Western Engineering

SE4450: Software Design II

Hydro Analytics Platform

User Manual

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Revision History

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April 21, 2015	1.1.2	Document contents updated, References updated.	Justin Postlewaite

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User Manual

Introduction

Purpose

This user manual is intended to provide the reader with background information for interacting with the Hydro Analytics Platform as either a developer or end user. The language used throughout will be chosen to promote understanding in the category of stakeholder that is expected to require an understanding of that section of the document, but will avoid using technical terms whenever possible to promote understanding.

Scope

The Hydro Analytics Platform software product will provide analysis and forecasting of consumer electricity use with the intention of generating insight into consumer electricity consumption patterns. This pattern recognition is intended to be used for insight generation only, and should not be used as the sole basis for decision making in a business environment. Is is intended to be an additional tool to provide factual information and complement other tools used to make decisions for both electricity producers and household consumers regarding electricity consumption.

Glossary

Due to the extensive use of terms related to electricity production and consumption as well as the understanding that some users may be unfamiliar with technical software terms, a glossary has been included. Please see Appendix II for definition of terms not commonly used in general business operations related to software development and the electricity industry.

References

In order to provide readers with access to information that supports this document, a list of references has been included as Appendix III. These documents provide additional background information related to the Hydro Analytics Platform, which has not been included for the sake of brevity. Readers will be directed to the appropriate references whenever it is appropriate throughout the body of the document.

Overview

This user manual will begin with a description of the Hydro Analytics Platform, and provide a description of the functionality available to users through the system. It will provide a thorough explanation of the features available and the capabilities of the software product. This will be followed by information targeted towards software developers interested in contributing to modular expansion of the software product, and how to obtain access to required resources. The document will conclude with a brief comment on where future versions of the user manual can be obtained as functionality is added.

Software Description

Core Functionality

The Hydro Analytics Platform is a tool to provide you, as an electricity consumer, with the ability to analyze your electricity consumption data and gain insight into your household usage patterns. The tools available within the Hydro Analytics Platform will help you to:

- Understand your past usage history and habits,
- Get a better idea of how much energy you will use in the future,
- Inspect your energy consumption records,
- Compare your usage to the usage of other consumers, and
- Begin to understand your daily energy usage patterns.

These functionalities are the core analytical options available to you as a user of the Hydro Analytics Platform. The following user walkthrough will assist you in learning how to interact with the Hydro Analytics Platform and be available as a reference for future use.

User Walkthrough

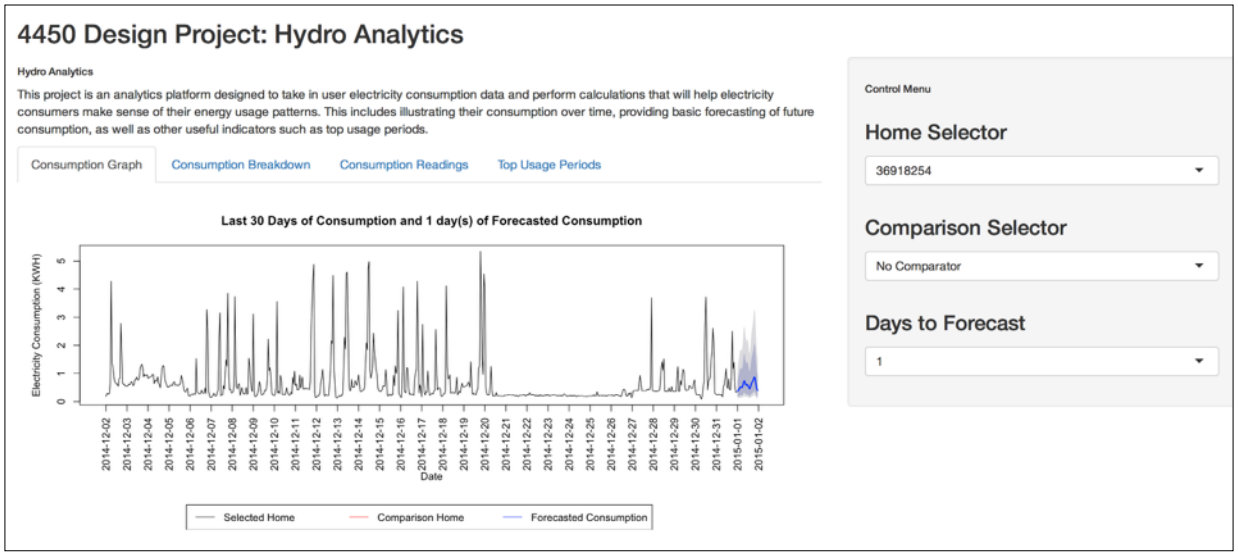

Figure I: System Platform Main Screen

The Hydro Analytics Platform is set up to allow access to all functionality from the main launch page, with controls separated into a menu on the right hand side of the platform. This will allow you to change tabs and views within the platform while still being able to access the main controls. These controls allow you to select which information you wish to interact with when using the software product.

Control	Description
Home Selector	This control allows you to select the desired home you wish to interact with from the database. This will provide the required records in order to conduct analysis on the consumption patterns of the selected home.
Comparison Selector	This control is used to select a second home after using the home selector, in order to allow comparisons between multiple sets of consumption records within the Hydro Analytics Platform.
Days to Forecast	This control provides a way to set the length of the forecast desired. The forecast created using past records will be the number of days provided in this input control.

Figure II: User Controls Description

The Hydro Analytics Platform can be navigated using the tab menu under the description of the platform on the main page. Each tab provides you with the ability to access a different functionality of the Hydro Analytics Platform.

Tab Option	Description
Consumption Graph	This tab provides you with a graph display of the selected household's past electricity consumption, as well as the forecasted consumption based on that past usage.
Consumption Breakdown	This tab allows you to see what amount of the electricity consumption of a house is determined by trends and overall usage patterns. This will help to determine what amount of your usage is expected, and what consumption is atypical.
Consumption Readings	This tab allows you to view the individual consumption records that are available through the Hydro Analytics Platform for the household that has been selected.
Top Usage Periods	This tab displays the most recent 24 hours of consumption data, as well as the average consumption for each period of the 24 hour day. This allows for comparison between current usage and typical usage of the household.

Figure III: Tab Menu Options Description

Consumption Graph Tab

This tab is automatically opened when the Hydro Analytics Platform is accessed. The Consumption Graph tab will display a layout similar to Figure I on page 5, where the consumption history for the selected household and a consumption forecast are graphed. You can use the options available through the Control menu in order to change the forecast length and the desired household as required.

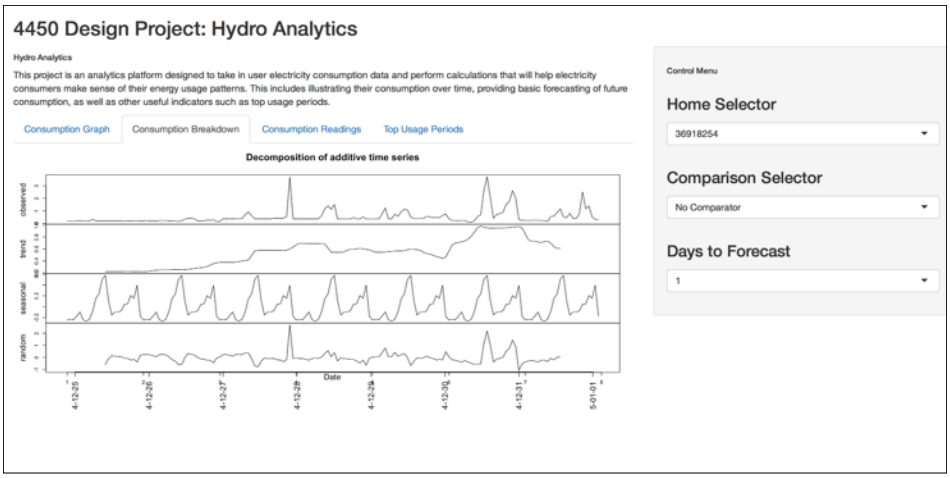

Figure IV: Consumption Breakdown Tab

Consumption Breakdown Tab

In order to provide more detailed information about a household's electricity consumption, the Hydro Analytics Platform presents a breakdown of the trends within overall consumption data. This allows for users to see the overall trend of energy consumption, their usage attributed to seasonal fluctuations, and the amount of usage that is not accounted for by an overall usage trend. These trends are displayed with the overall consumption graph in order to allow you to see patterns within household energy consumption.

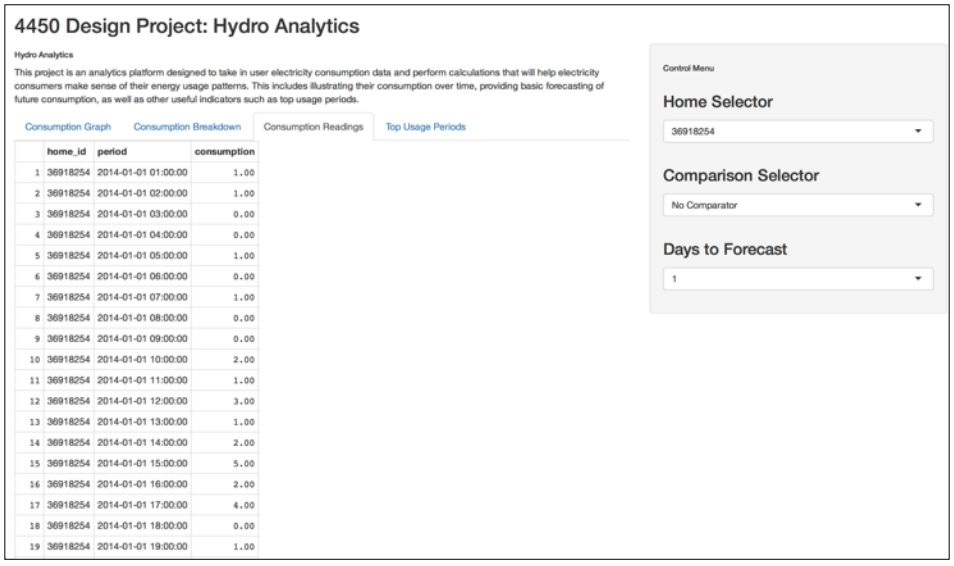

Figure V: Consumption Readings Tab

Consumption Readings Tab

As you may prefer to view the records of household consumption to provide a more factual perspective in contrast to the graphical representations used in other tabs, the Consumption Readings tab provides a way to view consumption records in table format. This allows for the discrete values to be analyzed, and acts as a reference for past consumption history.

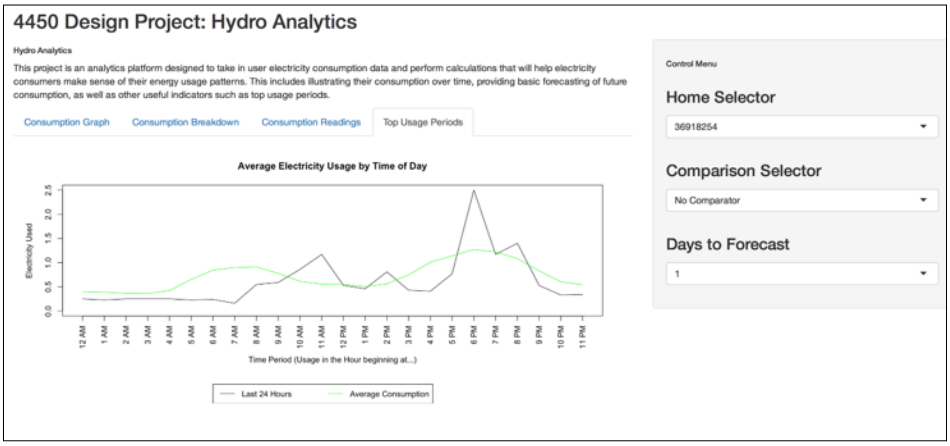

Figure VI: Top Usage Periods Tab

Top Usage Periods Tab

In order to understand if recent consumption is normal or atypical, it is beneficial to compare recent consumption against average consumption. This can be done using the Top Usage Periods tab which displays a graph of the last 24 hours of consumption, along with the average usage for each hour period of the 24 hour day. This can help to determine when the most energy is being consumed within a household, and provides a way to see when atypical usage is occurring.

Developer Resources

Installing R and RStudio

R[1] and RStudio[2] are available for download at no cost through their respective web pages. These addresses have been provided in the document references for convenience. Please refer to the respective documentation available through the download sources for installation assistance.

[1]The R Foundation. "The R Project for Statistical Computing." R. Accessed April 22, 2015. http://www.r-project.org.

[2] R Studio. "RStudio." RStudio. Accessed April 22, 2015. http://www.rstudio.com.

Installing R Packages

R packages can be downloaded and installed using the following command, replacing "ChosenPackage" with the name of the package that the user wishes to install:

```
install.packages("ChosenPackage")
```

Packages that are used within the Hydro Analytics Platform and that will be required for development are:

- Forecast,
- RMySQL, and
- Shiny.

Developers are free to import additional packages within modules they develop in order to improve functionality, but should consider using functionality that is already available to them whenever possible.

After installation, packages can be imported to the development environment using the following command, replacing "ChosenPackage" with the name of the package the user wishes to import:

```
library("ChosenPackage")
```

Installing MySQL

MySQL is also available for download at no cost from the MySQL web page[3]. It is suggested that all future development work use MySQL in order to provide ease of maintenance. Please refer to the documentation available through the download source for installation assistance.

Downloading the Hydro Analytics Platform

Source code for the Hydro Analytics Platform is available for download or fork from https://github.com/jpostlewaite/4450 with permission. As the repository is currently private, access to source code will be provided upon request.

Other Resources

Future Updates

As the Hydro Analytics Platform supports modular development, developers are encouraged to add new features on an ongoing basis. To ensure users can benefit from the new functionality as it is added an up to date PDF version of the most recent user manual will be available for download with the source code of the Hydro Analytics Platform, and developers should provide instructions for any functionality they develop in an updated version of this document.

[3] Oracle. "MySQL :: The World's Most Popular Open Source Database." MySQL :: The World's Most Popular Open Source Database. Accessed April 22, 2015. https://www.mysql.com.

Appendix I: List of Figures

Appendix II: Glossary

Term	Definition
Electricity Consumption	The amount of electricity used by a household during a given period of time. This consumption can be measured using various units, but is typically measured using either kilo-watt hours (kWh) or by the dollar amount charged to provide the electricity consumed.
Forecasting	Analysis of past data, information, and trends in order to predict future outcomes. For the purposes of the Hydro Analytics Platform, forecasting relates to the prediction of future electricity consumption.
Hydro Analytics Platform	The working name for the software product being developed.
R Package	A set of files that provide functionality within R. These files provide source code in the interests of reducing overall maintenance and maintaining consistency between software products. This is the equivalent of a library in other programming languages.
Trend	A noticeable pattern that repeats after a period of time. This can be in the form of a common change such as a steady increase, a cyclical pattern that repeats, or any other pattern that can be discerned from a data set.

Appendix III: List of References

Oracle. "MySQL :: The World's Most Popular Open Source Database." MySQL :: The World's Most Popular Open Source Database. Accessed April 22, 2015. https://www.mysql.com.

The R Foundation. "The R Project for Statistical Computing." R. Accessed April 22, 2015. http://www.r-project.org.

R Studio. "RStudio." RStudio. Accessed April 22, 2015. http://www.rstudio.com.

