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Multi-view Visualizations for Emergency Communities of Volunteers

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Abstract—Information and communication technologies might empower emergency communities of volunteers by assisting community participation and improving their capacity to respond to unexpected events. However, designing technology for such purpose places unique visualization challenges that go beyond the current state of research on public participation tools and related technologies. Empowering these communities requires developing representations that enable collaborative reflection, promote mutual visibility of volunteers’ efforts and sustain a shared view of the community. Similarly, it is necessary to envision visualizations that facilitate sense making of large, simultaneous and distributed pieces of heterogeneous information with different levels of credibility and priority. Accordingly, this paper identifies and characterizes these challenges to propose a multi-view and multi-abstraction-level visualization approach for emergency communities of volunteers. In particular, it combines time-oriented visualizations, space-filling visualization techniques, interaction mechanisms and coordinated maps to support community participation as well as collaborative and individual sense making. The application of these visualization techniques is discussed through the development of a set of design prototypes.

Citizen participation; communities of volunteers; emergency management; sense making; visualization techniques

I. INTRODUCTION

The field of emergency management (EM henceforth) has been evolving over time to adapt to the complexity of disasters associated to modern societies. Originally, EM was chiefly based on rigid command-and-control approaches in which responsibilities were exclusive of experts and governmental actors. Nowadays, EM is gradually moving from this traditional model to a more collaborative and social one that recognizes the importance of the participation of other actors such as non-profit organizations, volunteer groups or even citizens [34]. In this context, communities of volunteers are considered a fundamental asset to face crisis situations within this field [5]. Communities of volunteers are groups of individuals who altruistically collaborate with official emergency organisms and corps due to their accredited skills and valuable knowledge in specific situations.

Current technological advances on mobile and social computing might empower these communities of volunteers to participate more actively and to receive additional information from external sources [20]. Communities are not isolated structures [35]; they need to complement their perspective with external sources and including citizen-generated data in their perspective might contribute to take profit from the potential of citizens as natural information seekers [25]. For this to be possible, some design challenges need to be addressed, including at least community and sense making issues. In the first case, community issues, designing for supporting emergency communities is an intrinsically complex task that requires ideating ways to improve difficult concepts such as membership [24], collaborative discussions [32], or awareness [11]. Moreover, emergency communities need to make sense of all the emergency information to make well informed decisions. This brings to the forefront the need for enabling collective reflection, promoting mutual visibility of volunteers’ efforts, and sustaining a shared view of the community. It also highlights the necessity of integrating multiple, large-scale data, including citizen-generated data as well as simultaneous pieces of information of different priority levels and at various geographic locations. Furthermore, each piece of information may come from different kinds of citizens according to their level of credibility [13].

To address these challenges, this paper presents a multi-view and multi-abstraction-level visualization approach aimed at assisting both community participation and sense making activities. We adopt a visualization approach for providing varied and richer ways to perceive the community activity and to improve emergency awareness. In particular, this approach combines time-oriented visualizations, space-filling visualization techniques, interaction mechanisms, and coordinated maps as main visualization mechanisms. The final purpose is to provide volunteers with a flexible and interactive way to explore both community and emergency information.

The remaining of the paper is structured as follows. Next section provides an overview of the areas of communities of volunteers, citizen participation, and information visualization. Section three discusses related work on visualization tools for public participation across different application domains. Section four presents the visualization approach proposed. It characterizes the design challenges and, through the combination of different visualization techniques, proposes a set of design prototypes to address them. Afterwards, next section presents a usage scenario as a mean to illustrate the utility of this approach. Finally, some conclusions are drawn.

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