

Geocollaboration for decision-making: Visual mediation to enable human-system and human-human dialogue

Alan M. MacEachren^{1&2}
Guoray Cai^{1&3}

¹GeoVISTA Center (www.geovista.psu.edu)

²Department of Geography

³School of Information Science and Technology

Penn State University

correspondence: maceachren@psu.edu

Abstract

Group work with geospatial information is a critical component of decision-making in a range of contexts from urban planning through crisis management. Current geospatial technologies are not “group-friendly” – they impede rather than facilitate collaboration. These technologies also require a substantial investment in training – they require the user to learn the system’s language. The research project reported on here focuses on addressing both issues, specifically we are developing, implementing, and assessing a natural, multimodal, dialogue-enabled interface to GISystems that allows users to focus on the problem at hand (rather than on how to use the system) and that facilitates group work. Our research is grounded in the context of collaborative crisis management activities for which geospatial information is a critical factor.

In this paper, we focus on one component of our overall research activities – use of visual representation as a mediator for dialogue between a human and the system as well as among humans. We first introduce the natural speech-gesture interface to GISystems we have implemented. Next, we outline the general framework for our GeoDialogue Manager. Then, we detail our approach to using components of the visual-audio display to mediate human-system and human-human dialogue.

Visual displays serve several roles in human dialogue and in related collaborative activities. First, visual displays (maps, images, diagrams) encourage sharing of spatial and geographical contexts that are critical for discourse understanding and maintenance (along with other contexts such as tasks, team structures, and personal characteristics). Second, visual displays serve as a medium and resource for human thinking. Third, visual displays are tangible representations that prompt mental representations (thus are stimuli for accessing memory as well as for constructing new knowledge). Our dialogue system has implemented specific mechanisms to maximize the above roles of visual displays. Our complex user modeling subsystem keeps track of the mental states of collaboration and knowledge sharing and guides the process of display generation.

As visual mediators for human communication, maps (or other visual displays) in GeoDialogue are not pre-determined by the system, but instead are constructed through coordinated user-system interaction. This approach is fundamentally different from traditional map access and use in GISystems. It reflects the philosophy that maps in a dialogue (rather than being simple information sources) should act as dynamic facilitators to thinking and communication. Visual displays as externalized representation of human thinking should ‘listen’ to users and yield a significant amount of control to the user who is actively creating representations of his/her ideas as part of an ongoing dialogue. In other words, the process of generating map displays must be mixed-initiative, allowing the optimal division of roles among human and the system.