

CLAIMS

1. ~~—A method of training a robotic process automation, RPA, robot to use a GUI, the method comprising:~~

~~capturing video of the GUI as an operator uses the GUI to carry out a process;~~

~~capturing a sequence of events triggered as the operator uses the GUI to carry out said process;~~

~~analyzing said video and said sequence of events to thereby generate a workflow which, when executed by an RPA robot, causes the RPA robot to carry out said process using the GUI;~~

~~wherein said analyzing further comprises:~~

~~identifying an interactive element of the GUI from said video; and~~

~~matching at least one of the events in the sequence of events as corresponding to the interactive element,~~

~~wherein identifying an interactive element comprises identifying positions of one or more anchor elements in the GUI relative to said interactive element, and wherein the one or more anchor elements are identified by:~~

~~identifying a predetermined number of nearest elements as anchor elements;~~

~~identifying nearest elements in one or more predetermined directions as anchor elements; or~~

~~identifying all elements within a predefined region of the interactive element as anchor elements.~~

2. ~~—The method of claim 1 wherein identifying an interactive element is carried out by applying a trained machine learning algorithm to at least part of the video.~~

3. ~~—The method of any preceding claim wherein a machine learning algorithm is used to identify the one or more anchor elements based on one or more pre-determined feature values.~~

4. ~~—The method of claim 3 wherein the feature values are determined via training of the machine learning algorithm.~~

5. ~~—The method of claim 4 wherein the machine learning algorithm comprises a graph neural network.~~

6. ~~—The method of any one of claims 3 to 5 wherein the feature values include any one or more of:~~

~~distance between interactive elements;
orientation of an interactive element; and
whether interactive elements are in the same window.~~

7. ~~—The method of any preceding claim wherein the sequence of events comprise any one or more of:~~

~~a keypress event;
a hoverover event;
a click event;
a drag event; and
a gesture event.~~

8. ~~—The method of any preceding claim comprising including based on the video one or more inferred events in the sequence of events.~~

9. ~~—The method of claim 8 wherein a hover event is inferred based on one or more interface elements becoming visible in the GUI.~~

10. ~~—The method of any preceding claim wherein the step of analyzing comprises:~~

~~identifying a sequence of sub-processes of said process.~~

~~11.—The method of claim 10 wherein a process output of one of the sub-processes of the sequence is used by the RPA robot as a process input to another sub-process of the sequence.~~

~~12.—The method of claim 10 or claim 11 further comprising editing the generated workflow to include a portion of a previously generated workflow corresponding to a further sub-process, such that said edited workflow, when executed by an RPA robot, causes the RPA robot to carry out a version of said process using the GUI, the version of said process including the further sub-process.~~

~~13.—The method of claim 12 wherein the version of said process includes the further sub-process in place of an existing sub-process of said process.~~

~~14.—The method of any preceding claim wherein the video and or the sequence of event are captured using a remote desktop system.~~

~~15.—A method of carrying out a process using a GUI using an RPA robot trained by the method according to claim 1, the method further comprising the RPA robot re-identifying an interactive element in the GUI based on associated anchor elements in the GUI specified in a workflow,~~

~~wherein the one or more anchor elements are:~~

~~a predetermined number of nearest elements;~~

~~nearest elements in one or more predetermined directions;~~

~~or~~

~~all elements within a predefined region of the interactive element.~~

~~16.—The method of claim 15, wherein the RPA robot re-identifying an interactive element in the GUI based on associated anchor elements in the GUI~~

~~specified in a workflow comprises identifying anchor elements of the interactive element in the GUI in a further image that corresponds to the same anchor elements of a previously identified interactive element in the GUI, wherein an anchor element corresponds to another anchor element if the relative positions of the anchor elements to their respective interactive element in the GUI is within a pre-determined threshold.~~

~~17.—The method of claim 15 or claim 16 wherein a machine learning algorithm is used to re-identify the one or more interactive elements based on one or more pre-determined feature values of one or more interactive elements.~~

~~18.—The method of claim 17 wherein the feature values include any one or more of:~~

~~distance between interactive elements;
orientation of an interactive element; and
whether interactive elements are in the same window.~~

~~19.—An apparatus arranged to carry out a method according to any one of claims 1 to 18.~~

~~20.—A computer program which, when executed by a processor, causes the processor to carry out a method according to any one of claims 1 to 18.~~

~~21.—A computer-readable medium storing a computer program according to claim 18.~~

CLAIMS

1. A method of training an RPA robot to use a GUI, the method comprising:
capturing video of the GUI as an operator uses the GUI to carry out a process;
capturing a sequence of events triggered as the operator uses the GUI to carry out said process;
analyzing said video and said sequence of events to thereby generate a workflow which, when executed by an RPA robot, causes the RPA robot to carry out said process using the GUI.
2. The method of claim 1 wherein said analyzing further comprises:
identifying one or more interactive elements of the GUI from said video; and
matching at least one of the events in the sequence of events as corresponding to a least one of the interactive elements.
3. The method of claim 1 or 2 wherein identifying an interactive element is carried out by applying a trained machine learning algorithm to at least part of the video.
4. The method of any preceding claim wherein identifying an interactive element comprises identifying positions of one or more anchor elements in the GUI relative to said interactive element.
5. The method of claim 4 wherein a machine learning algorithm is used to identify the one or more anchor elements based on one or more pre-determined feature values.
6. The method of claim 5 wherein the feature values are determined via training of the machine learning algorithm.
7. The method of claim 5 or 6 wherein the feature values include any one or more of:
distance between elements,
orientation of an element; and
whether elements are in the same window.
8. The method of any preceding claim wherein the sequence of events comprise any one or more of:
a keypress event;
a hoverover event;
a click event;
a drag event; and

a gesture event.

9. The method of any preceding claim comprising including based on the video one or more inferred events in the sequence of events.
10. The method of claim 9 wherein a hover event is inferred based on one or more interface elements becoming visible in the GUI.
11. The method of any preceding claim wherein the step of analyzing comprises: identifying a sequence of sub-processes of said process.
12. The method of claim 11 wherein a process output of one of the sub-processes of the sequence is used by the RPA robot as a process input to another sub-process of the sequence.
13. The method of claim 11 or claim 12 further comprising editing the generated workflow to include a portion of a previously generated workflow corresponding to a further sub-process, such that said edited workflow, when executed by an RPA robot, causes the RPA robot to carry out a version of said process using the GUI, the version of said process including the further sub-process.
14. The method of claim 13 wherein the version of said process includes the further sub-process in place of an existing sub-process of said process.
15. The method of any preceding claim wherein the video and or the sequence of event are captured using a remote desktop system.
16. A method of carrying out a process using a GUI using an RPA robot trained by the method according to claim 1.
17. The method of claim 16 further comprising the RPA robot re-identifying one or more interactive elements in the GUI based on respective anchor elements specified in a workflow.
18. The method of claim 17 wherein a machine learning algorithm is used to re-identify the one or more interactive elements based on one or more pre-determined feature values.
19. The method of claim 18 wherein the feature values are determined via training of the machine learning algorithm.

20. The method of claim 18 or 19 wherein the feature values include any one or more of:
distance between elements,
orientation of an element; and
whether elements are in the same window.
21. An apparatus arranged to carry out a method according to any one of claims 1 to 20.
22. A computer program which, when executed by a processor, causes the processor to carry out a method according to any one of claims 1 to 20.
23. A computer-readable medium storing a computer program according to claim 22.