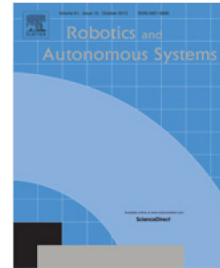


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# A Hybrid Approach to Decision Making and Information Fusion: Combining Humans and Artificial Agents

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## Abstract

This paper argues that hybrid human-agent systems can support powerful solutions to relevant problems such as Environmental Crisis management. However, it shows that such solutions require comprehensive approaches covering different aspects of data processing, model construction and the usage. In particular, the solutions (i) must be able to cope with complex correlations (as different data sources are used) and processing of large amounts of data, (ii) must be robust against modeling imperfections and (iii) human-machine interaction (HMI) approaches must facilitate human use of crisis management tools and reduce the likelihood of miscommunication.

In this paper the relevant problem is an environmental protection application involving the detection and tracking of gasses in case of chemical spills in an urban area. We show that a combination of Bayesian Networks, agent paradigm and systematic approaches to implementing HMI, support effective and robust solutions. To better integrate human information and demonstrate the usefulness of user generated crisis response information we developed a social media harvesting interface based on data from Twitter tweets and a visual interface to facilitate human smell classification.

## 1. Introduction

Social media have changed our world and the way we interact with each other. Despite all the information and communication available in our current society, a close cooperation between humans and intelligent agents is not really present. An Internet of Things makes objects accessible through internet, but does not create a real cooperation. Hybrid human-agent systems, also called Actor Agent communities, can support powerful solutions to real world problems, such as Crisis Management. Such hybrid human-agent systems have to supply, fuse and share information to create a situation assessment enabling reasoning and decision support. The challenge is to design distributed systems where both humans and intelligent agents have access to the same information in a dynamic world model, where information is fused and reasoning takes place.

*Problems and Challenges*

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