

Summary of Invention

Technical Problem

[0012] Even if the design modeling described in Patent Literature 1 or Non-Patent Literature 1 is employed, a high-order program portion which realizes the function and a low-order program portion which controls the device are closely connected to each other. Consequently, structured program design becomes difficult to perform, the software becomes complicated, and the maintainability, reusability, and expandability suffer.

It is an object of the present invention to simplify the processing structure that arbitrates contending requests.

10 Solution to Problem

[0013] A control apparatus according to an aspect of the present invention which arbitrates contending operation requests outputted from a plurality of APPs, APP standing for application program, and controls a device, includes: a request input part which supplies, as input, the operation requests outputted from the APPs, each to a phase predetermined for a corresponding APP among a plurality of phases arranged in a fixed order; an arbitration information storage part which stores, for each phase, arbitration information, wherein for a transition phase among the plurality of phases, status transition information which determines an operation request to be generated to correspond to a combination of an operation status of the device and an operation request inputted is stored, as the arbitration information; a request generating part which generates an operation request, being a result of arbitrating a contention of the operation requests inputted, in the phases sequentially starting with the first phase and in accordance with the arbitration information stored in the arbitration information storage part, and supplies, as input, the operation request generated, to a next phase, ~~thereby arbitrating the contention of the operation requests step by step~~ wherein in the transition phase, the request generating part generates a new operation

request from the operation request inputted in accordance with the state transition information, and supplies, as input, the operation request generated, to a next phase; and a device control part which controls an operation of the device in accordance with the operation request generated by the request generating part in the last phase.

5 [0013a] In another aspect, a control method of arbitrating contending operation requests outputted from a plurality of APPs, APP standing for application program, and controlling a device, comprising: a request input step of, with a processing device, supplying, as input, the operation requests outputted from the APPs, each to a phase predetermined for a corresponding APP among a plurality of phases arranged in a fixed order; a request generating step of, with the processing device, generating an operation request, being a result of arbitrating a contention of the operation requests inputted, in the phases sequentially starting with the first phase and in accordance with arbitration information stored in a storage device in advance for each phase, wherein for a transition phase among the plurality of phases, the arbitration information is status
 10 transition information which determines an operation request to be generated to correspond to a combination of an operation status of the device and an operation request inputted, and supplying, as input, the operation request generated, to a next phase, thereby arbitrating the contention of the operation requests step by step wherein in the transition phase, a new operation request is generated from the operation request
 15 inputted in accordance with the state transition information, and the operation request generated is supplied, as input, to a next phase; and a device control step of, with the processing device, controlling an operation of the device in accordance with the operation request generated in the request generating step in the last phase.

[0013b] In another aspect, a control program which arbitrates contending operation

25 requests outputted from a plurality of APPs, APP standing for application program, and

controls a device, comprising: a request input process of supplying, as input, the operation requests outputted from the APPs, each to a phase predetermined for a corresponding APP among a plurality of phases arranged in a fixed order; a request generating process of generating an operation request, being a result of arbitrating a contention of the operation requests inputted, in the phases sequentially starting with the first phase and in accordance with arbitration information stored in a storage device in advance for each phase, wherein for a transition phase among the plurality of phases, the arbitration information is status transition information which determines an operation request to be generated to correspond to a combination of an operation status of the device and an operation request inputted, and supplying, as input, the operation request generated, to a next phase, ~~thereby arbitrating the contention of the operation requests step by step~~ wherein in the transition phase, a new operation request is generated from the operation request inputted in accordance with the state transition information, and the operation request generated is supplied, as input, to a next phase; and a device control process of controlling an operation of the device in accordance

Claims

[Claim 1] A control apparatus which arbitrates contending operation requests outputted from a plurality of APPs, APP standing for application program, and controls a device, comprising:

5 a request input part which supplies, as input, the operation requests outputted from the APPs, each to a phase predetermined for a corresponding APP among a plurality of phases arranged in a fixed order;

an arbitration information storage part which stores, for each phase, arbitration information, wherein for a transition phase among the plurality of phases, status transition information which determines an operation request to be generated to correspond to a combination of an operation status of the device and an operation request inputted is stored, as the arbitration information;

10 transition information which determines an operation request to be generated to correspond to a combination of an operation status of the device and an operation request inputted is stored, as the arbitration information;

a request generating part which generates an operation request, being a result of arbitrating a contention of the operation requests inputted, in the phases sequentially starting with the first phase and in accordance with the arbitration information stored in the arbitration information storage part, and supplies, as input, the operation request generated, to a next phase, ~~thereby arbitrating the contention of the operation requests step by step~~ wherein in the transition phase, the request generating part generates a new operation request from the operation request inputted in accordance with the state transition information, and supplies, as input, the operation request generated, to a next phase; and

15 generated, to a next phase, thereby arbitrating the contention of the operation requests step by step

20 operation request from the operation request inputted in accordance with the state transition information, and supplies, as input, the operation request generated, to a next phase; and

a device control part which controls an operation of the device in accordance with the operation request generated by the request generating part in the last phase.

[Claim 2] The control apparatus according to claim 1,

25 wherein the arbitration information storage part, concerning a selection phase

among the plurality of phases, stores a priority concerning the operation request inputted, as the arbitration information, and

wherein the request generating part, when in the selection phase, selects a single operation request having a highest priority from among the operation requests

5 inputted, and supplies, as input, the operation request selected, to a next phase.

[Claim 3] The control apparatus according to claim 1 or 2,

wherein the arbitration information storage part, for a combination phase

among the plurality of phases, stores combination information that determines an operation request to be generated, as the arbitration information in accordance with a combination of the operation requests inputted, and

wherein the request generating part, when in the combination phase, generates
 5 a new operation request from the operation requests inputted, to correspond to the combination information, and supplies, as input, the operation request generated, to a next phase.

~~[Claim 4] The control apparatus according to any one of claims 1 to 3,
 wherein the arbitration information storage part, for a transition phase among
 10 the plurality of phases, stores status transition information that determines an operation request to be generated, as the arbitration information to correspond to a combination of an operation status of the device and the operation requests inputted, and
 wherein the request generating part, when in the transition phase, generates a new operation request from the operation requests inputted, in accordance with the
 15 status transition information, and supplies, as input, the operation request generated, to a next phase.~~

[Claim 54] The control apparatus according to any one of claims 1 to 43,

wherein the arbitration information storage part, for a correction phase among the plurality of phases, stores a priority concerning the operation requests outputted
 20 from the APPs, as the arbitration information, and

wherein the request generating part, when in the correction phase, selects a single operation request having a high priority from among the operation requests outputted from the APPs, corrects the operation request generated in a previous phase, with the operation request selected, and supplies, as input, the operation request
 25 corrected, to a next phase.

[Claim 65] The control apparatus according to any one of claims 1 to 54,
 wherein the request input part supplies, as input, an operation request having a
 higher priority to an earlier or later phase.

[Claim 76] A control method of arbitrating contending operation requests
 5 outputted from a plurality of APPs, APP standing for application program, and
 controlling a device, comprising:

 a request input step of, with a processing device, supplying, as input, the
 operation requests outputted from the APPs, each to a phase predetermined for a
 corresponding APP among a plurality of phases arranged in a fixed order;

10 a request generating step of, with the processing device, generating an
 operation request, being a result of arbitrating a contention of the operation requests
 inputted, in the phases sequentially starting with the first phase and in accordance with
 arbitration information stored in a storage device in advance for each phase, wherein for
a transition phase among the plurality of phases, the arbitration information is status
 15 transition information which determines an operation request to be generated to
correspond to a combination of an operation status of the device and an operation
request inputted, and supplying, as input, the operation request generated, to a next
phase, thereby arbitrating the contention of the operation requests step by step wherein
in the transition phase, a new operation request is generated from the operation request
 20 inputted in accordance with the state transition information, and the operation request
generated is supplied, as input, to a next phase; and

 a device control step of, with the processing device, controlling an operation of
 the device in accordance with the operation request generated in the request generating
 step in the last phase.

25 [Claim 87] A control program which arbitrates contending operation requests

outputted from a plurality of APPs, APP standing for application program, and controls a device, comprising:

- a request input process of supplying, as input, the operation requests outputted from the APPs, each to a phase predetermined for a corresponding APP among a
- 5 plurality of phases arranged in a fixed order;
- a request generating process of generating an operation request, being a result of arbitrating a contention of the operation requests inputted, in the phases sequentially

starting with the first phase and in accordance with arbitration information stored in a storage device in advance for each phase, wherein for a transition phase among the plurality of phases, the arbitration information is status transition information which determines an operation request to be generated to correspond to a combination of an
 5 operation status of the device and an operation request inputted, and supplying, as input, the operation request generated, to a next phase, ~~thereby arbitrating the contention of the operation requests step by step~~ wherein in the transition phase, a new operation request is generated from the operation request inputted in accordance with the state transition information, and the operation request generated is supplied, as input, to a next phase;
 10 and

a device control process of controlling an operation of the device in accordance with the operation request generated in the request generating process in the last phase.