

# **A METHOD AND SYSTEM FOR DISPLAYING A NETWORK OF INTERRELATED NODES**

## **FIELD OF INVENTION**

This invention relates to a method of displaying a network of interrelated nodes.

## **BACKGROUND OF THE INVENTION**

In prior art, US patent number 6,618,733, as illustrated in Figure 1, simple parent-child relationships between objects are displayed in a file explorer type of window displays for viewing folders and files. Window 500 represents an exemplary graphical user interface for a view and/or navigation mechanism to view a hierarchical organisation of nodes. The nodes can be representing objects, such as object nodes 501; or relations between the objects such as relation nodes 503; and types of object such as type nodes 505.

When a user selects an object node 501 in this example, the selected object node 501 is selected as a parent object node. The parent object node 501 is expanded and spawns the display of one or more relation nodes 503 which are associated with the selected parent object node 501. When a user can select a child object node 505, the object node 505 is now a parent object node and is expanded further. Object nodes 507, 509, 511 are the respective child object nodes for the corresponding parent object nodes 505, 507 and 509.

In this view, all the object nodes and relation nodes are displayed. Such a view is likely to cause confusion to the user. The user has to learn to differentiate between object nodes and relation nodes. Further, the excessive and redundant relation nodes over-cluster the view area. In order to locate the desired node, a user will need to scroll up and down the view in the view area, which is very inconvenient.

In addition, if an object has multiple parent/ child relationships, such as in a mesh-network, the view will not be effective in showing the multiple relationships between the objects.

Therefore, there is a need to provide a method for displaying a network of interrelated nodes more simply and clearly.

## **SUMMARY OF THE INVENTION**

According to an embodiment of the invention, there is provided a method for displaying a network of interrelated nodes on a user interface including the steps of classifying the nodes having a first type and a second type of relationships, displaying the nodes in a first view area, selecting a desired node in the first view area, displaying the nodes having a first type of relationship with the selected node in a second view area, and displaying the nodes having a second type of relationship with the selected node in a third view area.

In a second embodiment of the invention, the method further includes a step of grouping the nodes prior to classifying the nodes.

Preferably, the first type of relationship is hierarchical and the second type is non-hierarchical.

Still preferably, in the second embodiment of the invention, the method further includes a step of selecting a group of nodes for viewing, so only the nodes in the selected group are displayed in a first view area.

In both embodiments of the invention, the nodes illustrated as being objects. However, it will be apparent that they may be field devices.

In addition, the invention provides a system for displaying a network of interrelated nodes classified as having a first type of relationship and a second type of relationship on a user interface including a first view area for displaying the nodes, a second view area for displaying nodes having a first type of relationship with the selected node in the first view area, and a third view area for displaying nodes having a second type of relationship with the selected node in the first view area.

## **BRIEF DESCRIPTION OF THE DRAWING**

Figure 1 illustrates a view window in the prior art.

Figure 2 illustrates a simplified example of a mesh-network of interrelated nodes.

Figures 3 and 4 illustrate process flows of the invention.

Figure 5 illustrates a view window of the preferred embodiment of the invention.

Figure 6 illustrates one example of suitable system for practicing an embodiment of the invention.

## **DETAILED DESCRIPTION OF THE INVENTION**

Figure 2 illustrates an information model, which is a mesh network 100 of interrelated nodes 120. Each node 120 in the model is unique and contains specific information. Each of the nodes has a specific type of relationship 140 with another node (s) in the model. There are basically two types of relationships among the nodes 120. The two types of relationships can be classified as hierarchical and non-hierarchical. A hierarchical relationship is one that spans a hierarchy such as a parent child relationship in the prior art. A non-hierarchical relationship is one that does not span a hierarchy.

A first embodiment of the invention relates to a method for displaying a network of interrelated nodes on a user interface as illustrated in Figure 3. The method includes the steps of classifying the nodes as having a first type and a second type of relationships with each other. All the nodes are displayed in a first view area. A user selects a desired node in the first view area for viewing the related nodes. The nodes having a first type of relationship with the selected node are then displayed in a second view area, and those having a second type relationship with the selected node in a third view area.

Figure 5 illustrates an example of a view window 200 of the first embodiment of the invention. All the nodes are displayed in a first view area 220. In this example, the child nodes of each parent node are listed in the first view area 220. For a Node 4 in Figure 2,

Node 1 is the parent node and Nodes 6, 7, 8 are the child nodes. In Figure 5, when Node 4, illustrated by numeral 228, is selected, it is expanded in the first view area 220, and the child nodes, Nodes 6, 7 and 8 are displayed. These child nodes are also known as forward reference objects. The nodes having a hierarchical relationship with the selected Node 4, whether parent or child, are displayed in a second view area 240. In a third view area 260, the nodes having a non-hierarchical type of relationship with Node 4 are displayed. Non-hierarchical relationships 262 are displayed with the respective nodes 264.

In the second view area 240, hierarchical relationships 242 are displayed with the respective nodes 244. Referring to Figure 2 to identify the child and parent node (s), relationships such as child nodes are displayed as R2, R2 and R1 for Nodes 6, 7, and 8 respectively; and parent node is displayed as R2' for Node 1. The parent node is also known as backward reference object. Hence, in the second view area, the hierarchical view panel, both forward and backward reference objects of a selected node which has one or more bi-directional relationships in the information model are displayed. Some examples of hierarchical relationships include "ConsistOf", "HasProperty".

In the third view area 260, 262 shows the relationships of the non-hierarchical type nodes with the selected node. The non-hierarchical type nodes are usually information related to the selected node 228 which is hidden from the first view area. Some of the examples of non-hierarchical relationships include "TypeDefinitionOf", "Alias".

Alternatively, the step of selecting a node can be done in any of the second or third view areas. The selected node is updated as the desired node in the first view area and the nodes having a first and a second type of relationships with the desired node will be updated in the second and third view areas respectively. This allows all nodes in all view areas to be selected as the desired node. An example of this method is illustrated in Figure 4. For example, in Figure 5 the second view area 240. If Node 1 is selected, it is displayed as being selected in the first view area 220. The nodes having a hierarchical relationship with Node 1 are updated in the second view area 240, and those nodes having a non-hierarchical relationship with Node 1 are updated in the third view area 260.

Preferably, the method includes providing a selection means 290 to select a desired node in any of the first, second or third view area. An example of the selection means is a pointing device.

According to a second embodiment of the invention, the method includes an additional step of grouping the nodes. The groups may be used to identify the nodes under the charge of various users or operators. In another alternative, the groups identify the nodes in different locations.

Preferably, the method further includes the step of selecting a group for viewing. In this method, only the nodes in the selected group are displayed in a first view area. This is for monitoring the nodes, which are illustrated as being objects or field devices, as grouped by the location, or operators in charge of the nodes.

As illustrated in Figure 5, the tabs 222, 224 and 226 represent different groups. By selecting the desired tab 222, 224, 226, the first view area 220 lists the nodes in the selected group. In this example, the tab 222 lists all the nodes in the network, the tab 224 lists the nodes grouped in Operator1, tab 226 in Operator2.

The user may use the selection means 290 to select any of the tabs. When the desired tab is selected, the display in at least the first view area 220 is updated. In all the three view areas 220, 240, 260, a user may use the selection means 290 provided to select a desired node. When the desired node is selected, the display in all the first, second and third view areas are updated for the selected node.

Further, a status bar 280 of the view window 200 may be used to reflect any message or status. An example of having such a status or message is when the pointing device is moved over the selected node. Another example is a status or message for a group of nodes when the pointing device is moved over the selected tab.

Figure 6 illustrates an example of the system for operating the invention. Each group of nodes are represented by a tab 10, which can be selected by a selector 12 for viewing. In each group of nodes, there are at least two view areas – a hierarchical view panel 14 for node having a relationship of the first type and a non-hierarchical view panel 16 for a

node of the second type. Each node in the respective view area contains data, which are stored with the node in the respective view area. Alternatively, the data can be stored in different view areas. In addition, a pointing device 18 is provided for activating the selector 12 selecting the desired tab and/ or nodes and a status bar 20 is configured for displaying a status or message of a node or group of nodes. The information of a selected node or group of nodes, the configured status bar and the pointing device are managed by a controller 22 and updated for display in the at least three display areas.

In the current invention, the relation nodes are not displayed in any of the view areas and the relationships among the nodes are clearly visible from the multiple display areas in one display window. In the first display area, the familiar explorer type view is retained and more information is displayed in the second and third display areas clearly. By selecting the desired node from any view area and / or group of nodes, the relationship of the desired node with the any other nodes is displayed and allows for easy navigation to any other desired node.

We claim:

1. A method for displaying a network of interrelated nodes on a user interface including the steps of

- (a) classifying said nodes as having a first and a second type of relationships;
- (b) displaying said nodes in a first view area;
- (c) selecting a desired node in said first view area;
- (d) displaying said first type nodes of said selected node in a second view area;

and

- (e) displaying said second type nodes of said selected node in a third view area.

2. A method as claimed in claim 1 wherein said first type of relationship is hierarchical and said second type is non-hierarchical.

3. A method as claimed in claim 2 further including the step of  
grouping said nodes.

4. A method as claimed in claim 3 further including the step of  
selecting a desired group for viewing such that only nodes in the selected group are displayed in a first view area.

5. A method as claimed in claim 1 wherein said nodes are objects.

6. A method as claimed in claim 1 wherein said nodes are field devices.

7. A method as claimed in claim 1 further including the step of  
providing a selection means for selecting the desired node.

8. A method for displaying a network of interrelated nodes on a user interface including the steps of

- (a) classifying said nodes as having a first and a second type of relationships;
- (b) displaying said nodes in a first, second and third view areas;
- (c) selecting a desired node in said first, second or third view area;
- (d) determining if the selected node is in said first view area,

when said selected node is not in said first view area, the method further includes the steps of

- (e) updating said selected node in said first view area;
  - (f) displaying said first type nodes of said selected node in a second view area;
- and
- (g) displaying said second type nodes of said selected node in a third view area.

9. A system for displaying a selected a node in a network of interrelated nodes classified into a first type and a second type on a user interface including

- (a) a first view area for displaying said nodes;
- (b) a second view area for displaying said first type nodes of a selected node;

and

- (c) a third view area for displaying said second type nodes of said selected node

wherein said node is selected in said first, second or third view area.

10. A system as claimed in claim 9 wherein the second and the third view areas are hierarchical and non-hierarchical view panels, respectively.

11. A system as claimed in claim 9 wherein data are stored in said nodes in the second and third view areas.

12. A system as claimed in claim 9 further including

- (d) at least one tab, each tab for representing at least one node.

13. A system as claimed in claim 12 further including

- (e) a selector for selecting a node or tab.

14. A system as claimed in claim 9 further including

- (f) a controller for controlling the first, second and third view areas on the user interface.

15. A system as claimed in claim 9 further including

- (g) a status bar to display the status or message of a node or tab.