Developing a Semantic Irrigation Ontology to Support WaterSmart System: A Demonstration of Reducing Water and Energy Consumption in Nebraska

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November 26, 2022

Abstract

Traditional crop irrigation relies on farmers' knowledge on plant, soil, and weather. Irrigation system is one of the key facilities in Nebraska to supply sufficient water resource to farming activities. However, in large scale farming, it is not rare to see plant get over irrigated while the marginal economic benefit of irrigation decreases significantly. The WaterSmart system combines various data sources to provide irrigation guidance to help farmers making better irrigation decision. To support the WaterSmart system, a semantic irrigation ontology is developed to understand these Agro-Geoinformatics data with local planting knowledge such as water usage during different crop stages. Local knowledge on crop irrigation has already been studied and published by Institute of Agriculture and Natural Resources, Nebraska Extension at the University of Nebraska-Lincoln. The ontology is built using Webprotégé with using HermiT as the reasoner. The ontology focuses on two main crops in Nebraska: corn and soybean. Final product is released on GitHub repository and registered with w3id thru persistent uniform resource locator (PURL). All software and tools were used to develop the ontology are open source. The ontology is used to represent irrigation knowledge and host concepts in the irrigation decision making portal.

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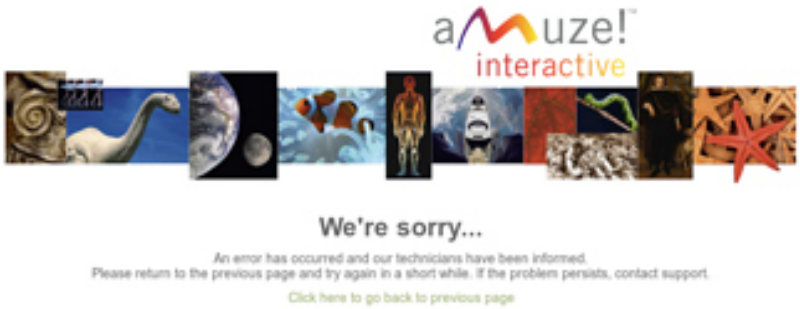

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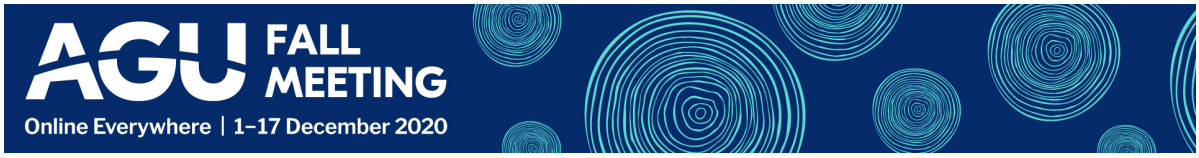

INTRODUCTION TO WATERSMART

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SEMANTIC IRRIGATION ONTOLOGY TO SUPPORT WATERSMART

To support the WaterSmart system, a semantic irrigation ontology is developed to understand these Agro-Geoinformatics data with local planting knowledge such as water usage during different crop stages. Local knowledge on crop irrigation has already been studied and published by Institute of Agriculture and Natural Resources, Nebraska Extension at the University of Nebraska-Lincoln. The ontology is built using Webprotégé with using HermiT as the reasoner.

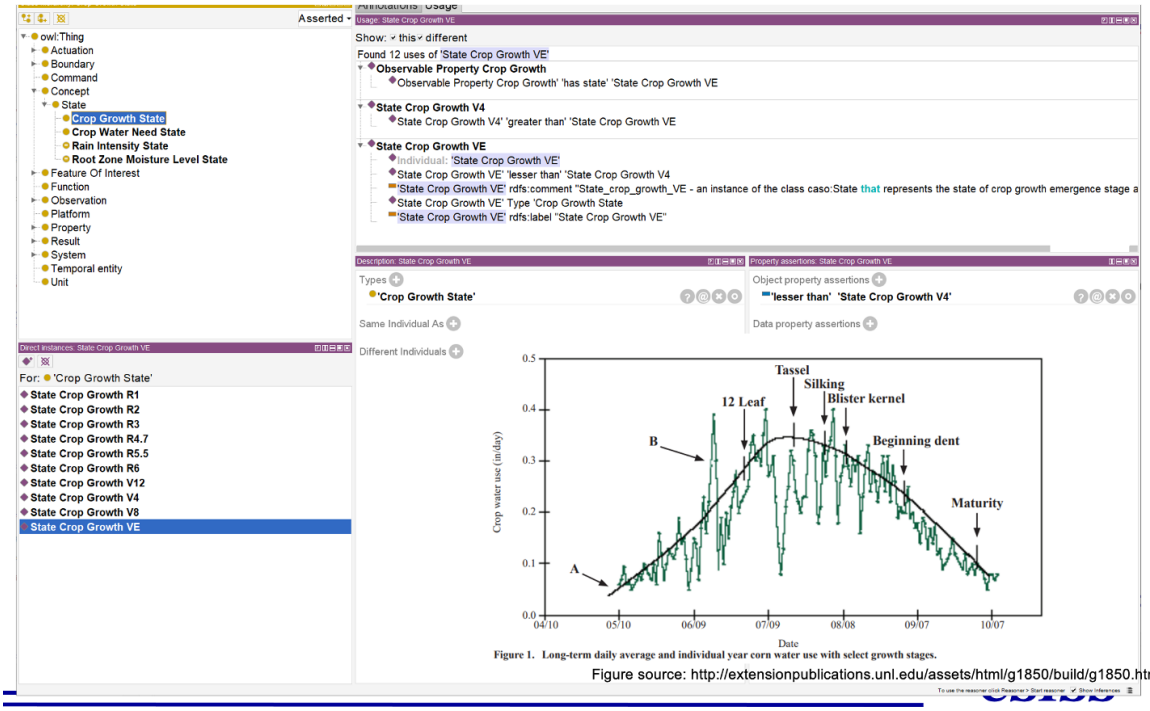

Figure 1. Long-term daily average and individual year corn water use with select growth stages.

Figure source: http://extensionpublications.unl.edu/assets/html/g1850/build/g1850.htm

RESULTS

CONCLUSION

The ontology focuses on two main crops in Nebraska: corn and soybean. Final product is released on GitHub repository and registered with w3id thru persistent uniform resource locator (PURL). All software and tools were used to develop the ontology are open source. The ontology is used to represent irrigation knowledge and host concepts in the irrigation decision making portal.

This research was funded by grants from NASA Applied Science Program (Grant # NNX14AP91G, PI: Prof. Liping Di) and NSF INFEWS program (Grant# CNS-1739705, PI: Prof. Liping Di).

DISCLOSURES

This research was funded by grants from NASA Applied Science Program (Grant # NNX14AP91G, PI: Prof. Liping Di) and NSF INFEWS program (Grant# CNS-1739705, PI: Prof. Liping Di).

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ABSTRACT

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