Claims:

1. A method for control system optimization, the method comprising:

retrieving from a control system information repository, information corresponding to an implemented control system;

based on the retrieved information, identifying:

a plurality of function blocks corresponding to the implemented control system; and

equipment components related to the plurality of function blocks;

grouping the plurality of function blocks into a plurality of function block groups such that at least one of the plurality of function block groups comprises a plurality of function blocks, wherein grouping of function blocks within each function block group is based on identification of one or more attributes shared by each function block within said function block group;

generating a plurality of equipment component groups, each generated equipment component group comprising at least one equipment component and at least one of the plurality of equipment component groups comprising a plurality of equipment components, wherein:

each generated equipment component group corresponds uniquely to one function block group; and

each equipment component group includes one or more equipment components selected such that said one or more equipment components are related to one or more function blocks within a function block group that uniquely corresponds to said equipment component group;

within each equipment component group, identify interconnections between equipment components within said equipment component group, wherein identifying interconnections between equipment components within at least one equipment component group comprises determining existence of a relationship between at least one pair of equipment components within said equipment component group;

selecting from among the identified interconnections, a sub-set of the identified interconnections, wherein selection of the sub-set is based on a predetermined evaluation criteria;

and

~~generate~~ generating a control system topology ~~based on~~comprising the identified equipment components, and the selected sub-set of identified interconnections between equipment components, wherein the control system topology excludes one or more identified interconnections that are not within the selected sub-set of identified interconnections.

2. The method as claimed in claim 1, comprising responding to detection of a first event within a process environment associated with the implemented control system by:

identifying a first equipment component within the implemented control system, wherein the identified first equipment component is related to the detected first event;

identifying a second equipment component within the implemented control system, wherein the identified second equipment component is related to the identified first equipment component; and

displaying one or more event notifications at a user interface, wherein the displayed one or more event notifications include information corresponding to both the first equipment component and the second equipment component;

wherein identification of the second equipment component is based on equipment component interconnection information retrieved from the control system topology.

3. The method as claimed in claim 1, wherein identification of interconnections between equipment components within an equipment component group comprises analysing each possible pair of equipment components within said equipment group to determine existence of a relationship between said pair of equipment components.

4. The method as claimed in claim 1, wherein identification of interconnections between equipment components within an equipment component group comprises applying association rule analysis to equipment parameter data corresponding to equipment components within said equipment component group.

5. The method as claimed in claim 4, wherein identification of interconnections between equipment components within an equipment component group is based on one or more association scores resulting from the applied association rule analysis.

~~6. The method as claimed in any one of claims4 or 5, wherein the control system topology is generated based on a selected sub-set of the identified interconnections between equipment components, and wherein selecting the sub-set of identified interconnections comprises evaluating identified interconnections based on a predefined criteria.~~

~~7~~6. The method as claimed in claim ~~6~~1, wherein selecting the sub-set of the identified interconnections includes ~~evaluating the identified interconnections based on a predefined criteria comprises~~ applying the predefined evaluation criteria to association scores resulting from the applied association analysis.

~~8~~7. The method as claimed in claim ~~6~~1, wherein all identified interconnections that do not satisfy the predefined evaluation criteria are omitted or eliminated from the generated control system topology.

~~9~~8. The method as claimed in claim 5, wherein the one or more association scores comprise any of (i) a support score, (ii) a confidence score, (iii) a lift score, (iv) a chi square score, or (v) a unified score derived based on any of a support score, a confidence score, a lift score and a chi square score.

~~10~~9. The method as claimed in claim 1, further comprising identifying a plurality of clusters of equipment components within the generated control system topology, and wherein identification of said clusters is based on detection of community structure among equipment components within each cluster.

~~11~~10. The method as claimed in claim 1, wherein the information retrieved from the control system information repository is retrieved from one or more of engineering documents, system specifications, control drawings, logic charts, sequence tables or interlock tables, flow diagrams, a control system engineering information data source, a control system classification information data source, a plant configuration information data source, or an asset management information data source.

~~12~~11. The method as claimed in claim 1, wherein identification of one or more attributes shared by each function block within the identified group of function blocks is based on classification identifiers assigned to each of the plurality of function blocks.

~~13~~12. The method as claimed in claim 1, wherein the one or more attributes shared by each function block within a function block group comprises any one or more of (i) physical location, (ii) physical media relied on for operation, (iii) equipment type, (iv) an upstream or downstream data flow, (v) media flow or control flow relationship, (vi) location within a specific area or plant site, (vii) being in network communication with other function blocks within the identified group of function blocks, and (viii) inclusion of each said function block within a single interface screen, display window or display wireframe corresponding to a user interface within the implemented control system.

~~14~~13. The method as claimed in claim 2, wherein the detected first event is independent of the identified second equipment component.

~~15~~14. The method as claimed in claim 2, wherein displaying one or more event notifications at the user interface includes displaying an event notification corresponding to a detected second event, wherein the detected second event relates to the identified second equipment component.

~~16~~15. The method as claimed in claim ~~10~~9, further comprising displaying information identifying one or more community structure based clusters of equipment components.

~~17~~16. A system for control system optimization, the system comprising:

one or more controllers;

a plurality of field devices;

a processor configured to:

retrieve from a control system information repository, information corresponding to an implemented control system;

based on the retrieved information, identify:

a plurality of function blocks corresponding to the implemented control system; and

equipment components related to the plurality of function blocks;

group the plurality of function blocks into a plurality of function block groups such that at least one of the plurality of function block groups comprises a plurality of function blocks, wherein grouping of function blocks within each function block group is based on identification of one or more attributes shared by each function block within said function block group;

generate a plurality of equipment component groups, each generated equipment component group comprising at least one equipment component and at least one of the plurality of equipment component groups comprising a plurality of equipment components, wherein:

each generated equipment component group corresponds uniquely to one function block group; and

each equipment component group includes one or more equipment components selected such that said one or more equipment components are related to one or more function blocks within a function block group that uniquely corresponds to said equipment component group;

within each equipment component group, identify interconnections between equipment components within said equipment component group, wherein identifying interconnections between equipment components within at least one equipment component group comprises determining existence of a relationship between at least one pair of equipment components within said equipment component group;

selecting from among the identified interconnections, a sub-set of the identified interconnections, wherein selection of the sub-set is based on a predetermined evaluation criteria;

and

a topology generator configured to generate a control system topology comprising ~~based on~~ the identified equipment components, and the selected sub-set of identified interconnections between equipment components, wherein the control system topology excludes one or more identified interconnections that are not within the selected sub-set of identified interconnections.

~~18~~17. The system as claimed in claim ~~17~~16, further comprising a process monitor configured such that, responsive to detection of a first event within a process environment associated with the implemented control system, the process monitor:

identifies a first equipment component within the implemented control system, wherein the identified first equipment component is related to the detected first event;

identifies a second equipment component within the implemented control system, wherein the identified second equipment component is related to the identified first equipment component; and

displays one or more event notifications at a user interface, wherein the displayed one or more event notifications include information corresponding to both the first equipment component and the second equipment component;

wherein identification of the second equipment component is based on equipment component interconnection information retrieved from the control system topology.

~~19~~18. The system as claimed in claim ~~17~~16, wherein identifying interconnections between equipment components within an equipment component group comprises analysing each possible pair of equipment components within said equipment group to determine existence of a relationship between said pair of equipment components.

~~20~~19. The system as claimed in claim ~~17~~16, wherein identifying interconnections between equipment components within an equipment component group comprises applying association rule analysis to equipment parameter data corresponding to equipment components within said equipment component group.

~~21~~20. The system as claimed in claim ~~20~~19, wherein identifying interconnections between equipment components within an equipment component group is based on one or more association scores resulting from the applied association rule analysis.

22. The system as claimed in any one of claims 20 or 21, wherein the topology generator is configured to generate the control system topology based on a selected sub-set of the identified

~~interconnections between equipment components, and wherein selecting the sub-set of identified interconnections comprises evaluating identified interconnections based on a predefined criteria.~~

~~23~~21. The system as claimed in claim ~~22~~16, wherein selecting the sub-set of the identified interconnections includes ~~evaluating the identified interconnections based on a predefined criteria comprises~~ applying the predefined evaluation criteria to association scores resulting from the applied association analysis.

~~24~~22. The system as claimed in claim ~~22~~16, wherein the topology generator is configured to omit or eliminate from the generated control system topology, identified interconnections that do not satisfy the predefined evaluation criteria.

~~25~~23. The system as claimed in claim ~~21~~20, wherein the one or more association scores comprise any of (i) a support score, (ii) a confidence score, (iii) a lift score, (iv) a chi square score, or (v) a unified score derived based on any of a support score, a confidence score, a lift score and a chi square score.

~~26~~24. The system as claimed in claim 16~~17~~, wherein the processor is configured to identify a plurality of clusters of equipment components within the generated control system topology, and wherein identification of said clusters is based on detection of community structure among equipment components within each cluster.

~~27~~25. The system as claimed in claim ~~17~~16, wherein the information retrieved from the control system information repository is retrieved from one or more of engineering documents, system specifications, control drawings, logic charts, sequence tables or interlock tables, flow diagrams, a control system engineering information data source, a control system classification information data source, a plant configuration information data source, or an asset management information data source.

~~28~~26. The system as claimed in claim ~~17~~16, wherein the processor is configured to identify one or more attributes shared by each function block within the identified group of function blocks, based on classification identifiers assigned to each of the plurality of function blocks.

~~29~~27. The system as claimed in claim ~~17~~16, wherein the one or more attributes shared by each function block within a function block group comprises any one or more of (i) physical location, (ii) physical media relied on for operation, (iii) equipment type, (iv) an upstream or downstream data flow, (v) media flow or control flow relationship, (vi) location within a specific area or plant site, (vii) being in network communication with other function blocks within the identified group of function blocks, and (viii) inclusion of each said function block within a single interface screen, display window or display wireframe corresponding to a user interface within the implemented control system.

~~30~~28. The system as claimed in claim ~~18~~17, wherein the detected first event is independent of the identified second equipment component.

~~31~~29. The system as claimed in claim ~~18~~17, wherein displaying one or more event notifications at the user interface includes displaying an event notification corresponding to a detected second event, wherein the detected second event relates to the identified second equipment component.

~~32~~30. The system as claimed in claim ~~26~~24, wherein a process monitor is configured to display information identifying one or more community structure based clusters of equipment components.

~~33~~31. A computer program product for control system optimization, comprising a non-transitory computer usable medium having a computer readable program code embodied therein, the computer readable program code comprising instructions for:

retrieving from a control system information repository, information corresponding to an implemented control system;

based on the retrieved information, identifying:

a plurality of function blocks corresponding to the implemented control system; and

equipment components related to the plurality of function blocks;

grouping the plurality of function blocks into a plurality of function block groups such that at least one of the plurality of function block groups comprises a plurality of function blocks,

wherein grouping of function blocks within each function block group is based on identification of one or more attributes shared by each function block within said function block group;

generating a plurality of equipment component groups, each generated equipment component group comprising at least one equipment component and at least one of the plurality of equipment component groups comprising a plurality of equipment components, wherein:

each generated equipment component group corresponds uniquely to one function block group; and

each equipment component group includes one or more equipment components selected such that said one or more equipment components are related to one or more function blocks within a function block group that uniquely corresponds to said equipment component group;

within each equipment component group, identify interconnections between equipment components within said equipment component group, wherein identifying interconnections between equipment components within at least one equipment component group comprises determining existence of a relationship between at least one pair of equipment components within said equipment component group;

selecting from among the identified interconnections, a sub-set of the identified interconnections, wherein selection of the sub-set is based on a predetermined evaluation criteria;

and

~~generate~~ generating a control system topology ~~based on~~comprising the identified equipment components, and the selected sub-set of identified interconnections between equipment components, wherein the control system topology excludes one or more identified interconnections that are not within the selected sub-set of identified interconnections.

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