verification processing device 1 temporarily restores the excluded elements to the model to be checked MOD (step S15). In this case, the verification processing device 1 efficiently advances the exclusion process by further narrowing down the elements restored to the model to be checked MOD in step S15 as a target using binary search (step S16). The binary search performed in step S16 will be described later.

[0053]

(Exclusion Process Using Individual Element Exclusion History Value)

Next, the exclusion process using the individual element exclusion history value will be described with reference to Fig. 9.

As illustrated in Fig. 9, the selection unit 101 of the verification processing device 1 selects all elements (X1, X2, ...) in which the individual element exclusion history value exceeds a predetermined threshold value (step S21). Here, this exclusion process is skipped in a case where there is no element in which the individual element exclusion history value exceeds the predetermined threshold value.

[0054]

Next, the checking unit 100 of the verification processing device 1 excludes all elements selected in step

S21 from the model to be checked MOD (step S22) and performs the model re-checking (step S23).

In a case where the checking result of the model re-checking does not result in TRUE (another counterexample is output) (step S24; NO), a determination that all elements excluded in step S22 are not the main cause can be made. Thus, the verification processing device 1 continues further narrowing down without restoring the excluded elements to the model to be checked MOD.

On the other hand, in a case where the checking result changes to TRUE in the model re-checking (a counterexample is not output) (step S24; YES), a determination that the main cause is included in the elements excluded in step S22 can be made. Thus, the verification processing device 1 temporarily restores the excluded elements to the model to be checked MOD (step S25). In this case, the verification processing device 1 efficiently advances the exclusion process by further narrowing down the elements restored to the model to be checked MOD in step S25 as a target using binary search (step S26). The binary search performed in step S26 will be described later.

[0055]

The binary search in step S16 (Fig. 8) and step S26 (Fig. 9) will be described with reference to Fig. 10.

Claims

[Claim 1]

A verification processing device comprising:

a checking unit that performs model checking on a model to be checked including a plurality of elements;

a selection unit that selects one or more of a plurality of elements included in a counterexample output as a result of the model checking; and

an exclusion history generation unit that generates exclusion history information indicating an exclusion frequency for each of a plurality of elements,

wherein the checking unit further performs model re-checking on the model to be checked obtained by excluding the selected element,

in a case where another counterexample is output as a result of the model re-checking, the exclusion history generation unit increases the exclusion frequency of the selected element and updates the exclusion history information, and

the selection unit selects an element of which the exclusion frequency is high based on the exclusion history information.

[Claim 2]

The verification processing device according to Claim 1,

wherein the exclusion history generation unit generates, based on the exclusion frequency for each element included in one design drawing, exclusion history information indicating an exclusion frequency in design drawing units, and

the selection unit selects all elements included in a design drawing of which the exclusion frequency in the design drawing units is high based on the exclusion history information.

[Claim 3]

The verification processing device according to Claim 1 or Claim 2,

wherein the exclusion history generation unit generates exclusion history information indicating an exclusion frequency in checking expression units for each of the plurality of elements, and

the selection unit selects an element of which the exclusion frequency in the checking expression units corresponding to a checking expression used in the next model checking is high based on the exclusion history information.

[Claim 4]

The verification processing device according to any one of Claims 1 to 3,

wherein in a case where a counterexample is not output as a result of the model re-checking, the selection unit selects one of two groups into which a plurality of previously selected elements is divided.

[Claim 5]

The verification processing device according to any one of Claims 1 to 4, further comprising:

a threshold value decision unit that decides a threshold value used for determining whether or not to exclude each element from the model to be checked by comparing the threshold value with the exclusion frequency.

[Claim 6]

A verification processing method comprising:

a step of performing model checking on a model to be checked including a plurality of elements;

a step of selecting one or more of a plurality of elements included in a counterexample output as a result of the model checking;

a step of generating exclusion history information indicating an exclusion frequency for each of a plurality of elements;

a step of performing model re-checking on the model to be checked obtained by excluding the selected element; and

a step of increasing, in a case where another counterexample is output as a result of the model re-checking, the exclusion frequency of the selected element and updating the exclusion history information,

wherein in the selecting step, an element of which the exclusion frequency is high is selected based on the exclusion history information.

[Claim 7]

A computer readable recording medium storing a program causing a computer to execute:

a step of performing model checking on a model to be checked including a plurality of elements;

a step of selecting one or more of a plurality of elements included in a counterexample output as a result of the model checking;

a step of generating exclusion history information indicating an exclusion frequency for each of a plurality of elements;

a step of performing model re-checking on the model to be checked obtained by excluding the selected element; and

a step of increasing, in a case where another counterexample is output as a result of the model re-checking, the exclusion frequency of the selected element and updating the exclusion history information,

wherein in the selecting step, an element of which the exclusion frequency is high is selected based on the exclusion history information.