Chapter 7
Exploring Multiple Dynamic Social Networks in Computer–Mediated Communications:
An Experimentally Validated Ecosystem

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ABSTRACT

This chapter discusses concepts and tools for the exploration and visualization of computer-mediated communication (CMC), especially communication involving multiple users and taking place asynchronously. The work presented here is based on experimentally validated social networks (SN) extraction methods and consists of a diverse number of techniques for conveying the data to a business analyst. The chapter explores a large number of contexts ranging from direct social network graphs to more complex geographical, hierarchical, and conversation-centric approaches. User validation studies were conducted for the most representative techniques, centered both on extracting and on conveying of CMC data. The chapter examines methods for automatically extracting social networks, which is determining who is communicating with whom across different CMC channels. Beyond the network, the chapter focuses on the end-user discovery of topics and on integrating those with geographical, hierarchical, and user data. User-centric, interactive visualizations are presented from a functional perspective.

INTRODUCTION

Ease of analysis and exploration of the big data generated through computer-mediated communication (CMC) is significant to practitioners like network analysts, business and marketing experts, researchers, intelligence analysts, first responders, as it determines their ability to exploit the vast amount of data available through the different modern CMC platforms like microblog (Twitter), social media (Facebook, internet relay chat), instant messaging,(Instagram) etc. In order to empower users to take advantage of the wealth of information transmitted and stored within the CMC platforms, research into concepts and tools for efficient analysis, exploration and visualization of digital communications is essential. A diverse number of techniques for analyzing and conveying the information to a business analyst (and other practitioners) via a large number of contexts ranging from direct social network graphs to more complex geographical, hierarchical, and conversation centric approaches along with the results of their experiments are presented in this chapter.

Modern internet access and the ubiquity of smart phones have greatly increased (and perhaps altered) the dynamics of human communication; the variety and the currency of subjects, diversity and population of participants, multiplicity and intensity of opinions are difficult to envision in the absence CMC. Furthermore, access to the simultaneous engagement of users in multiple interactions via different CMC systems and applications like microblog, chats, messaging applications, and online social networking offers practitioners a rich virtual environment to better understand the complex dynamics of human communications. Although, these CMC archives along with their metadata like time, geographic location, and device identifiers provide practitioners like social network analysts, business and marketing experts, researchers, intelligence analysts, first responders with a wealth of information for analyzing different aspects of human interactions; the volume and diversity of available data presents the challenge of efficient of exploration and analysis for the purpose of extracting and presenting information of interest from the data. The challenge of extracting actionable information from CMC systems is still an active research topic. Methods for extracting situational awareness for tweets (Verma et al., 2011) as well as identification and categorization of disaster-related tweets Stowe et al. (2016) are some of the related works in this domain.

This chapter explores the above described challenge in the context of big data and under two broad objectives; namely, analysis and visualization. The nature of big data dictates that design choices for various techniques focus on simplicity of processing, where priority is given to analysis techniques that run fast and visualizations that present simple relationships and allow the user to navigate in the large expanse of relationships provided by big data. The CMC data analysis category includes methods for automatic analysis of actors, their social network structures as well as

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