

DOOR LOCK (VERILOG)

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1. Introduction

In our project we've implemented a password based door-lock system written in verilog, this project is a basic implementation of a real world door lock system. We've used digital logic design concepts in designing our project. If the password matches the password stored inside the memory of the door lock then the door gets unlocked else it remains locked.

2. Design

The main purpose of the door lock is to provide safety, and for that we need a proper set of instructions to make it secure and provide various other facilities. In this section the design of the door lock and various memory components of the door lock system are described.

First of all, we will store the password in 4 bit x 4 bit memory (RAM). The default password of the door is 1234, later we can change the password by giving commands appropriately.

Memory Components :

- original is a 4x4 memory which stores the door lock password,
- reset is a 1 bit memory which stores whether the reset button is pressed or not,
- password is a 4x4 memory which will store the password entered by the user,
- command is a 1 bit memory which stores the command which is given to the door lock,
- newpass is a 4x4 memory which stores the new password to be updated,

- confpass is a 4x4 memory which stores the confirmatory password of newpass,
- cout is a 1 bit memory which tells whether the door is locked or unlocked.

Working Procedure :

1. Set cout equals 0 because till now the door is locked and check if the reset value is 1.
2. If reset is 1 then original is updated to password.
3. If reset is 0 then match the original and password.
4. If original and password matches then check what is the command given :
 - a. If command is 1, the door gets unlocked and cout is set 1.
 - b. If command is 0, check if the newpass and confpass are equal.
 - c. If newpass and confpass are equal, original is updated to newpass.
 - d. If newpass and confpass doesn't match error is printed.
5. If original and password doesn't match another error is displayed.
6. Now it moves on to the next set of input.

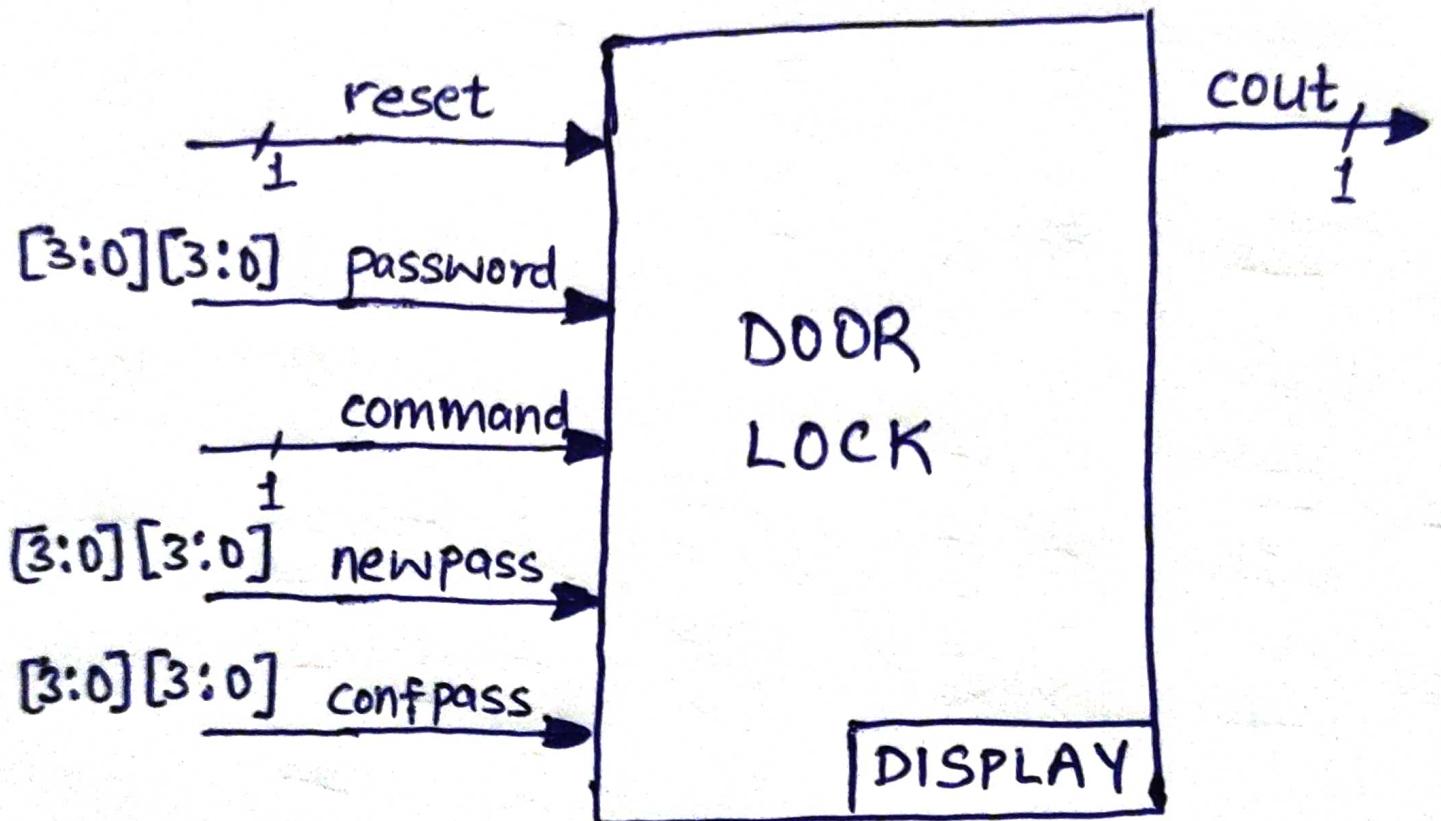


Fig1 : Input and output to the door lock module

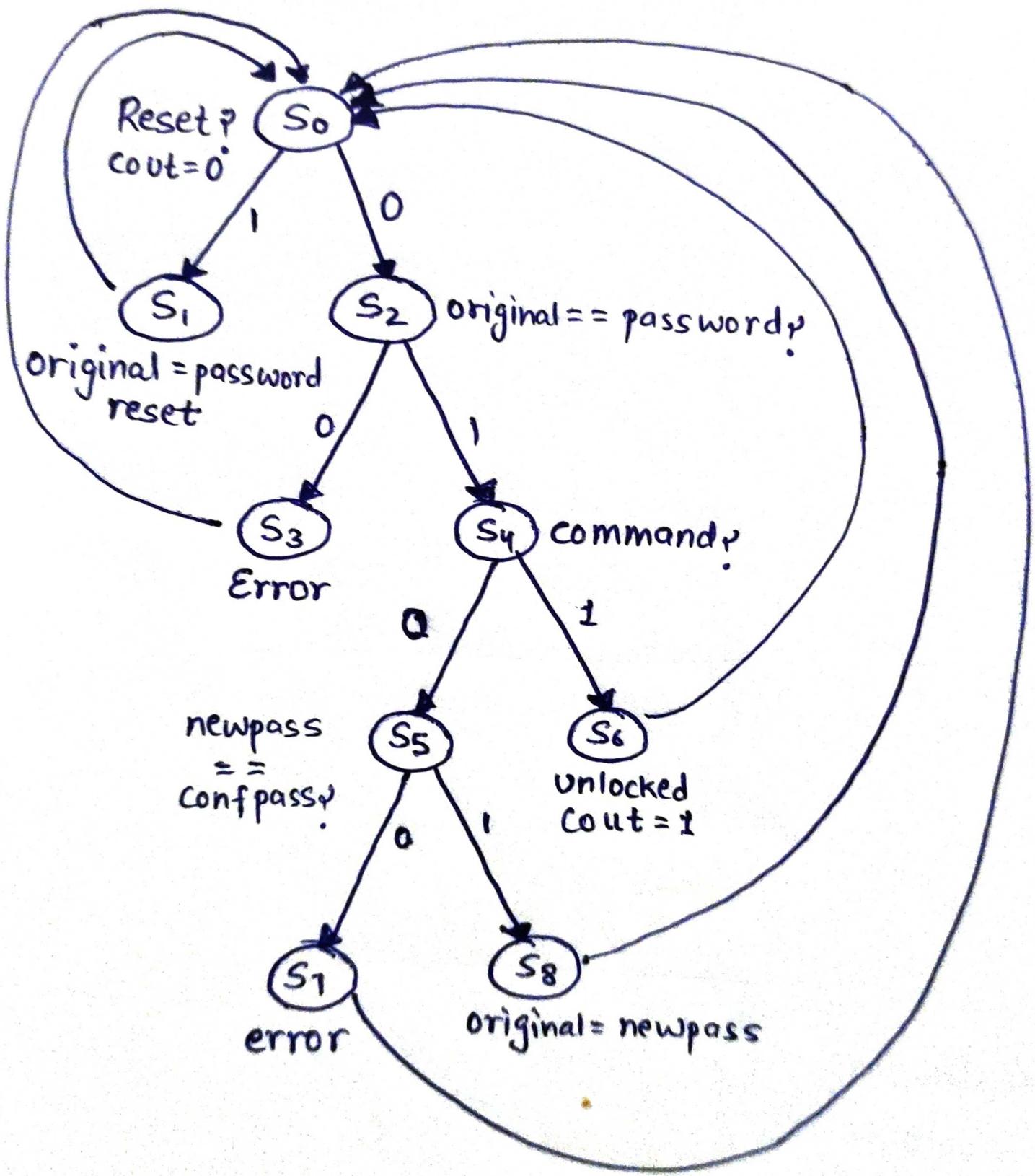


Fig2 : State Diagram / Flow diagram of door lock module

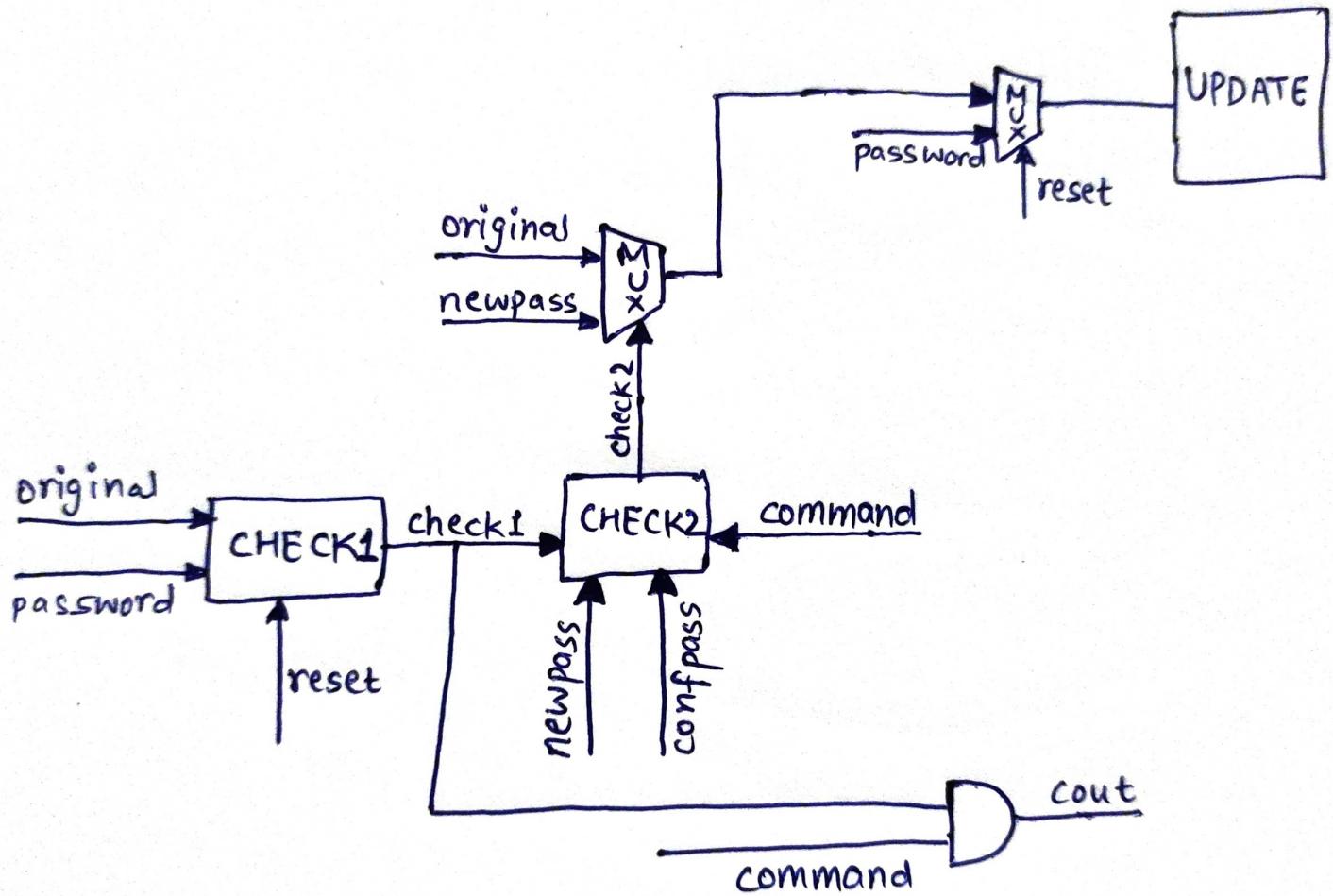


Fig3 : Digital structure of door lock

CHECK 1 BLOCK : If reset is 1 or original not equals password then check1 output is 0, else it is 1. To match original and password xnor gates will be used.

CHECK 2 BLOCK : If command is 1 or check1 is 0 or newpass not equals confpass then check2 is 0, else it is 1. To match newpass and confpass xnor gates will be used.

UPDATE BLOCK : In this the original is updated to the input given to this block .

3. Features

In this section we will learn about the various features of the door lock system.

● SECURITY

Like any door lock system it allows the user to secure the entry of anyone until and unless he/she knows the password to open the door.

● RESET

In case we forget the current password we can always reset the password to the original password that had been initially set. We can always change the password then.

● CHANGE PASSWORD

We also have the option to change the password to any desired password we want. You can do this for any reason including if you believe that your password has been compromised.

4. Validation Approach

In this section we will see the output for various sets of input given for the password based door lock.

RESET	PASSWORD	ORIGINAL	COMMAND	NEWPASS	CONFPASS	COUT	OUTPUT
0	1234	1234	1	X	X	1	Door Unlock ed
1	2207	2207	1	X	X	0	Reset Mode

0	2207	2207	1	X	X	1	Door Unlock ed
0	6707	2207	1	X	X	0	Wrong Passw ord
0	2207	2207	0	9365	4913	0	Error! Passw ord Didn't Match
0	2207	2207	0	4913	4913	0	Passw ord Updat ed
0	4913	4913	1	X	X	1	Door Unlock ed
1	4913	4913	1	X	X	0	Reset Mode
1	6126	6126	1	X	X	0	Reset Mode
0	6126	6126	1	X	X	1	Door Unlock ed
0	9646	6126	0	9646	9646	0	Wrong Passw ord
0	9645	6126	1	X	X	0	Wrong Passw ord

0	6126	6126	1	X	X	1	Door Unlock ed
0	9245	6126	1	X	X	0	Wrong Passw ord
1	2416	2416	1	X	X	0	Reset Mode
0	1416	2416	1	X	X	0	Wrong Passw ord
0	2416	2416	0	1967	1967	0	Passw ord Updat ed
0	1967	1967	1	X	X	1	Door Unlock ed

5. Results

In this section we will describe the various results (output) we get depending on the different input given by the user.

● RESET MODE

This means that the password has been reset to the original password that was initially given to the system by the user. It happens when we press the reset button (in code when we input the reset variable as “1”).

● DOOR UNLOCKED

This is displayed on the output screen when we have successfully opened the door. This happens when the input password matches the correct password and we have given the door unlocking command (in code set the command variable as “1”).

● PASSWORD UPDATED

This output means we were successful in updating the password to a new password of our choice. For this we have to first input the correct password and select the password update command (in code set the command variable as “0”).

Next we have to input our desired new password and reconfirm the password, only if they match is our password updated to a new one.

● ERROR! PASSWORD DIDN'T MATCH

This output is displayed when the new password and reconfirm password do not match. In this case the password is not updated and to update the password we will have to begin the process from step one.

● WRONG PASSWORD

This output is displayed when the password we input does not match the correct password preinstalled in the door lock system.

6. Summary

In this project we developed a password protected door lock system. It allows only authenticated (people knowing password)

to enter through the door, also you can change the password to a new password in case needed.

In order to even improve our door lock system we could have used led to depict the state of the door (locked, unlocked, reset mode etc.) or speech assistant to do the same, also we can use biometrics for unlocking the door. This could be beneficial for many who may find it difficult to use the normal version.