

Expansion of Telecommunication Social Networks

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Abstract. A social network, in which nodes represent humans and weighted ties reflect relationships between them, can be formed in an automatic way based on the data about customers of a telecommunication company as well as their communication activities. The expansion of a telecommunication social network can be supported with one of three main approaches that have been considered in this paper: existing group conjunction, internal expansion of groups, and transfer of external relationships.

Keywords: social networks, integration of networks, network expansion.

1 Introduction

A social network is the network of nodes – actors (individuals, organizations, organizational units) with ties i.e. social relationships linking pairs of actors [10]. The nodes and ties are usually represented by graphs or matrices. In social networks that are supported by computer or telecommunication networks, the mutual communication is crucial stuff in creating and maintaining personal relationships. Moreover, these relationships tend to change over the course of time: people establish new relations and neglect or discontinue the old ones. The evolution of a social network depends on mutual experience, knowledge, relative interpersonal interests, and trust of human beings [4, 8] as well as their social capital [7] and social position. The last ones describe importance and social statement of an individual within a social network. Some cohesive social subgroups can be recognized and extracted from a social network using clustering methods [11]. Building new or strengthening the existing relationships can benefit both individuals and entire social groups. The number of relationships can be increased by bonding or bridging [9]. The goal of the former is the interconnection of two or more homogeneous and similar but separate groups whereas in the latter the different heterogeneous groups are linked. Usually, the joined groups are internally very close. Both bonding and bridging enable the group to become a larger community in which the associations between humans are permanent. Another approach is to stimulate new relationships within groups. In this way the social network contains many disconnected but internally very coherent groups of members that know one another very well. Practically, the creation of new relationships can be stimulated by various types of recommendation systems [7, 8].

Computer and telecommunication networks can not only reinforce but also help to expand existing social networks especially within a geographical community [5].

2 Telecommunication Social Network, Relationship Extraction

A telecommunication social network is the network created upon the interactions (calls) between customers of a single telecom provider. A telecommunication social network $TSN=(H,R)$ consists of the set of members H (humans) and the set of durable relationships between pairs of members $R=H\times H$ (see Fig. 1). Relationships are automatically mined from the data about phone calls that are performed within the network. Note that a network member is practically an owner and user of a single phone number.

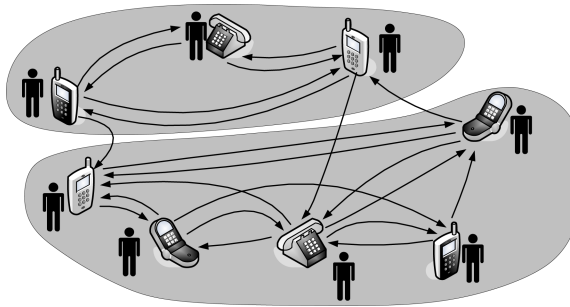


Fig. 1. Telecom network with two social groups. Edges reflect relationships between members.

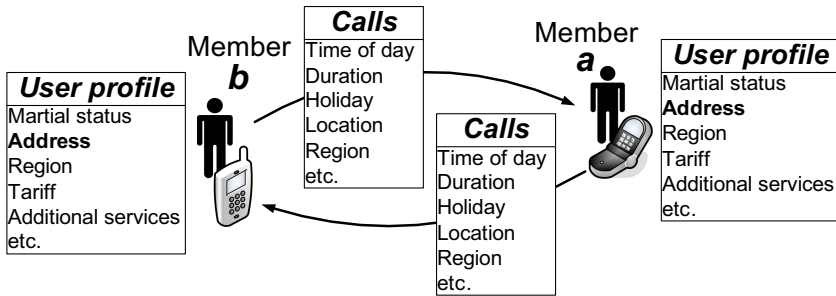


Fig. 2. Components used for relationship extraction

Social relationships that exist between telecom users can be extracted based on the data available from telecom companies with the certain probability, especially: user profiles that contain information from the contract and information about calls derived from the billing system (Fig. 2). People with the same or adjoining address live together or close to each other (neighbors), so they are in a common relationship even though they do not call each other. Nevertheless, performed calls are the most significant indicator of a relationship. However, a single call from member a to member b is