# Forming a Social Structure in Mobile Opportunistic Networks

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*Abstract*—In mobile opportunistic networks, the network topology is unpredictable and very dynamic. Thus, broadcast or flooding is the best way to disseminate information. However, this approach consumes a lot of resources and introduces a duplication problem. One way to overcome this problem is to understand the relationship between the mobile nodes to guide the information dissemination flow. In this paper, we introduce three different approaches to form a node social relationship based on the node frequency interactions. The methods are *Social structure based on average frequency interactions*, *Social Structure based on Periodicity Frequency Interactions* and *Social Structure based on Sliding Window*. The results show that it is possible to form a social structure based on the nodes frequency interactions with other nodes. The most suitable approach to represent the nodes social relationship in opportunistic networks is the social structure based on Sliding Window approach.

*Index Terms*—Mobile opportunistic networks and Social Networks.

## I. Introduction

Mobile opportunistic networking has been developed by the networking community as an evolution of delay tolerant networking. Instead of end-to-end connectivity being available at a single point in time, connections may be intermittent and so the path of links between source and recipient is spread over a period of time. So there may be no complete path ever existing between sender and receiver [1]. Therefore, in this situation the mobile nodes have to use a store, carry and forward technique in order to deliver the information. The communications between nodes is based on peer-to-peer concept and it uses a short range communication technologies such as Bluetooth, WiFi and ZigBee.

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the flooding consumes a lot of resources and introduces an information duplication problem. This problem inspired number of researchers to propose a new way of disseminating information in opportunistic networks. The proposed information dissemination technique can be classified into three categories;epidemic routing, probabilistic routing and context based routing. Epidemic Routing introduced in [2] is an improvement of flooding based technique. In original form [2], instead of passing information to all known neighbours, it uses information index (summary vector) exchange process to avoid sending the same information to same nodes. The probabilistic introduced in [3] extends the epidemic routing approach. Each node calculates predictability delivery of encountered nodes. This probability reflects whether the encountered node is a good forwarder or not. Context Based routing exploits user information for routing purposes. Information such as user address, location, and preference are the examples of information that can be exploited. CAR [4], HiBOP [5] are the techniques that are classified under this category. This technique requires a memory to store information and the state of the nodes. Moreover, it also requires nodes to update and to recalculate to provide a better route solutions. The context based routing is very close to our social structure concept. However, instead of exploiting the user information, our approach focus on exploiting the mobile nodes frequency interactions to form a social structure.

In a general literature, a social structure can represent many relationships between nodes (people, devices, organization) in social networks. The relationships between nodes can be made from different interdependencies, such as friendship, knowledge, beliefs and other elements that make nodes share or exchange things. According to Jhon Guare [6], people are actually separated by "six degrees of freedom", which means