DATA MINING AND PREDICTIVE ANALYTICS SERVICE IN THE BUSINESS INTELLIGENCE MICROSTRATEGY REPORTS ON INTEGRATED MASSES

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Abstract

The problem of designing an MSTR with an optimal fusion center is addressed. Since it was determined that signal processing and classification are best performed at the sensors, the MSTR described is constructed with multiple sensor classifiers; each sensor classifier is designed with some optimal recognition scheme and classifies targets independently of other sensor classifiers. The result of target recognition by an individual sensor is transmitted to a data fusion center that has been optimally designed. The MSTR design is illustrated using radar and infrared (IR) sensors. A specific design example for a two-sensor, three-class MSTR with Gaussian data showed a 14% improvement in the average probability of correct classification (P_{e}) over a single-sensor system. This design was further demonstrated in a radar-IR MSTR using field radar and field FLIR (forward-looking infrared) data. The performance results show an average 12% P_{e} improvement over radar alone and 9% P_{e} improvement over IR alone. MicroStrategy Web is a user-friendly environment for interactive analysis. A full set of data browsing, drilling, and reporting development capabilities enable stream-of-consciousness navigation. Boardroom-quality reports can be generated using a wide range of charting and formatting options. MicroStrategy, Inc. is a provider of business intelligence (BI), mobile software, and cloud-based services area and serves companies and organizations worldwide. MicroStrategy develops software that enables organizations to analyze internal and external data in order to make business decisions. Its proprietary software can be deployed in companies’ data centers, or as cloud services. MicroStrategy develops and sells business intelligence, mobile software, and cloud-based services. The company’s software performs analytics on a variety of data, such as sales figures, payroll data, and inventory in order to inform users’ business decisions.

Key words: infrared (IR), field radar and field (FLIR), MicroStrategy (MSTR), Very large database (VLDB), OLAP (online analytical processing), Business intelligence (BI)

1. Introduction

Business intelligence (BI) has two basic different meanings related to the use of the term intelligence. The primary, less frequently, is the human intelligence capacity applied in business affairs/activities. Intelligence of Business is a new field of the investigation of the application of human cognitive faculties and artificial intelligence technologies to the management and decision support in different business problems. The purpose of this document is to provide users with a background of a few key data mining concepts, information about Data Mining Services in the MicroStrategy BI platform, and business scenarios to illustrate MicroStrategy’s approach to data mining analysis. By the end of this document, users will have an understanding of the important Concepts required building highly sophisticated data mining and predictive analysis reports. This document is intended for MicroStrategy customers and prospects who wish to:

- Learn how MicroStrategy allows decision makers to distribute data mining and predictive analytics across their entire organization
- Understand how MicroStrategy integrates with existing data mining software, so they can leverage their existing data mining investment, and
- Perform data mining and predictive analytics without 3rd-party data mining software.

MicroStrategy is one of the most popular Business Intelligence (BI) reporting tools in the market that extends functionality to include ROLAP (Relational Online Analytical Processing). This means, a complex relational database structure can be presented as a multidimensional cube that is easy for end user and business user to understand easily. Like any BI reporting tool, MicroStrategy generates SQL for running against Green plum and this SQL code looks identical to any SQL based tool. MicroStrategy performs certification tests internally in their company and has provided excellent support. MicroStrategy maintains a metadata dictionary to store object information related to reports. Just like most BI tools store application objects and other relevant particulars in a meta data, MicroStrategy does the same using
databases such as Microsoft Access and SQL server. MicroStrategy does not depend on either star schema or relational database normal forms for implementation of either metadata or its reports. It uses user designed model to capture hierarchies and relationships between various objects within MicroStrategy, which are typically modeled differently compared to database schema objects. Note that MicroStrategy uses rather confusing terminology for its internal objects; for instance, an attribute in MicroStrategy is same as an entity in entity relationship diagram.

- MicroStrategy reporting components: MicroStrategy organizes all objects under project source (indicates connection to a metadata database such as SQL server or Microsoft Access database and MicroStrategy Intelligence Server or I-Server) and projects (refers to data warehouse database connection and related objects or reference to database schema). Note that three-tier architecture uses Intelligence server which allows many advanced features including access to VLDB (Very Large Database) settings.
- Different Very large database (VLDB) settings are targeted for different databases. Over 100 VLDB settings are available for customizing behavior of MicroStrategy engine for SQL code generation. • A simplified architecture diagram of MicroStrategy is below. There is no intelligence server in two-tier architecture. As mentioned above, meta data database can be either Microsoft SQL server or Access, not Greenplum database.
- Project: refers to database and its objects or schema.
- Project source: refers to both I-server (3-tier) and Meta data database. Connectivity: through ODBC drivers from Data Direct.

2. The MicroStrategy Business Intelligence Platform

With MicroStrategy, companies have the most powerful and comprehensive business intelligence capabilities on one single platform. This means that they all share common infrastructure, common metadata definitions, common prompting, common scheduling, common caching, common security, etc, and that everything is re-used across each of the styles of BI, accelerating the development process and minimizing the number of servers required. Even more important is the fact that all five styles of BI are presented to the user from a single integrated architecture through a unified Web interface. The five styles of BI are:

- Scorecards and Dashboards
- Reporting
- OLAP Analysis
- Predictive Analysis
- Alerting and Proactive Notification

Users have no knowledge that they are using different BI styles. Within a single look-and-feel, business people are finding reports, running reports, answering prompts, manipulating the results, and finally saving, printing, or exporting their work.

User Scalability

The MicroStrategy platform offers unparalleled user scalability – perfect for companies with hundreds of users and growing, and perfect for companies with hundreds of thousands of users internal and external to the enterprise. Deployment to all users worldwide is simple with MicroStrategy’s zero-footprint, pure Web interface. With MicroStrategy, all users have immediate and secure access to all reporting and analysis applications from any Web browser.
Data Scalability
The MicroStrategy platform provides unlimited data scalability, allowing companies to report on and analyze all enterprise data as it amasses into terabytes and beyond. MicroStrategy’s relational OLAP (ROLAP) architecture combined with its Intelligent Cube™ technology can handle any size database while delivering high performance. With MicroStrategy, companies can carry out comprehensive enterprise reporting and analyses down to the transaction level of detail. MicroStrategy Analytic Services MicroStrategy OLAP Services MicroStrategy Report

3. MicroStrategy reporting components

The MicroStrategy BI Platform is the industry’s only industrial-strength business intelligence architecture. MicroStrategy’s high performance BI platform is accessed through a zero-footprint unified Web interface that provides all five styles of business intelligence and extends enterprise reporting and analysis to the masses. MicroStrategy is a Business Intelligence (BI) solution by MicroStrategy, Inc., a BI, enterprise reporting and online analytical processing (OLAP) software providing company. MicroStrategy is a fully integrated BI platform that makes Business Intelligence faster, easier, and more user-friendly and delivers high performance, sophisticated analytics and rapid report creation. It allows a non-technical person to build state-of-the-art reports. This document introduces the basic process to create reports using MicroStrategy. Building a sophisticated report using MicroStrategy is quite simple and comprises of a few easy steps. In this blog, we will be using the MicroStrategy Desktop tool for demonstrating the creation of reports. Before we delve into the actual activity of creating the report, let us first get familiar with the various components of MicroStrategy, depicted in Figure 1 below.

Intelligence Server (I-Server): The core engine of the MicroStrategy platform comprises of Reporting Services, Analytical Services and OLAP Services.

Metadata: This is a data repository that stores information about various objects that you create under MicroStrategy.

Data Warehouse: This is the database that holds the business data collected and processed by the external application. MicroStrategy pulls and processes this data in order to create various reports.

Client: This is a computer used to interact with I-Server. This is mainly used for development and performing other maintenance tasks.

Web Server: The Web server interacts with I-Server in order to display the reports in a browser

3.1 GETTING STARTED WITH MICROSTRATEGY REPORTING:

MicroStrategy Desktop is a business intelligence environment designed to meet today’s sophisticated business intelligence requirements. It brings integrated query and reporting, powerful collaborative analytics, and investigative workflow to...
every desktop. MicroStrategy Desktop enables project designers, report designers, and system administrators to design, create, and maintain an entire business intelligence system from a single interface. Desktop has two editions:

1. From your computer’s Start menu, select Programs, MicroStrategy, Desktop, and select Desktop again.
2. In the User Login window, enter your Login ID and Password. Depending on how your administrator set up your user account, this may be the same login and password you use to access your computer or it may be a MicroStrategy-specific login and password.
3. Clicks OK.

**About passwords**

1. When you are prompted to change your password, click yes. (If you click No, you will not be allowed to access any MicroStrategy projects until you return to this screen and change your password.)
2. In the Change Password dialog box, enter your current password in the Old password field.
3. Enter a new password in the New password and Confirm password fields, and click OK. The system logs you in and you can open MicroStrategy Tutorial and any other projects available to you.

4. **ANALYZING DATA**

When reports return large amounts of data, it can be difficult to easily understand what the data is telling you. Several MicroStrategy tools can help you analyze large amounts of data more quickly.

**Sorting data**

You can reorganize how data is displayed on your report by sorting the data. Sorting lets you move data so you can analyze that data more effectively. Consider the following sorting techniques:

- Move the most important data up to the top of the report where you can see it easily.
- Group particular chunks of data together so you can more easily compare the data.

For example, you are looking at a report that shows income ranges for your customers. The report lists all income brackets for customers in every region in the United States. The image below shows just the top half of this lengthy report. (The rest of the report that is not included here shows the rest of the regions in the United States.)

5. **MicroStrategy Report Services**

MicroStrategy Report Services is a plug-n-play extension to Intelligence Server providing Scorecards and Dashboards – highly visual, pixel-perfect displays that provide “at-a-glance” view of the enterprise using gauges.

**MicroStrategy Component desktop**

Creating attributes for financial line items

For your financial reporting project, each lookup table is represented in MicroStrategy as a single attribute representing that level of elements, with the attribute ID form representing the ID values in the table, and the attribute description form representing the description values in the table. The image below shows the three lookup tables and the one relationship table, from the examples above, included in a project.
1. Create attributes at each level, and map the attribute forms to the corresponding columns of data in the level lookup tables.

2. Create the relationships between the level attributes you created, to represent the hierarchical structure of the financial information. The relationships can be simple one-to-many relationships, with the highest level attribute being directly related to the second highest level attribute, the second highest level attribute being directly related to the third highest related attribute, and so on. An example of this is shown below level 1, level 2, level 3.

3. Create a hierarchy that represents these attributes as a single, logical group. This hierarchy is used later when creating metrics for the project.

5.1 Displaying financial line item attributes in exported results

1. Determine the ID values for the attribute objects: a) In MicroStrategy Desktop, navigate to the attribute, right-click the attribute, and select Properties. The Properties dialog box opens. b) Make a note of the alphanumeric string of characters listed as the ID value. You must determine this ID value for each attribute that includes empty elements. In the example described in creating attributes for financial line items, this would be Level2 and Level3.

2. Right-click the project that stores your financial data and select Project Configuration. The Project Configuration Editor opens.

3. On the left, expand Project definition, and then select Advanced.

4. In the Analytical engine VLDB properties area, click Configure. The VLDB Properties Editor opens.

5. From the Tools menu, ensure that Show Advanced Settings is selected.

6. In the VLDB Settings pane, expand Export Engine, then select the GUID of attributes in profit and loss hierarchy (separated by ‘:’) that has dummy rows to be removed VLDB property.

7. Clear the Use default inherited value check box.

8. In the text field, type each ID value for all financial line item attributes that include empty elements. Use a colon (:) to separate each attribute ID value.

9. Click Save and Close to save your changes and close the VLDB Properties Editor.
When you use MicroStrategy Web to export a report that includes financial line item attributes, the empty elements will not be shown in the exported data.

5.2 Creating schema objects for financial data
1. Using MicroStrategy Architect, you must create a fact to integrate the data into the project. This can be a simple fact that points directly to the column in your database that stores the financial data.
2. Each category used to define the level of data in this fact table must be included in MicroStrategy as an attribute. In addition to the fact table, you may have additional lookup tables that provide the descriptive data for these categories. Within the fact table, the ID column of each category should be included. The image below shows an example of what the fact table might look like in MicroStrategy, with a single fact column (Data) of financial data, and additional attributes to categorize the financial data.

5.3 Returning financial data with metrics
Metrics allow you to further integrate your data into MicroStrategy and display this data on reports. To support this financial reporting project, you need to create some specific metrics.

Retrieving financial data from the database
Since you modeled your data to store all financial data in a single fact column, you need to create a metric that returns all of the data that is stored in the database. The definition for this metric is as follows:

\[
\text{Sum (Fact) \{\rightarrow, \langle[Level]\rangle\}}
\]

In the definition provided above:

- **Fact** is the single fact you created for your financial data, as described in Creating schema objects for financial data, on page 396. In the example provided, the fact is named Data.

- **Level** is the hierarchy created for the attributes used to define the hierarchical organization of the financial line items, as described in creating tables to provide hierarchical organization. In the example provided, the hierarchy is named Level. The level of this metric is defined as \{\rightarrow, \langle[Level]\rangle\},

Which indicates that this metric is not aggregated over the Level attributes that define the hierarchical structure of the financial line items? This ensures that subtotals are calculated correctly. For example, the definition for this metric can be as follows:

\[
\text{Sum (Data) \{\rightarrow, \langle[Level]\rangle\}}
\]

You can use any name for this metric; for this example the metric is named Stored Data.

6. Creating reports for your financial data
1. Include the attributes used to create the hierarchical organization of the financial line items. Creating these attributes is described in creating attributes for financial line items, As highlighted in the report below, these attributes provide the names of the financial line items as well as their overall structure:
2. Include the single metric that returns all the data for your financial line items. Creating this metric is described in financial data metric. This single metric is highlighted in the report below:

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Metrics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Revenue</td>
<td></td>
<td>2,104,461,928</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost of Revenues</td>
<td></td>
<td>10,435,310</td>
<td></td>
</tr>
<tr>
<td>Gross Profit</td>
<td>Gross Profit Margin</td>
<td></td>
<td>200,026,617</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operating Expense</td>
<td></td>
<td>2,077,407</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depreciation Expense</td>
<td></td>
<td>2,097,550</td>
<td></td>
</tr>
<tr>
<td>Operating Income</td>
<td>Operating Margin</td>
<td></td>
<td>195,456,232</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other Income</td>
<td></td>
<td>92.9%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EBIT</td>
<td></td>
<td>20,955,394</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EBITDA</td>
<td></td>
<td>216,312,912</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interest Income</td>
<td></td>
<td>10,428,549</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interest Expense</td>
<td></td>
<td>8,259,126</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interest Coverage Ratio</td>
<td></td>
<td>2366.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Taxes</td>
<td></td>
<td>16,827,078</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Net Income</td>
<td></td>
<td>201,580,847</td>
<td></td>
</tr>
</tbody>
</table>

6.1 Final report as

Benefits of Integrating Data Mining with Micro Strategy’s Industrial-Strength BI Platform

- Allows businesses to view predictive reports through a wide variety of different user interfaces, namely: Web, email, portal, Excel, etc.
- Delivers all 5 styles of BI through a single unified backplane and a single unified Web interface.
- Provides unlimited scalability, allowing organizations to monitor, report, and analyze predictive information against all enterprise data and deliver these reports to thousands of users.
- Helps businesses better align people to organizational goals by providing predictive information through easy-to-use products.
- Notifies business users of new predictive information through alerting and proactive report distribution.
- Creates highly formatted and data-rich predictive scorecards, dashboards, and managed metric reports for all corporate performance management needs.
- Empowers analysts to perform further predictive analysis, such as slice-and-dice data, ad-hoc report creation, drilling, pivoting, and sorting on predictive reports.
- Provides the most robust security for intranet and extranet applications.

7. Conclusion

Many organizations have adopted data mining and predictive analytics applications to make proactive knowledge-driven decisions, improving their organization’s efficiency and effectiveness. Despite the power of these data mining tools, the growth and user adoption of these tools has been slow due to their lack BI functionality, proactive Information distribution and collaboration, robust security, and easy self-service analysis, and their inability to scale to large user populations and data volumes. The industry leading MicroStrategy BI platform is the first to deliver data
mining and predictive analytics to all users through a fully integrated enterprise caliber BI system. Using Data Mining
Services, business users, report designers and analysts alike can view and build predictive reports using MicroStrategy
and distribute these reports to all relevant decision makers and stakeholders.

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