RETRIEVAL OF ATTRIBUTE VALUES BASED UPON IDENTIFIED ENTITIES

RELATED APPLICATION

This application claims priority to U.S. Provisional Patent Application No. 61/846,574, filed on Jul. 15, 2013, and entitled "TABLE RETRIEVAL AND MANIPULATION BASED UPON NATURAL LANGUAGE QUERIES", the entirety of which is incorporated herein by reference.

BACKGROUND

[0001] Computer-executable spreadsheet applications are conventionally configured to allow users thereof to organize and analyze tabular data. Generally, a spreadsheet of a computer-executable spreadsheet application includes numerous cells arranged in rows and columns, wherein each cell can retain a respective value (or function that outputs a value based upon data in other cells). A user of the spreadsheet application may select a cell and manually modify content thereof, either by specifying a new value to be included in the cell or by modifying a function used to compute a value for the cell.

[0002] Conventional spreadsheet applications are well suited for organizing and manipulating tabular data, particularly when the user is familiar with functions supported by the spreadsheet applications (and commands that invoke such functions). In an example, the user can cause values in a respective plurality of cells to be summed by setting forth a textual command, such as "SUM", and subsequently identifying cells that include values that are desirably included in a summation.

[0003] In conventional spreadsheet application, however, it can be arduous to augment a table with data that is not already loaded into the spreadsheet application. For example, a novice user may load a table into the spreadsheet application, where the table includes a column of entities (e.g., where an entity is a string that is representative of a person, place, or thing). Thus, in an example, the column of entities can include city names, state names, company names, etc. As can be ascertained, a person, place, or thing can be described by an attribute. For instance, the state of California can be described by numerous attributes, such as population (e.g., in a certain year), average rainfall (e.g., over several years), etc., wherein the attributes have values respectively corresponding thereto. Conventionally, for example, to augment a table to add a column of attribute values in correspondence with respective entities, a user must perform a search for the desired attribute values (e.g., through use of a conventional search engine), identify a data source that includes the attribute values (e.g., a table or set of tables), determine that the data source is trustworthy, and then manually transport data from the identified source into the table at the appropriate locations. It can be ascertained that this can be a time-consuming and frustrating task.

What is claimed is :

1. A computing system comprising:

a processor; and

memory that has a spreadsheet application loaded therein, wherein the spreadsheet application, when executed by the processor, causes the processor to perform acts comprising:

displaying, on a display of the computing system, the spreadsheet in a graphical user interface of a spreadsheet application, wherein the spreadsheet comprises a table, and the table comprises a column that includes entities, wherein an entity is a string that represents a person, place, or thing, and wherein people, places, or things represented by the entities in the column have an attribute;

receiving an indication that a user has selected the entities in the table by way of the graphical user interface of the spreadsheet application;

receiving an indication that the user has requested a search to be performed based upon the selected entities from the column;

transmitting the selected entities to a server computing device that is programmed with instructions that, when executed by the server computing device, cause the server computing device to search over an index of source tables based upon the selected entities;

responsive to transmitting the selected entities to the server computing device , receiving attribute values for the attribute from the server computing device, the attribute values being values of the attribute of the computer-readable entities; and

responsive to receiving the attribute values for the attribute, updating the spreadsheet in the graphical user interface of the spreadsheet application to include another column, wherein the another column is populated with the attribute values such that the attribute values are displayed to correspond to the selected entities .

2. The computing system of claim 1 being one of a mobile telephone or a tablet computing device.

3. The computing system of claim 1, the acts further comprising :

prior to receiving the attribute values from the server computing device, receiving table snippets from the server computing device, the table snippets summarizing respective source tables identified by the server computing device as being relevant to the selected entities; and

displaying the table snippets in the graphical user interface of the spreadsheet application responsive to receiving the table snippets.

4. The computing system of claim 3, the acts further comprising :

receiving a selection of a table snippet in the table snippets, the attribute values comprised by a source table summarized by the table snippet, wherein the spreadsheet in the graphical user interface is updated to include the another column responsive to receipt of the selection of the table snippet.

5. The computing system of claim 4, the table snippet comprises a title of the source table summarized by the table snippet, data that identifies a network location of the source table, and a sample portion of the source table, wherein keywords in a query utilized to locate the source table are highlighted in the table snippet where such keywords occur in the table snippet.

6. The computing system of claim 4, the acts further comprising :

receiving an indication that a column represented in the table snippet has been selected from the table snippet, wherein updating the spreadsheet in the graphical user interface of the spreadsheet application to include the another column comprises adding contents of the column represented in the table snippet to the another column.

7. The computing system of claim of claim 1, the acts further comprising :

receiving a selection of the attribute; and

transmitting the identity of the attribute to the server computing device with the entities.

8. The computing system of claim 1, wherein the another column is adjacent to the column in the updated graphical user interface of the spreadsheet application.

9. The computing system of claim 1, the acts further comprising :

displaying a popup window in the graphical user interface of the spreadsheet application in response to receiving the indication that the user has selected the entities in the table, wherein the popup window comprises a selectable option for retrieving the attribute values, wherein the indication that the user has requested the search to be performed is receipt of selection of the selectable option.

10. A method executed at a client computing device, the method comprising:

displaying a table in a graphical user interface of a spreadsheet application on a display of the client computing device, wherein the table has a column that the column includes entities, wherein an entity is a string that represents a person, place, or thing, and wherein people, places, or things represented by the entities in the column have an attribute;

receiving an indication that a user of the client computing device has selected the entities in the column of the table;

responsive to receiving the indication that the user of the client computing device has selected the entities, transmitting the entities to a server computing device, wherein the server computing device is programmed with instructions that, when executed by the server computing device, cause the server computing device to perform a search over an index of network accessible tables based upon the selected entities;

receiving, from the server computing device, respective attribute values for the selected entities, the attribute values being values of the attribute; and

responsive to receiving the attribute values, updating the graphical user interface of the spreadsheet application such that the table includes another column, the another column comprises the attribute values, wherein the attribute values are arranged in the another column to correspond to the entities in the column that have the attribute values.

11. The method of claim 10, the indication corresponding to one of a:

a selection the entities by way of a mouse pointer;

a selection of the entities by way of a gesture performed on a touch-sensitive display of the client computing device; or

a spoken command that identifies the entities.

12. The method of claim 10, wherein responsive to transmitting the entities to the server computing device, attributes of the entities are received from the server computing device, the attributes comprise the attribute, the method further comprises:

receiving a selection of the attribute from the attributes;

responsive to receiving the selection of the attribute from the attributes, transmitting the attribute to the server computing device , wherein

the attribute values are received from the server computing device responsive to transmitting the attribute to the server computing device.

13. The method of claim 10, further comprising:

responsive to transmitting the entities to the server computing device, receiving a ranked list of table snippets from the server computing device, each table snippet in the ranked list of table snippets summarizes a respective source table accessible by way of a network connection, each table snippet in the ranked list of table snippets comprises:

a title for the respective source table;

a network location of the respective source table; and

a representative portion of the respective source table; prior to receiving the respective attribute values from the server computing device;

displaying the ranked list of table snippets on the display;

receiving a selection of a table snippet in the ranked list of table snippets, the table snippet summarizes a source table that comprises the attribute values;

responsive to receiving the selection of the table snippet, transmitting the selection of the table snippet to the server computing device, wherein the respective attribute values are received from the server computing device responsive to transmitting the selection of the table snippet to the server computing device.

14. The method of claim 10, wherein the client computing device is one of a mobile telephone or a tablet computing device.

15. The method of claim 10, wherein the column and the another column are adjacent to one another in the updated graphical user interface.

16. A client computing device comprising a computer-readable storage medium, the computer-readable storage medium comprising instructions that, when executed by a processor, cause the processor to perform acts comprising:

displaying a spreadsheet in a graphical user interface of a spreadsheet application, the spreadsheet comprises a table, the table comprises a column that includes entities, wherein an entity is a string that represents a person, place, or thing, and wherein people, places, or things represented by the entities in the column have an attribute ;

receiving a selection of the entities in the table;

receiving an indication that a search is to be conducted based upon the entities selected in the table;

transmitting the entities and the attribute to a server computing device that is in network communication with the client computing device, the server computing device programmed with instructions that, when executed by the server computing device, cause the server computing device to execute a search for computer-readable tables based upon the entities and the attribute;

responsive to transmitting the entities and the attribute to the server computing device, receiving values of the attribute that respectively correspond to the entities; and

responsive to receiving the values of the attribute, adding another column to the table in the spreadsheet displayed in the graphical user interface of the spreadsheet application, the another column comprises the values of the attribute, the values of the attribute arranged in the another column to respectively map to the entities in the column.

17. The client computing device of claim 16 being one of a mobile telephone or a tablet computing device.

18. The client computing device of claim 16, wherein the another column is adjacent to the column in the table.

19. The client computing device of claim 16, the acts further comprising :

prior to receiving the attribute values from the server computing device, receiving table snippets from the server computing device, the table snippets summarizing respective source tables identified by the server computing device as being relevant to the selected entities; and

displaying the table snippets in the graphical user interface of the spreadsheet application responsive to receiving the table snippets.

20. The client computing device of claim 19, the acts further comprising :

receiving a selection of a table snippet in the table snippets, the attribute values comprised by a source table summarized by the table snippet, wherein the spreadsheet in the graphical user interface is updated to include the another column responsive to receipt of the selection of the table snippet.