

EECS20n, Quiz 2, 2/16/00

The quiz is to provide feedback to you and to me about how well you've followed the material so far. The quiz will take 15 minutes. Do your calculations on the sheet and put a box around your answer.

Please print your name here:

Last Name: _____ First: _____ Lab time: _____

A certain device is controlled via a keyboard that has only the alphabetic keys, A through Z. Assume that you can only press one key at a time (unlike a real computer keyboard). The designer of the device uses a state machine to get the desired behavior, and defines the state machine with the following update table:

<i>state</i>	<i>(next state, output) under input</i>			
	A	B	C	D, ..., Z
state1	(state2, absent)			
state2		(state3, absent)		(state1, absent)
state3			(stop, stop)	(state1, absent)
stop				

The start state is *state1*. The blank entries indicate that the state machine stutters. Notice that the response to the whole set of keys D through Z is given in a single column of the table, for compactness.

1. Given the input and output alphabets for this machine.

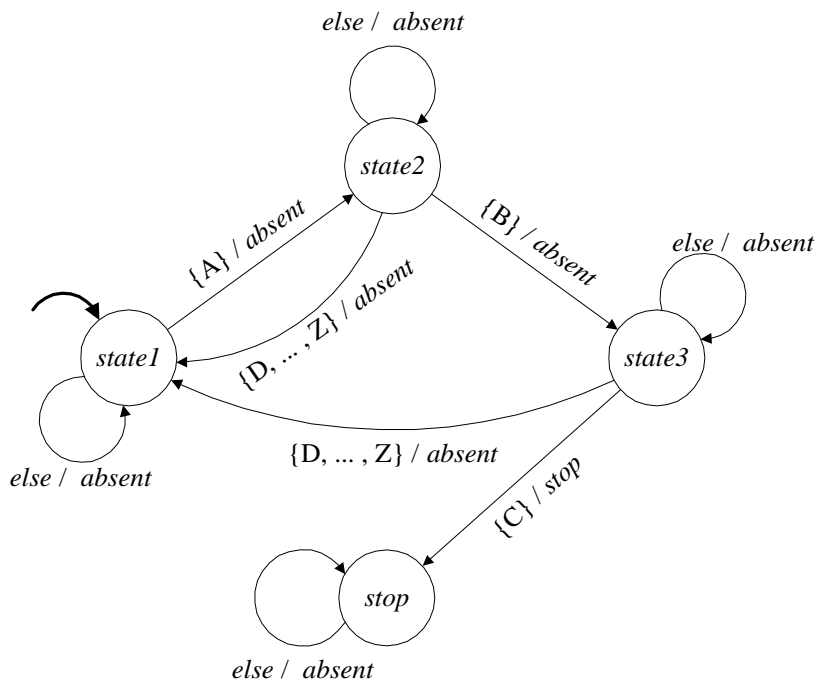
Answer

$$\text{Inputs} = \{A, \dots, Z, \text{absent}\}$$

$$\text{Outputs} = \{\text{stop}, \text{absent}\}$$

2. The state transition diagram diagram below corresponds to the above table. Label the arcs. Be sure your diagram specifies all aspects of the behavior. In particular, show “else” transitions (if any) explicitly, and show all outputs, including stuttering outputs.

Answer



3. A portion of the specification for this device says:

To stop the device, the user should hit keys “A”, “B”, and “C” in sequence, one immediately after the other.

Given this specification, the table has a bug in it. Its behavior does not quite match the specification. Identify the bug; in particular, give a sequence of inputs that illustrates the bug, and give an update table that corrects the bug.

Answer

Under the input sequence $ABAC$, for example, the sequence of states is 1,2,3,3,stop which is incorrect. In fact, any sequence of inputs with a subsequence ABC will stop the machine. The corrected table is:

state	(next state, output) under input			
	A	B	C	D, ..., Z
state1	(state2, absent)			
state2		(state3, absent)	(state1, absent)	(state1, absent)
state3	(state2, absent)	(state1, absent)	(stop, stop)	(state1, absent)
stop				