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# A multi-dimensional routing based approach for efficient communication inside partitioned social networks

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## Abstract

Social Networks (SNs) connect nodes from different geographical areas, keeping users updated about current affairs through message sharing. Natural calamities or deliberately imposed actions can cause Internet disconnections between geographical areas. This results in a SN partition which leads to communication loss between nodes inside the partitioned area. In this paper, we propose an extended Multi-Dimensional Routing (eMDR) algorithm using Greedy routing, which considers multiple attributes for routing. It improves the communication efficiency inside partitioned SNs. The performance of the proposed algorithm is validated by considering three dimensions/attributes, viz., social interest, geographical location and time-zones of social nodes on both real and synthetic SN datasets. The results of topological and routing probabilities for Chord and novel Social Interest Overlay networks, show considerable improvement in communication inside partitioned SNs.

## 1 Introduction

A Social Network (SN) is a structure of social-nodes (users), directly or indirectly connected to each other through different social relationships such as friendship, social communities, trust, etc. Group of socially-connected users form a small world simulating many real-world scenarios.

[1]. Many useful features of SNs can be effectively exploited using Semantic Overlay Network (SON) topologies. SON is a flexible network organization which improves query performance while maintaining a high degree of node autonomy, wherein a node can belong to more than one SONs at any particular time. With SONs, nodes with semantically similar content and information are clustered together and form connections with other related nodes [2]. Peer-To-Peer (P2P) social overlay networks help in interconnecting friends by exploiting useful SN features sharing ideas, pictures, posts,

activities, events and interests. A representation of each user with his/her social links and a variety of supplementary services such as career services are provided by various SN functionalities.

Users are more concerned and connected on SNs now-a-days and substantial information such as weather forecast or information about missing persons and many such types of news can be spread very fast. However, due to a natural calamity or a deliberate action by some organization, a particular geographical area gets disconnected from rest of the network [3]. Such disconnection results in a network partition, which hampers message sharing between nodes inside the partitioned area. It is because two social nodes may be connected through indirect links and if any such intermediate link gets disconnected due to the partition, the message sharing becomes difficult. In this case, SNs hold advantage over other communication means like mobile calling, which is time consuming, limited to a few users, and restricted to a particular way of communication where all types of information cannot be shared.

Figure 1 represents a SN spread over six geographical partitions $(P_1$ to $P_6)$. There are three social communities based on common social interests (represented by simple line, dotted line and dashed line). If the partition $P_4$ suffers a network breakdown, the social nodes which were connected through the nodes in other geographical partitions, cannot

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