1</sup>, (Member, IEEE), SUDEEP TANWAR<sup>1</sup>, (Senior Member, IEEE), RAJAT AGRAWAL<sup>3</sup>, GULSHAN SHARMA<sup>4</sup>, PITSHOU N. BOKORO<sup>5</sup>, (Member, IEEE), AND RAVI SHARMA<sup>6</sup>

<sup>1</sup>Department of Computer Science and Engineering, Institute of Technology, Nirma University, Ahmedabad, Gujarat 382481, India

<sup>2</sup>Faculty of Engineering, Al-Balqa Applied University, Al-Salt 19117, Jordan

<sup>3</sup>Department of Computer Science and Information Systems, BITS Pilani, Pilani, Rajasthan 333031, India

<sup>4</sup>Department of Electrical Engineering Technology, University of Johannesburg, Johannesburg 2006, South Africa

<sup>5</sup>Department of Electrical and Electronics Engineering, University of Johannesburg, Johannesburg 2006, South Africa

<sup>6</sup>Centre for Inter-Disciplinary Research and Innovation, University of Petroleum and Energy Studies, Dehradun 248001, India

Corresponding authors: Sudeep Tanwar (sudeep.tanwar@nirmauni.ac.in), Smita Agrawal (smita.agrawal@nirmauni.ac.in), and Gulshan Sharma (gulshans@uj.ac.za)

**ABSTRACT** In most countries, traffic congestion has reached a level where managing traffic is tedious for regulatory bodies. The traffic management faced many issues such as route routing based on congestion, delivery of messages/emails to end-users, and real-time allocation of parking slots. There have been many works on predicting parking prices for traffic management, but most favor users or owners and are not secure. To address these issues, a blockchain and Interplanetary File System (IPFS)-based parking price prediction scheme (*PADaaV*) is proposed to facilitate the users to reserve a parking slot securely and efficiently. It mainly focuses on ensuring security, privacy, and transparency for parking slot owners and users. Furthermore, we employ a second price auction model to optimize the parking price for users, and parking slot owners can also get benefit from it. The performance of the *PADaaV* has been simulated for 100 users with 40 parking slots based on different auction models. The various performance parameters considered are profit for users, profit for parking slot owners, overall revenue of the system, scalability, computation time, and data storage cost. The performance results show that the *PADaaV* is secure and beneficial for users and parking slot owners.

**INDEX TERMS** Blockchain, smart contracts, second price auction model, traffic management.

## I. INTRODUCTION

Traffic management is one of the challenging tasks that need to be controlled efficiently. It is necessary to regulate the flow of traffic for sustainable traffic management. Traffic congestion is the main reason due to which it is getting difficult day by day for the drivers to find an empty parking slot, especially during peak hours [1]. There are many research studies conducted [2], [3], which state that vehicles looking for free parking slots include approximately 8% of traffic. Drivers spend approximately 3.5 to 14 minutes to find an empty

parking slot [4], [5]. Even in developing countries, many types of fatal accidents are caused due to traffic congestion [6], [7]. There are various studies on vehicle parking prices, and they have shown that a vehicle pays approximately 5 dollars or more, which is a huge amount of total travel cost [8], [9]. The survey data of 2013 and 2015 states that on-street parking price on weekdays has increased from 2.00 USD to 4.40 USD per hour [10]. Many researchers worldwide discussed the various parking price prediction schemes. Still, with the help of a centralized authority, which is vulnerable to various security issues such as data modification, spoofing, Man-in-the-middle (MitM) attack, etc [11]. Centralized authority can charge high parking prices to

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