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INFORMATION COMMUNICATION USING KNOWLEDGE ENGINE ON FLOOD ISSUES

Ibrahim Demir¹ and Witold F. Krajewski²

Information Systems (IS) have been extensively used as a communication tool for sharing environmental data and information (Demir, 2009a; 2009b; 2010). Recent developments in information and Internet technologies provide opportunity to enhance managing, analysis, visualization, modeling, and sharing of environmental data and information. The Iowa Flood Information System (IFIS) is a web-based platform developed by the Iowa Flood Center (IFC) to provide access to flood inundation maps, real-time flood conditions, flood forecasts both short-term and seasonal, flood-related data, information and interactive visualizations for communities in Iowa. The key element of the system's architecture is the notion of community. Locations of the communities, those near streams and rivers, define basin boundaries.

The system is designed for use by general public. To improve effective communication we have introduced a new way in IFIS to get information on flood related issues by providing computations based on a collection of built-in data, analysis, and methods. The IFIS Knowledge Engine connects to distributed sources of real-time stream gauges, and in-house data sources, analysis and visualization tools to answer questions grouped into categories. Users will be able to provide several types of inputs based on the query within a predefined flood related category.

Our goal is the systematization of data and modeling results on flood related issues in Iowa, and to provide an interface for definitive answers to factual queries. Long-term goal of this knowledge engine is to make all flood related knowledge in Iowa easily accessible to everyone, and provide an educational geo-informatics tool. We aim to integrate all flood related data, implement analytical and visualization tools, and make it possible to compute answers from questions. The architecture of IFIS Knowledge Engine consists of several layers including a web-based user interface (Fig. 1), data, application, visualization, mapping and data query layers. Available data resources are grouped into categories including weather conditions, flood maps, flood risk, forecast, flood conditions, and data resources. Each query is converted into a question in natural language that allows users to provide a simple input for selected question.

The IFIS explicitly implements analytical methods and models, as algorithms, and curates all flood related data and resources so that all these resources are computable. The IFIS Knowledge Engine computes the answer by deriving it from its computational knowledge base. The knowledge engine processes the statement, access data warehouse, run complex database queries on the server-side and return outputs in various formats. Available output formats include text, table, figure, map, and visualization. IFIS integrates several modules in the system to provide interactive and rich graphical knowledge to the users by combining mapping interface with visualizations and analytical components. IFIS stores short-term historical data and curated modeling outputs for quick access in future queries.

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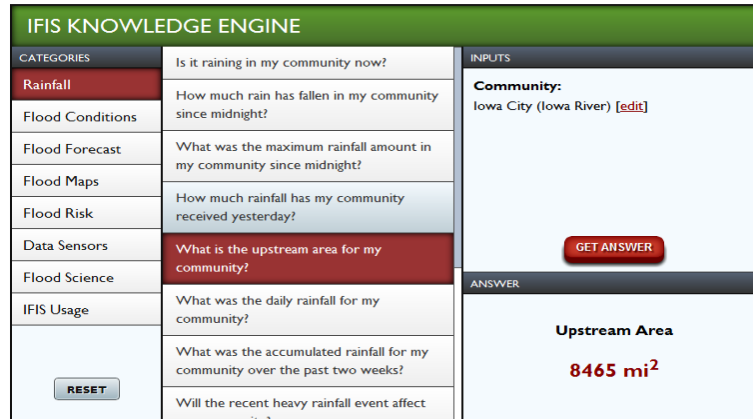


Figure 1 User Interface of IFIS Knowledge Engine

This paper provides an overview of our Knowledge Engine, its unique information interface and functionality as an educational tool, and discusses the future plans for providing knowledge on flood related issues and resources. The contribution of this paper in information management and knowledge transfer on floods is a comprehensive example for efforts in different environmental domains. Having real-time, structured, and easy to access flood related data and information provides several benefits. IFIS Knowledge Engine provides an alternative access method to these comprehensive set of tools and data resources available in IFIS.

The Iowa Flood Information System (IFIS) is a web-based platform (freely accessible at <http://ifis.iowafloodcenter.org>) with advanced data integration components, analysis and modeling tools, map layers, and rich geo-spatial visualization interfaces. The IFIS Knowledge Engine will help users to access all the advanced tools and interfaces in IFIS to make better-informed decisions on the occurrence of floods, and will alert communities in advance to help minimize damage of floods. The future implementation of the system will be able to accept free-form input and voice recognition capabilities within browser and mobile applications. We intend to deliver increasing capabilities for the system over the coming releases of IFIS.

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