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Sample Solution for Problem Set 3
Due: May 8, 2007, 9:14 am

Embedded Systems

Problem 1

(a)
The model consists of an "on" and an "off" state. In the "on" state, there are three main subcharts:

- "mode_control" which controls the main mode, that is whether to control the CD player and view informations about the CD or to display the time and in which format.
- "clock", which operates the clock and allows the user to change time
- "cd_player" which operates the CD player allowing the user to eject and insert the CD, change title, etc.

The simulink environment consists of a number of keys which allow the user to operate the device plus a display which allows viewing the time, title number, etc. Notice that the same display is used both for informations about time as well as the CD, as it is usually done in real CD players. The constants on the left of the model give informations about the CD and the current title. Notice that you can change them during the simulation!
As an additional feature, a standby mode has been implemented. In this mode, one cannot play CDs or display time, but the time is still increased.

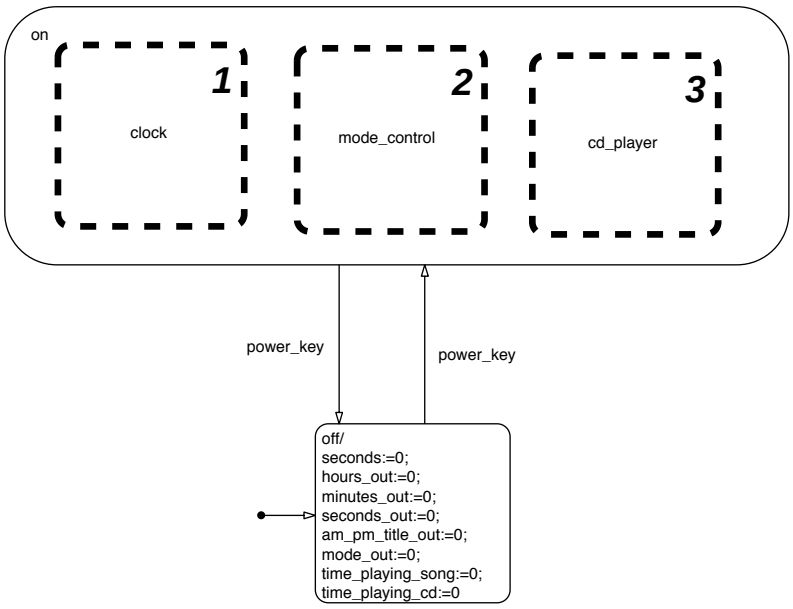


Figure 1: Problem 1: Main StateFlow chart

Problem 2

(a) We assume that all variables have been zero initially.

- "EV" is consumed in "S1" which therefore moves to "S2". The event "F" is generated and "X" is set to 1.
- "F" is consumed in "S4" moving to "S5" and setting "Y" to 1. At the same time, control moves from "S7" to "S8"
- control moves from "S2" to "S3" thereby setting "Z" to 1.
- the AND-subchart is left, current state becomes "S6"

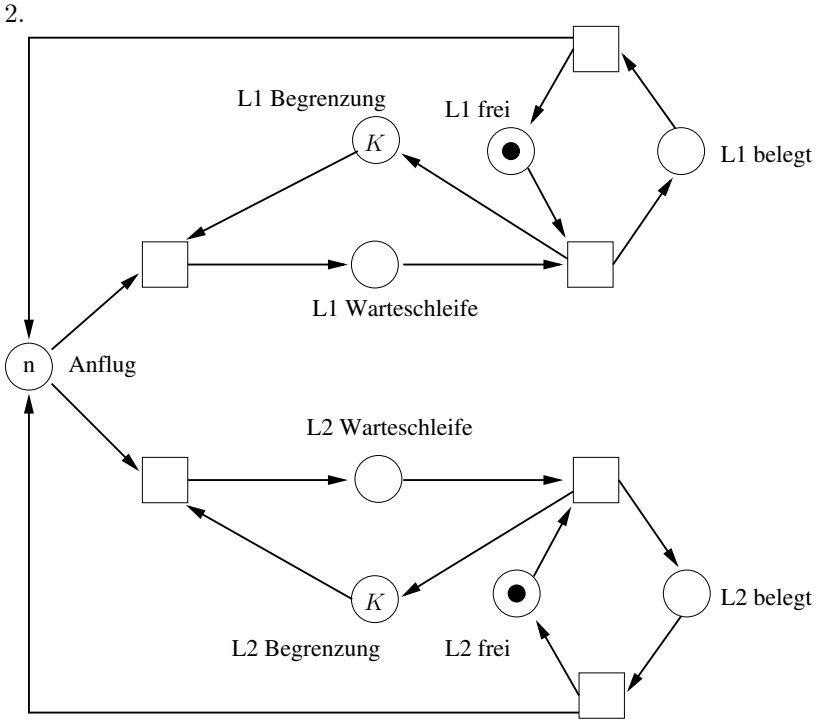
(b) No, because the event "F" has already been consumed before.
(c) Yes, because the condition for this transistion will be true at some time.

Problem 3

1.
Weights of edges: All become 1.
Capacities:

- "Anflug": inf
- "L1 Warteschleife": K
- "L2 Warteschleife": K
- "L1 frei": 1
- "L1 belegt": 1
- "L2 frei": 1
- "L2 belegt": 1

Initial marking: For example, let all $M(s) = 0$ for all s except "Anflug", "L1 frei" and "L2 frei" and let $M(\text{Anflug}) = n$, $M(\text{L1 frei}) = 1$, $M(\text{L2 frei}) = 1$. Then we have n airplanes in the air but none in the waiting list or on ground.
2.



Notice that here n and K mean tokens in the initial marking, so we do not have any capacities given here.

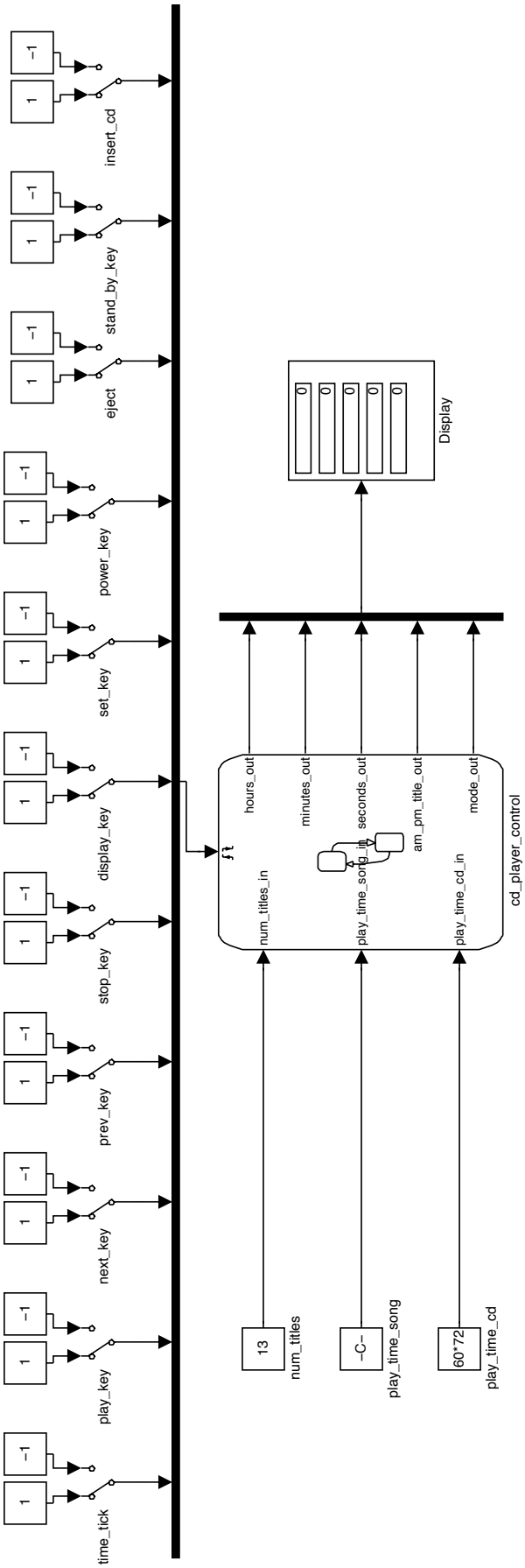


Figure 2: Problem 1: Simulink model in which main chart is embedded

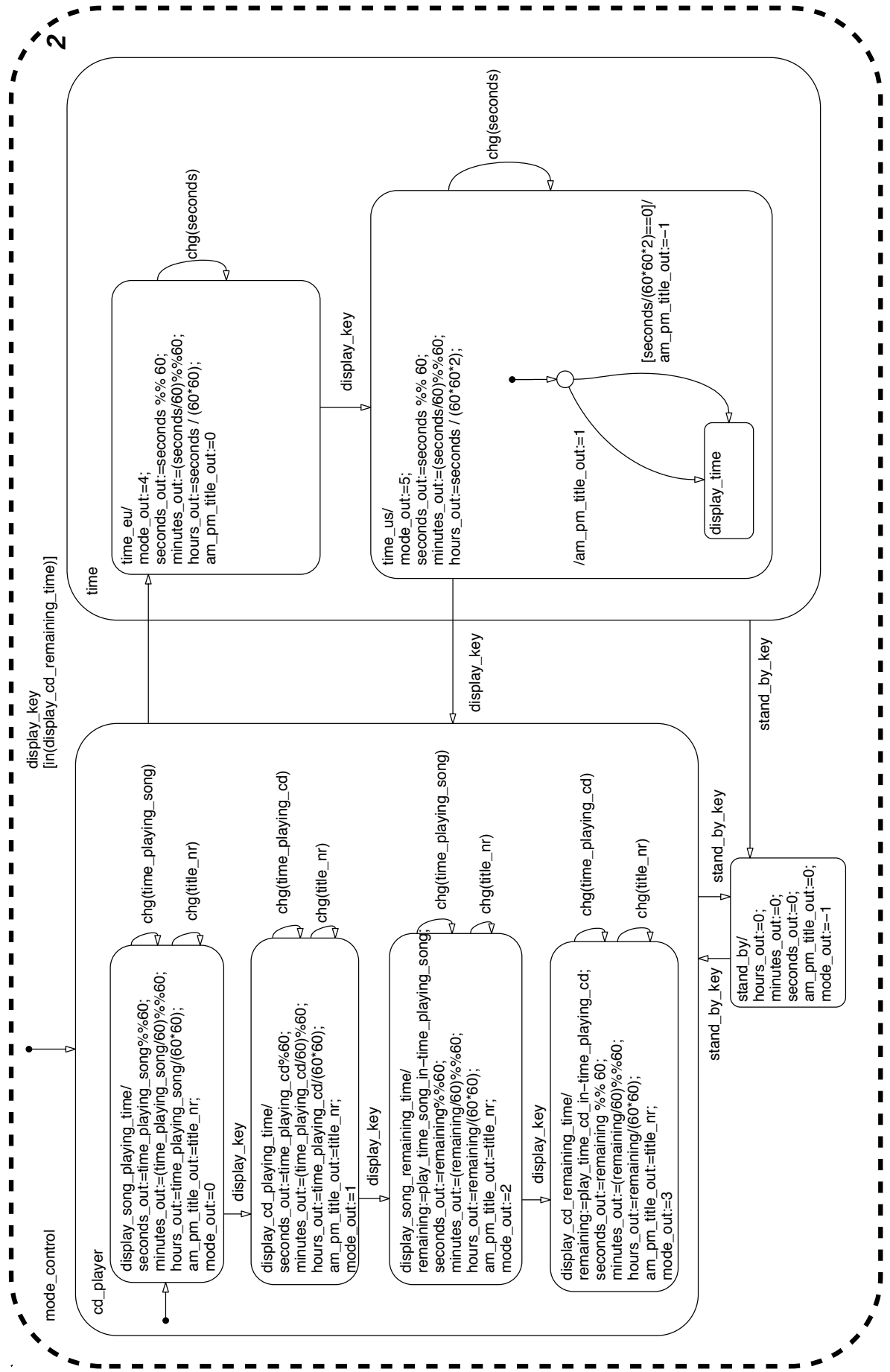


Figure 3: Problem 1: Subchart controlling the modes of the CD player

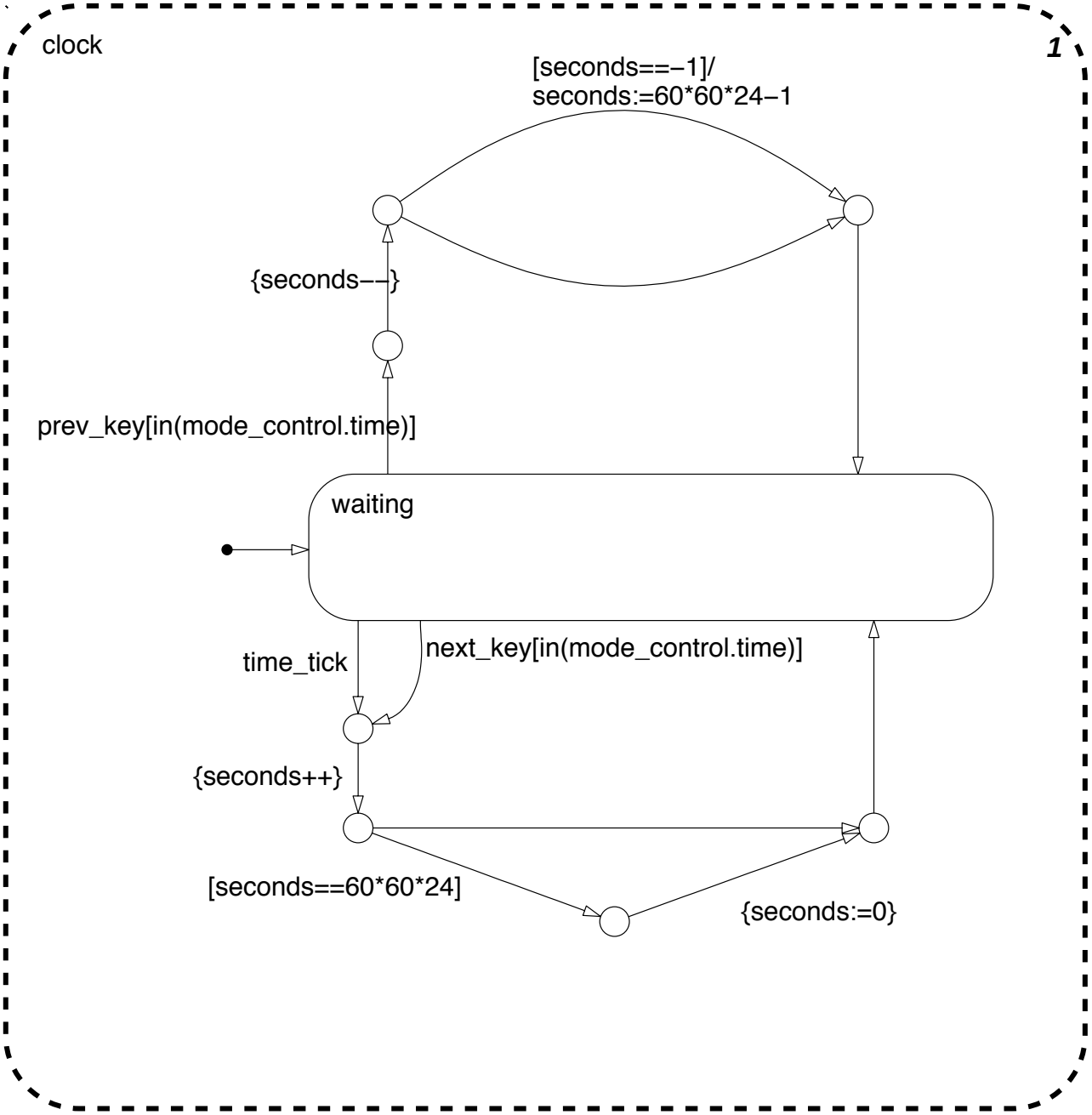


Figure 4: Problem 1: Subchart controlling the clock of the CD player

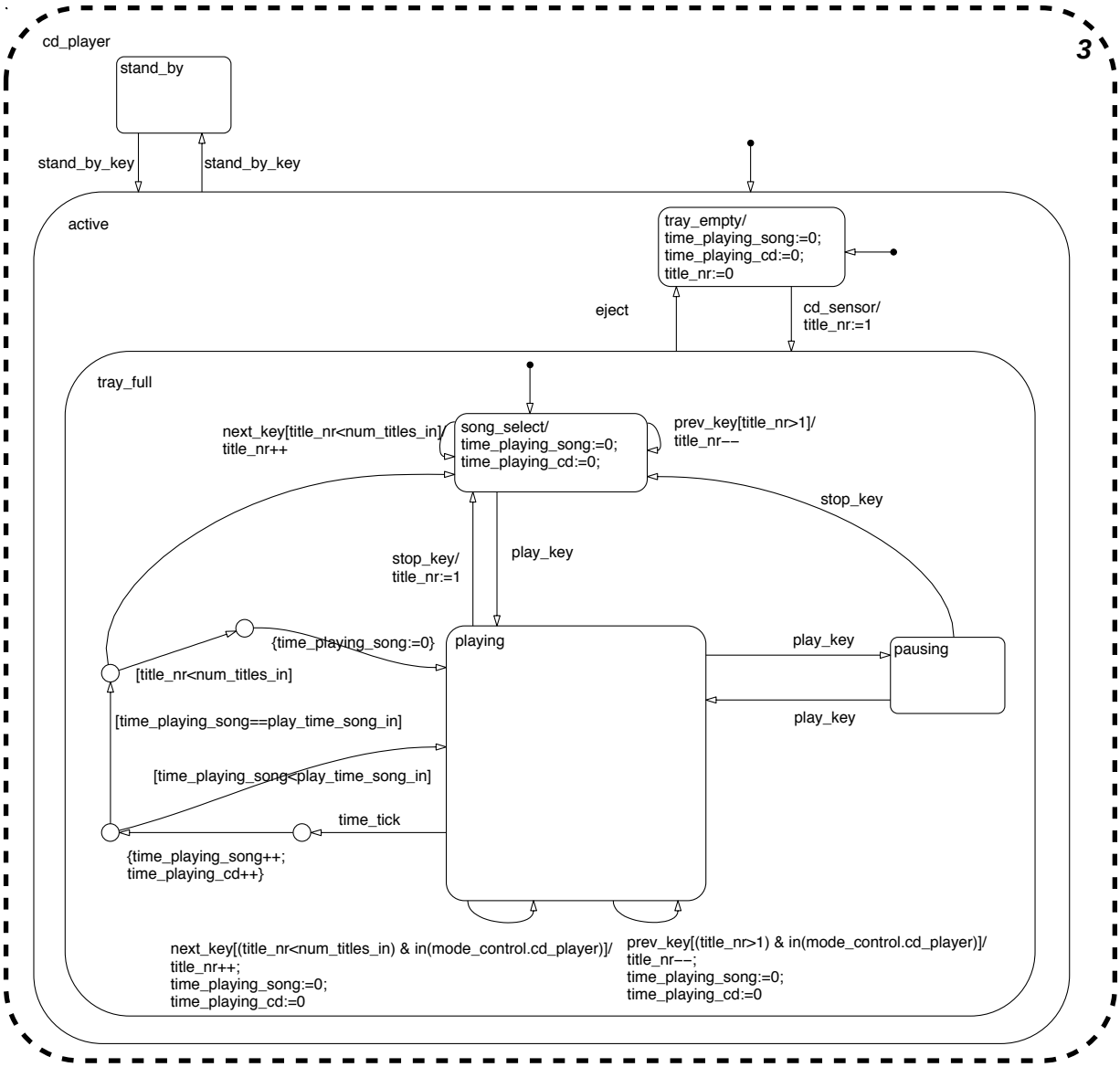


Figure 5: Problem 1: Subchart controlling the actual CD player