

Agent Based Modeling Formalism for the Management of Water Resources

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ABSTRACT

Water availability in Arizona continues to rely on limited groundwater and surface water sources that are affected among other things by varying regional hydrologic conditions and possibly pronounced climatic variability. These hydrologic uncertainties coupled with unprecedented growth in many parts of the state dictate development of sustainable water management strategies.

While sustainable water resources management is of great importance to state government, planning authorities, policy and decision makers, many of the factors that influence the management water depict heterogeneity and complexities beyond the scope of local and state agencies jurisdiction. The management of water resources in Arizona is influenced by socio-political and regional factors in addition to technical factors such as regional non-stationary hydrologic regimes.

Any water management strategies would therefore require a comprehensive understanding of the non-linear dynamics of supply and availability of water; particularly the impact of socio-political issues, local and regional policies and water-use. Consequently, it is relevant to understand the dynamic interactions between many heterogeneous socio-political and technical issues to achieve sustainable and equitable water resources policies.

This paper presents an evolutionary modeling framework to study and evaluate Water Management Strategies. The paper proposes a new a new framework by attempting to apply agent based simulation methodologies to understand complexities in the water resources systems in Arizona. This constitutes a new formalism in the study of policies and provides a virtual laboratory to study strategies.

The proposed methodology facilitates computational experimentation of range of water management strategies. These water management policies are an “emergent phenomena” resulting from interaction of “heterogeneous micro-behavior” of many socio-political and technical factors.

Finally the paper presents a preliminary study using Agent Based Model for the management of water resources. The success of agent based models in water management and future expansion of this work is also discussed in detail.