

ICRAMCS 2026

THE EIGHTH EDITION OF THE INTERNATIONAL CONFERENCE ON
RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
April 23-24-25, 2026 | Marrakech, Morocco



Position Affinity Algorithm : A Deterministic Collision Reduction Strategy for 2D Lattice-Based Blockchain Mining

Communication Info

Authors:

Salim BLOUNDI¹
Hussain Ben-azza*²

¹ *Ensam-Meknès, UMI, Meknès,
Morocco*

² *Ensam-Meknès, LIMSIS
Laboratory, UMI, Meknès,
Morocco*

Keywords:

- (1) Blockchain
- (2) Hashing
- (3) Consensus
- (4) 2D-Lattice

Abstract

Traditional blockchain systems, pioneered by Nakamoto [1], organize blocks in a linear chain where each block references exactly one predecessor. This linear structure inherently limits throughput and creates scalability challenges. In 2D lattice-based blockchain systems, unlike standard Bitcoin [1], multiple miners compete to place blocks on a growing frontier of available positions. Without coordination, miners may select the same position, leading to wasted computational work when only one block can occupy each position. This work presents the Position Affinity Algorithm, a deterministic strategy that assigns each miner a unique preference ordering over frontier positions using cryptographic hashing. Drawing from consistent hashing techniques [2, 3], and classical probability theory, we prove that this approach reduces mining collisions by significant ratios while requiring zero network communication, enabling parallel mining without the rigid constraints of zone-based partitioning.

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