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Technical Status Report

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Accounting for Human Intervention in Streamflow Forecasting
(Aptima Job #1416)
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Prepared for:

Pedro Restrepo, Ph.D.
NOAA/NWS
1325 East West Highway
Silver Spring, MD 20910
pedro.restrepo@noaa.gov

Prepared by:

Lawrence Wolpert, Ph.D.
Aptima, Inc.
12 Gill Street, Suite 1400
Woburn, MA 01801
lwolpert@aptima.com

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Contractor Name: Aptima, Inc.
Contractor Address: See above

Scope

River regulation (reservoir operations, river diversions for water supply and irrigation, returns, consumption sue, etc.) complicates the forecasting of streamflow for a number of reasons, such as availability of planned reservoir releases and water derivations, deviations from those plans when available, and the very complex problem of addressing water rights, especially in the Western United States. This grant addresses the problem of accounting for river regulation activities by presenting a method for predicting how different classes of water management agencies will react to a given set of current river conditions and forecasts. The proposed approach is intended to be both compatible with, and to extend the capabilities, of existing NWS forecasting techniques.

This report summarizes Aptima's progress on the NWS Streamflow grant from 4/1/08 through 10/10/08

1.   Accomplishments

During this period, Aptima made progress on the following tasks:

Knowledge Elicitation

- Conducted KE session with forecasters at RFC Taunton

- Conducted KE session with DOHs in Silver Spring

- Follow up meetings via phone with participants at the DOH meeting, and subsequent review with NWS customers

System Modeling

Based on data from the KE sessions we have begun drafting decision ladders of the river forecasting domain. These decision ladders identify "what" is done in performing river forecasting, as well as the major information/constraints that are used in their execution. Mapping the river forecasting domain in the form of decision ladders has identified 5 primary activities performed within the river forecasting domain:

a) environmental monitoring (i.e. examining the current state of the "environment" and comparing this actual state to the expected status),

b) model result evaluation (i.e. identification of a model run's accuracy in terms of how well it fits historical, ground truth, data)

c) alerts (i.e. the identification of a need for model execution due to disparity between what was expected to occur within the environment and what actually occurred, or between historical data and the fit of a model's run to that ground truth data)

d) reminders (i.e. the identification of a need for model execution due to a specified amount of time elapsing, or from a request)

e) model execution (i.e. the execution of a river forecast model).

Capturing these decision ladders is important for identifying "where" models of the water resource managers will integrate into the river forecasting domain.

<u>Use Case Development</u>

Use cases identify how users, both humans and other systems, will interact with the Water Resource Manager (WRM) model. The current development effort entails creation of use cases based both on the previously identified decision ladders as well as knowledge elicitation sessions conducted with River Forecasters. To date, five use cases have been identified corresponding to each of the steps of the decision ladder. Within each use case we identify the following:

1. Use case metadata - e.g. Name, Creation date, Version, Author

2. Summary - provides a quick overview of the use case to describe the main aspects

3. Goals - What is to be achieved through interaction with the model?

4. Actors - Who will be using the model during this operation? May be a mix of both humans and other systems

5. Preconditions - What are the necessary conditions that must exist in order for the use case to be initiated?

6. Triggers - What are the actual events that trigger the use case? Note that these differ from preconditions in that triggers actually cause the use case to be initiated, while preconditions are the set of conditions that must exist, regardless of whether they cause the use case to be initiated.

7. Course of events - What is the basic flow of events that occur once the use case is initiated. This should include all notable interactions with the actors, but will not detail the inner workings of the system.

8. Alternative paths - If the course of events branches, what are the alternate scenarios that may arise?

9. Postconditions - After the use case ends, what has changed within the system?

10. Additional notes - Any additional information not captured in the preceding sections.

2.   Problem Areas

None.

3.   Future Efforts Next Reporting Period

The next steps to the modeling effort include further detailing and verification of the use cases and interviews with water resource managers. Once the use cases are finalized, they will be applied in the initial creation of a model architecture. The use cases help define the inputs and outputs necessary for the model. Of paramount importance in moving the modeling effort forward will be the interviews with the water resource managers. The knowledge gained from these interviews will be used to help detail the internal structure of the WRM model.

4.   Overall Status

Work proceeded on schedule and within budget.