Interactive information visualization in a conference location

Maria Chiara Caschera, Fernando Ferri, Patrizia Grifoni

Istituto di Ricerche sulla Popolazione e Politiche Sociali, CNR, Via Nizza 128,
00198 Roma, Italy
{mc.caschera, fernando.ferri, patrizia.grifoni}@irpps.cnr.it

1 Introduction

The growing interest in visualization and analysis of social networks has led to the development of several methods of structural analysis in order to explore and analyse individual and group behaviors. An important component in the visualization of social networks is the understanding of the spatial and the temporal characteristics of individual and group behaviors.
In particular, the increasing importance of social networks is due to the decentralization of people working surroundings and asynchronous work timings. This is connected to the fact that people are able to communicate by mobile devices with others at anytime and any-where and they are free from the restrictions of time and place.
Moreover the interest in visualization and analysis of social networks is supported by the diffusion of the pervasive computing technologies, that allow to infer human activities through different sensors and collecting their data. These data can be refereed to location, movement orientations, work interests of the users and so on. The collection of these data can be used to infer users' behaviors and to offer them services that they could need. Considering social network application scenario, these collected data can be used in order to support the discovery of people with the same interests about work and hobbies and to facilitate their interaction.
Visualization can play an important role for social network analysis. The net can be created mainly using two approaches: using graph-based approaches that consist of nodes and edges that connect the different nodes; and using matrix, where row and columns stand for people and properties, and the numbers in each cell stand for specific relationships among these values.
In detail, most social network applications, based on graph visualization [1], represent social actors (persons or groups) as nodes, while edges show connections among the actors or flows between them. A graph-based visualization is used in [2] to highlight clusters of contacts derived from email archives showing different aspects of a person's social network.
However the graph representation is not always appropriate for large or dense data about social networks because of their complexity. In this case a good alternative can be given by the matrix representation.

To visualize the social networks and interacting with them can improve the relationships among people and support them in the definition of groups of interest.
The visualization of social networks improves the discovery of people and connections among them facilitating the awareness of community's structure.
This paper proposes a multimodal system that uses a matrix-based model for visualizing social networks according to interests of their members, their geographical location and spatial features. This system proposes an approach for supporting people to make working interaction during special events, as a scientific conference, and to explore the evolutionary process of visitation patterns in the conference.
The paper is organized as follows: section 2 focuses on several methods that are proposed in literature to analyse information about people, section 3 proposes a map-based system that visualizes interests of people and finally, section 4 concludes.

2 Related works

In literature several methods to support exploration of information about people and social interaction in different places have been developed in different domains.
To support the exploration and the detection of people with the same interests [3] has proposed a visualization interface for analysing what Internet pages are referring users.
In the domain of the e-mail communication, ContactMap [4] allows users to visualize the model of the their personal social network using a visual map of individual contacts and groups. This visualization uses a graph where each node offers communication functions and enables the user to retrieve current and archived information associated with contacts. This system groups contacts of the user using different colors and it positions them in a map that is similar to a geographic map where the spatial positions represent relationships among contacts. The position of each contact in the map reflects if they are central or peripheral to the user's work and personal life.
In [5] a visualization system for exploring online social networks has been presented. This system allows an ethnographic research of online social networking services in order to allow users the discovery of communities, people and connections among people. It supports a graph-based visualization and it provides applications for visualizing graph inter-connectivity and analysis of network and profile data.
Furthermore, several existing theoretical models of information visualization have been developed in [6] for visualizing a zoomable layout of an online social network.
This paper proposes SIM (Social Interaction Map system), a system that uses a matrix-based model for visualizing social networks according to characteristics connected to interests of their members and spatial features. In particular the system proposes an experimental approach for supporting people to make working interaction during special events, as a scientific conference.
This system supports the visualization of interests of people in order to allow each user to detect people that share work interests and to establish a direct connection by mobile devices using a multimodal interaction.

3 Visualization of people interests in a conference location

This paper describes a map-based visualization system that collects interests of people and visualizes them in order to support each user for detecting people that share work interests.
This visualization aims to create a shared awareness among them in a common place. The process awareness provided by the system enables its users to monitor interests of all users. Often during scientific conferences it is not easy to detect people having specific common interests and to interact with them, because the necessary information are not available, participants could be located in different rooms and it could be not possible to meet them. The interaction with maps using mobile devices can represent the possibility to go over spatial barriers.
To achieve this purpose the SIM (Social Interaction Map system) system was designed and implemented starting from the hypothesis that the main features to consider for visualization are the interests of each person and the spatial location of people.
An important spatial component is the proximity that is quantified as the distance between two devices (PDA or tablet PC). The location of each user is obtained by technologies for the geographical detection.
The discovery process requires that user registers her/his device and configures it with the visibility option. Registered users can explore their own neighborhood and the interest map is a tool for the analysis of personal interests networks in order to identify common interests.
Devices of the conference's members, which join in the map of interests, have a tag for the detection of their positions. Moreover rooms of the conference have sensors for detecting the position of each mobile device.
Using this system each registered member of the conference can detect other participants by Bluetooth and WiFi proximity detection.
User can also search mobile devices of other conference's members on the Web using WAP or UMTS technologies.
In this scenario, interests of people are collected by the system using a specific form, and each person can select her/his interests, that are managed by the system in order to define the map.
The system offers a multi-layer map that supports the functionality to choice a set of categories that fit user's work interests. Interests on specific topics of each person are grouped into categories, such as: multimodality, map visualization, visual languages, database systems, usability, information extraction, user modeling and context-aware computing.
In particular, the interface consists of a set of views that considers:

- A set of categories of interests C where $C = \{c_1, c_2, \ldots c_n\}$
- A set of users U where $U = \{u_1, u_2, \ldots u_i\}$
- A set of services S where $S = \{s_1, s_2, \ldots s_j\}$

The Boolean values of the Table 1 defines if the user u_i is interested in the category c_n ($k_{in} = 1$), or not ($k_{in} = 0$).

User	Category		
	c_1	c_2	c_n
u_1	k_{11}	k_{12}	k_{1n}
u_2	k_{21}	k_{22}	k_{2n}
u_i	k_{i1}	k_{i2}	k_{in}

Table 1: Categories of interests of users

Moreover each user u_k can set the service s_j connected to her/his category of interest c_n or she/he can directly select only her/his categories of interest (Table 2).

Service	Category		
	c_1	c_2	c_n
s_1	e_{11}^k	e_{12}^k	e_{1n}^k
s_2	e_{21}^k	e_{22}^k	e_{2n}^k
s_j	e_{jn}^k	e_{jn}^k	e_{jn}^k

Table 2: Categories of interest and services

In Table 2 each element e_{jn}^k is a Boolean variable whose value is 1 if the user u_k sharing the service j concerns the category n, 0 otherwise.
System loads, indexes, groups and filters data and visually encodes them in terms of selection in and between multiple layers.
In detail, a particular layer shows to users selected interests by circles and each category of interests is differently visualized according to the color and the pattern specified in the legend (Figure 1).

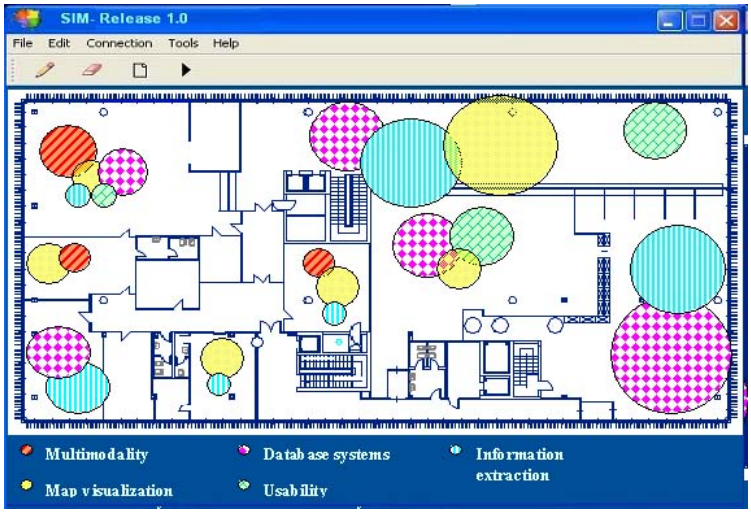

Figure 1: Selected categories of interests

So the map of interests shows members of the conferences that share the selected work interests, and the distance between the user's position and the position of the selected members in the network.
It is also possible filtering information about categories of interests considering the position of members of the conference. So considering people that are in a conference, all positions in the network are defined by their relationships with other position of other members of the conferences.
Participants of the conference can examine the information shared by them and can directly contact people with which they are interested to communicate. This type of communication is interactive and facilitates the creation of working groups.
If the user is interested to select only people in proximity she/he can select a threshold that sets the distance.
The system shows the locations of members (Figure 2) and it stores total participants and patterns of participants over time for the conference.

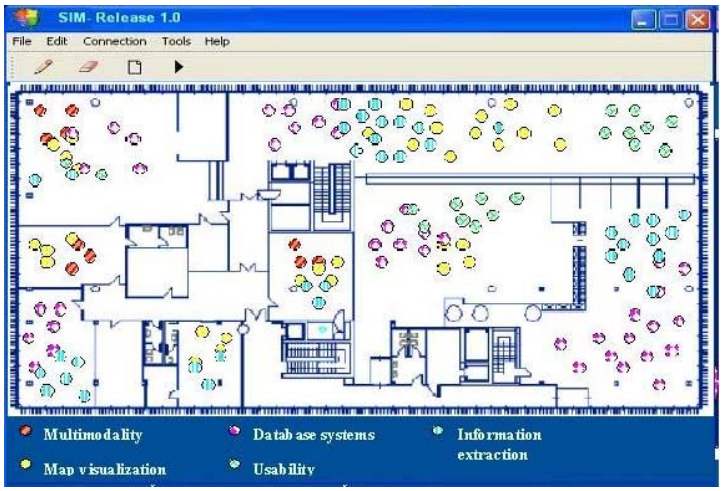

Figure 2: Interests of each member of the conference

Data collected by this system can be used in order to observe the distribution of specific categories of interest among several conferences and for analyzing the distribution of each specific category. Moreover, it is also possible to reenact the interests of each member of the conference during the time, enhancing the social function of the system.

4 Conclusions and future works

This paper has proposed the map-based system SIM for supporting people participating in a scientific conference to detect other people that share specific interests and to establish a direct connection by mobile devices going over spatial barriers. The proposed system visualizes the map of people interests during the

conference according to several parameters such as: members of the conferences; categories of interests; distance among participants at the conference.
This visualization can be useful in order to analyze the interests of people that participate in the conference, in order to plan special session of the conference and to analyze trends in the different scientific sectors. Moreover, the system can be used to evolve topics for the next conferences considering information about the interests of the people in the sector for more than one conference.
As future works, it will be possible to update the interests of each member of the conference during the time. We have also planned a system's evolution in order to provide the visualization and the interaction with people using maps on geographic scale too.

References

[1] Linton Freeman: Visualizing Social Networks. Journal of Social Structure 1(1): (2000)

[2] Viégas, F. B., & Donath, J. (2004). Social network visualization: Can we go beyond the graph? Workshop on Social Networks, CSCW'04, November 6-10, 2004. Chicago, IL, USA.

[3] North C, Shneiderman B. (2000). Snap-together visualization: a user interface for coordinating visualizations via relational schemata. Working Conference on Advanced Visual Interfaces 2000 (New York, NY), ACM Press: New York. 128–135.

[4] Nardi, B., S. Whittaker, E. Isaacs, M. Creech, J. Johnson, J. Hainsworth. ContactMap: Integrating Communication and Information Through Visualizing Personal Social Networks. Communications of the ACM, 45(4), April 2002, 89-95.

[5] Jeffrey Heer and danah boyd. (2005). Vizster: Visualizing Online Social Networks. IEEE Symposium on Information Visualization (InfoVis 2005). Minneapolis, Minnesota, October 23-25.

[6] Heer J, Card S, Landay J. (2005). Prefuse: a toolkit for interactive information visualization. Conference on Human Factors in Computing Systems 2005 (Portland, OR), ACM Press: New York. 421–430.