

state-based program for a control system and generating a user interface program and generating a data base query schema program.

15 **15.** An apparatus for automatically generating a state-based program for a component of a system consisting of a plurality of components communicating with each other, wherein said program is generated from a specification of said system, said specification comprising interaction-based sequence descriptions of said system, said apparatus comprising a general purpose computer programmed for executing the steps of:

- a) determining all sequence descriptions of said component defined by said specification of said system,
- b) normalizing said sequence descriptions of said component such that a normalized sequence description comprises exactly one initial condition and exactly one final condition and, between said initial condition and said final condition, communication actions only,
- c) determining a state-based specification of said component by identifying all equal initial and final conditions of said normalized sequence descriptions of said component with a single state, and
- d) determining said state-based program for said component, wherein each sequence description contained in said state-based specification of said component is replaced by a sequence of said communication actions of this sequence description, separated by additionally inserted states.

20 **16.** The apparatus of claim 15, wherein step b) comprises the following sub-steps:

- b1) inserting a condition prescribed in said specification of said system as an initial condition into each of those sequence descriptions of said component that begin with a communication action,
- b2) inserting a condition prescribed in said specification of said system as a final condition into each of those sequence descriptions of said component that end with a communication action, and
- b3) splitting all sequence descriptions of said component having more than two conditions into a plurality of sequence descriptions of said component, each of the split sequence descriptions having exactly two conditions.

25 **17.** The apparatus of claim 15, wherein said apparatus is used for at least one of generating a state-based program for a telecommunication application and generating a state-based program for providing an error tolerant communication of data and generating a state-based program for providing an error tolerant communication of messages and generating a state-based program for a reactive system and generating a state-based program for a control system and generating a user interface program and generating a data base query schema program.

**18.** A computer program product for execution by a general purpose computer for automatically generating a state-based program for a component of a system consisting of a plurality of components communicating with each other, wherein said program is generated from a specification of said system, said specification comprising interaction-based sequence descriptions of said system, said computer program product including instructions for making said general purpose computer perform the steps of:

- a) determining all sequence descriptions of said component defined by said specification of said system,
- b) normalizing said sequence descriptions of said component such that a normalized sequence description comprises exactly one initial condition and exactly one final condition and, between said initial condition and said final condition, communication actions only,
- c) determining a state-based specification of said component by identifying all equal initial and final conditions of said normalized sequence descriptions of said component with a single state, and
- d) determining said state-based program for said component, wherein each sequence description contained in said state-based specification of said component is replaced by a sequence of said communication actions of this sequence description, separated by additionally inserted states.

**19.** The computer program product of claim 18, wherein step b) comprises the following sub-steps:

- b1) inserting a condition prescribed in said specification of said system as an initial condition into each of those sequence descriptions of said component that begin with a communication action,
- b2) inserting a condition prescribed in said specification of said system as a final condition into each of those sequence descriptions of said component that end with a communication action, and
- b3) splitting all sequence descriptions of said component having more than two conditions into a plurality of sequence descriptions of said component, each of the split sequence descriptions having exactly two conditions.

30 **20.** The computer program product of claim 18, said computer program product being used for at least one of generating a state-based program for a telecommunication application and generating a state-based program for providing an error tolerant communication of data and generating a state-based program for providing an error tolerant communication of messages and generating a state-based program for a reactive system and generating a state-based program for a control system and generating a user interface program and generating a data base query schema program.