B.Tech. 3rd Semester

Digital System Design (EC204)

Mini-Project Final Report

On

Intelligent Hospital Check-in

Submitted to:

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1. Abstract:

Hospitals are bustling hubs of healing where thousands of individuals seeking solace for their ailments flood the halls daily. From minor concerns to major afflictions, the diversity of medical needs and questions among patients and their loved ones is as vast as the human experience itself and In addition to scheduling the appointments, **the reception desk plays a critical role in managing patient information and maintaining accurate records.** They are responsible for collecting patient demographics, insurance information, and medical history. They also assist patients with check-in and check-out procedures, and handle billing and payments.

An automated system for managing appointments can improve the efficiency and accuracy of the scheduling process. **It can also reduce the workload on receptionists, allowing them to focus on other tasks** such as managing patient information and assisting patients with check-in and check-out procedures.

One of the key benefits of automating the appointment scheduling process is the ability to match patients with the most appropriate doctor based on their medical needs. For example, a patient with a broken bone would be scheduled with an orthopaedic specialist, while a

patient with a heart condition would be scheduled with a cardiologist. An automated system can also take into account the availability of the doctor and the patient's preferred time for the appointment.

Another benefit of an automated system is the ability to notify patients of their appointment details in a timely manner. This can be done via email or text message, reducing the need for patients to call the reception desk to confirm their appointment.

In short, Automating the reception process for booking appointment would streamline the process for both the hospital staff and patients, it would improve the matchmaking of patients to doctors, reduce errors and redundancy, and also provide patients with accurate and up-to-date information about their appointments.

2. PROBLEM DESCRIPTION:

We have made an attempt to automate the process of allotment of the doctors according to the incoming medical requirement of the patients. The patients input the type of query which is fed into the system and the system generates the output informing the patient which doctor to consult. However, if none of the required doctors are vacant, the system generates the wait signal and the input request could be fed again after a certain time interval. Here we have tried to depict our approach using a small-scale scenario:

Hospital description: -> Equipped with two doctors namely S1 and S2 ->

The incoming patient could have 4 types of queries/medical requirement which is numbered from 0 to 3.

-> Query no. 0 can only be solved by doctor S1.

-> Query no. 1 can be solved both by doctors S1 and S2.

-> Query no. 2 can be solved both by doctors S1 and S2.

-> Query no. 3 can be solved by only doctor S2.

-> If none of required doctor(s) are vacant, the patient is required to wait.

ASSUMPTIONS:

1. *The input requests from the patients are assumed to be sequential, i.e., our system can't handle two requests at once.*

2. *Unidirectional input from patient*.

3. *The consulting time for every patient is considered to be the same.*

3.Simplification:

INPUT: The input will be a four-bit integer out of which 2 bits represent the query no. of the incoming patient and the remaining 2 bits is a system generated input which represents the availability of the suitable consultant.

A: MSB of the query

number B: LSB of the query

number

For example: A = 1, B = 1: represents query numbered 3 S1(t), S2(t) are present states indicating the availability of the doctors. It has been implemented using flip flops.

OUTPUT: The output will be a two-bit integer which informs the patient whether the suitable doctor is available or if he/she is required to wait. In the former case, two bits represent the doctor to consult (A or B). In the latter case, the wait signal is given, after the waiting time, the input is requested again.

X, Y: denote if the doctor S1 or S2 have been allotted respectively

X: It will be 1 only if the doctor S1 has been

allotted.

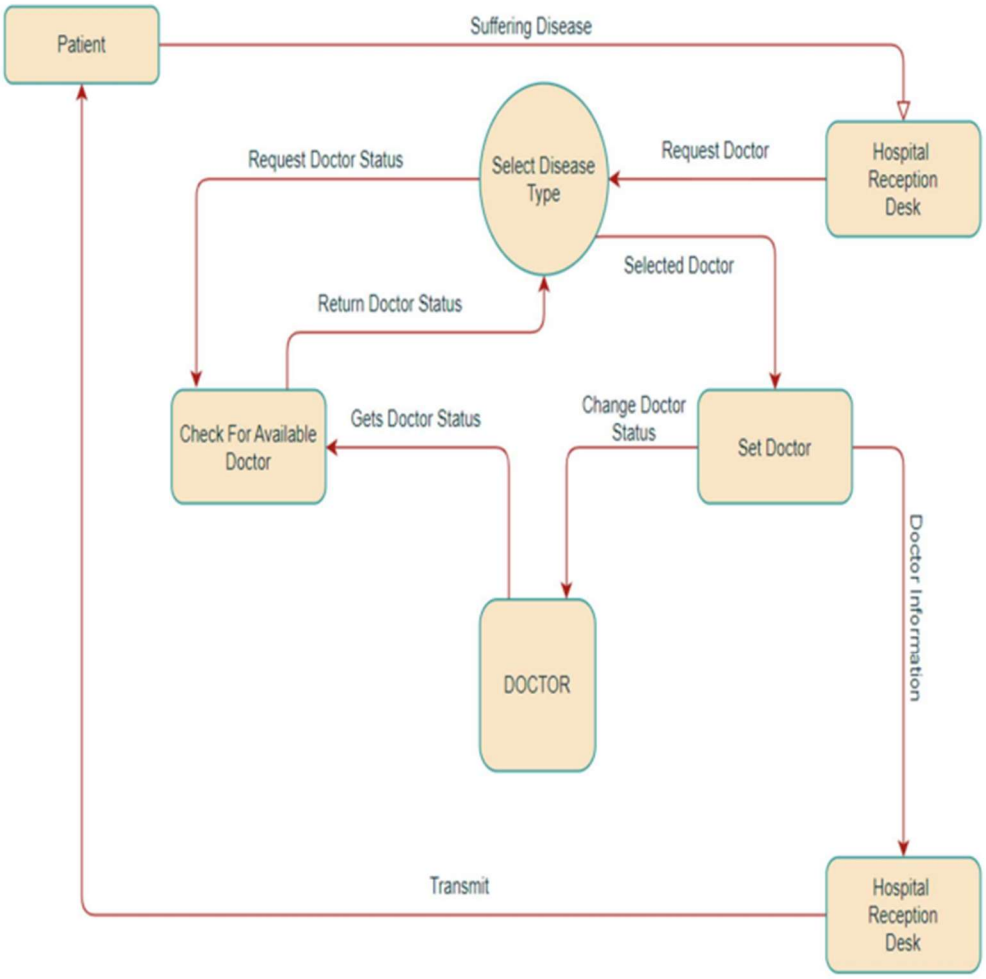
Y: It will be 1 only if the doctor S2 has been

allotted.

Note: Both X, Y cannot be 1 If none of the required doctors are available, then the wait signal is generated i.e., X = 0 and Y = 0

S1(t+1), S2(t+1) are the next or updated states after the allotment which indicates the availability of the doctors for the next input request. The truth table below depicts this outer layout of the system.

5. Flowchart


Patient
Suffering Disease
Hospital Reception Desk
Request Doctor
Select Disease Type
Request Doctor Status
Selected Doctor
Return Doctor Status
Check For Available Doctor
Gets Doctor Status
Change Doctor Status
Set Doctor
Doctor Information
DOCTOR
Transmit
Hospital Reception Desk

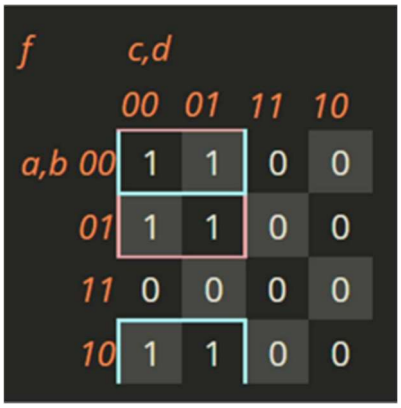
6. Design

Truth Table:

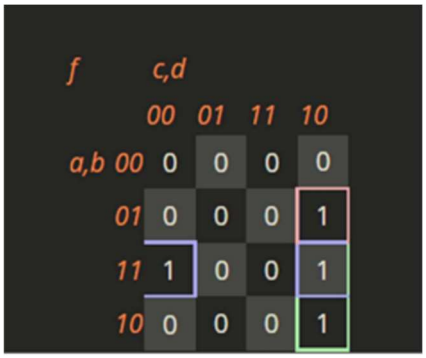
A	B	S1(t)	S2(t)	X	Y	S1(t+1)	S2(t+1)
0	0	0	0	1	0	1	0
0	0	0	1	1	0	1	1
0	0	1	0	0	0	1	0
0	0	1	1	0	0	1	1
0	1	0	0	1	0	1	0
0	1	0	1	1	0	1	1
0	1	1	0	0	1	1	1
0	1	1	1	0	0	1	1
1	0	0	0	1	0	1	0
1	0	0	1	1	0	1	1
1	0	1	0	0	1	1	1
1	0	1	1	0	0	1	1
1	1	0	0	0	1	0	1
1	1	0	1	0	0	0	1
1	1	1	0	0	1	1	1
1	1	1	1	0	0	1	1

KARNAUGH MAPS (K-MAPS)

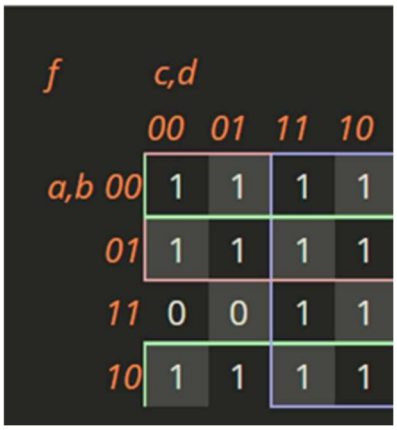
Note: in the K-maps, the variables a, b, c, d correspond to A, B, S1(t), S2(t)



BOOLEAN EXPRESSION
X = A' S1(t)' + B' S1(t)'

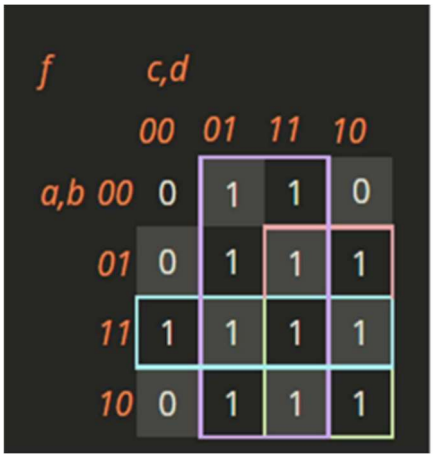


BOOLEAN EXPRESSION
Y = B S1(t) S2(t)' + A S1(t) S2(t)' + A B S2(t)'



BOOLEAN EXPRESSION

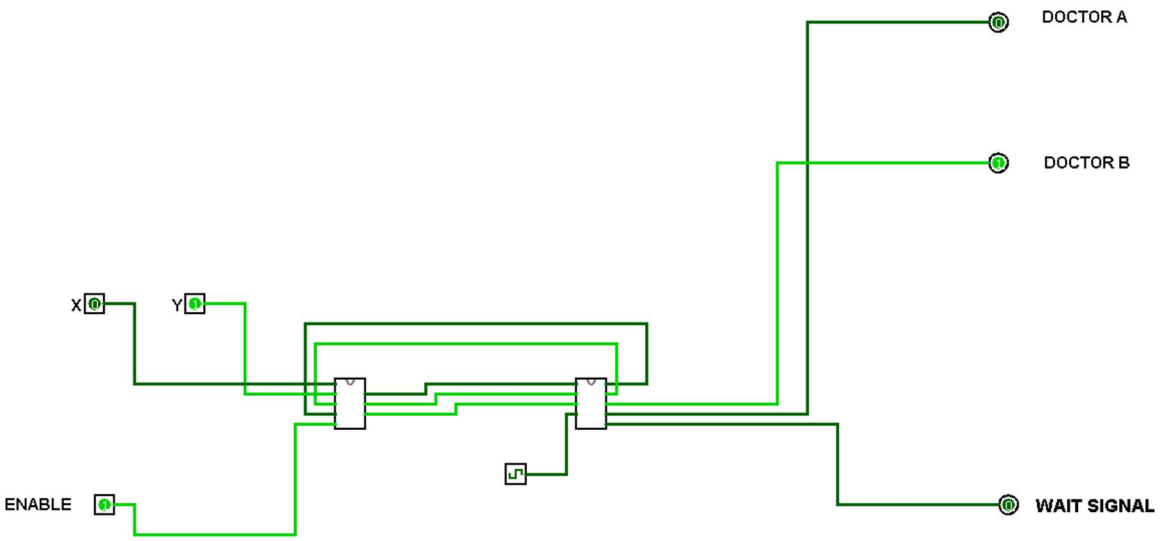
S1(t+1) = A' + B' + S1(t)

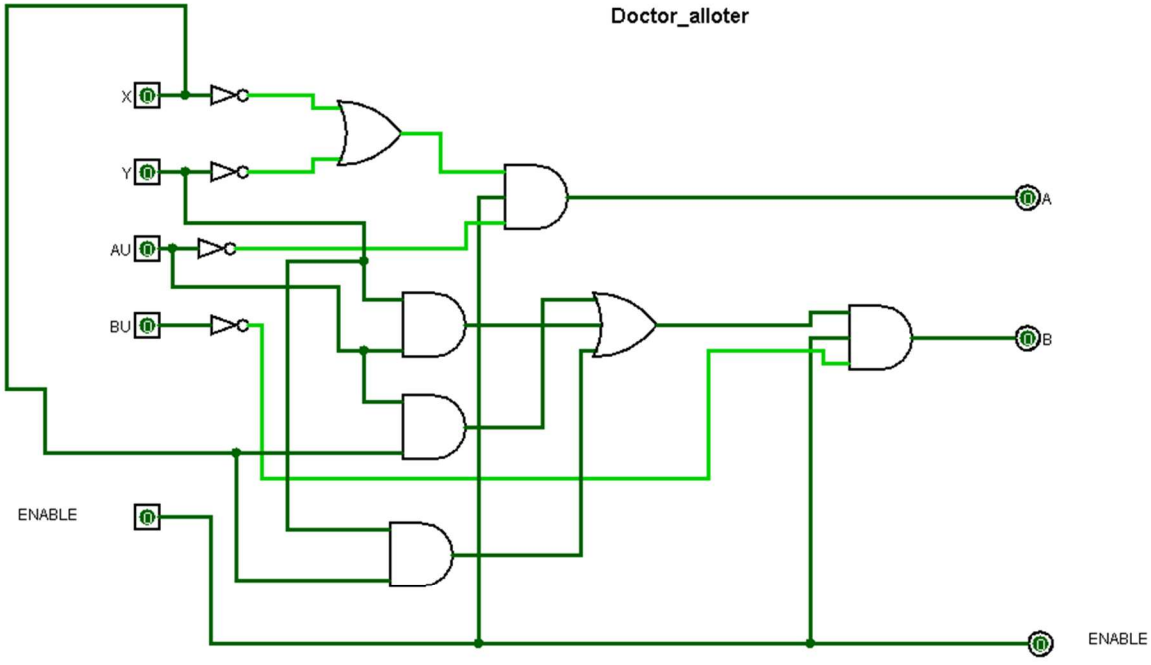


BOOLEAN EXPRESSION

S2(t+1) = S2(t) + B S1(t) + A S1(t) + A

7. Logisim Circuit Diagram:





Input Information

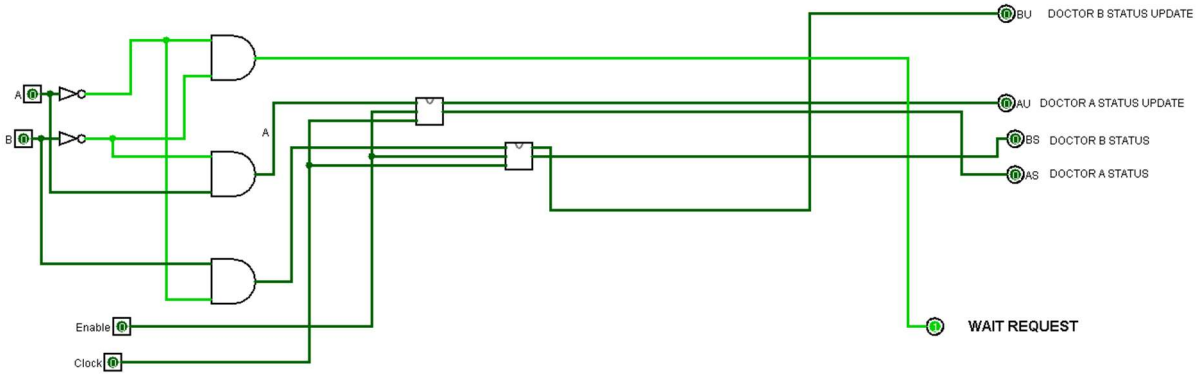
X and Y are the inputs by user

AU and BU are status inputs given by doctor_availability

Output Information

A and B return which doctor is alloted

DOCTOR AVAILABILITY STATUS UPDATE



During the consultation , the status of doctor availiability is kept occupied for 15 seconds

Any enable is turned on, BU/AU checks and updates the status of respective doctors

INPUT EXPLANATION:

A and B is input which reprsents the doctor alloted by doctor_alloter

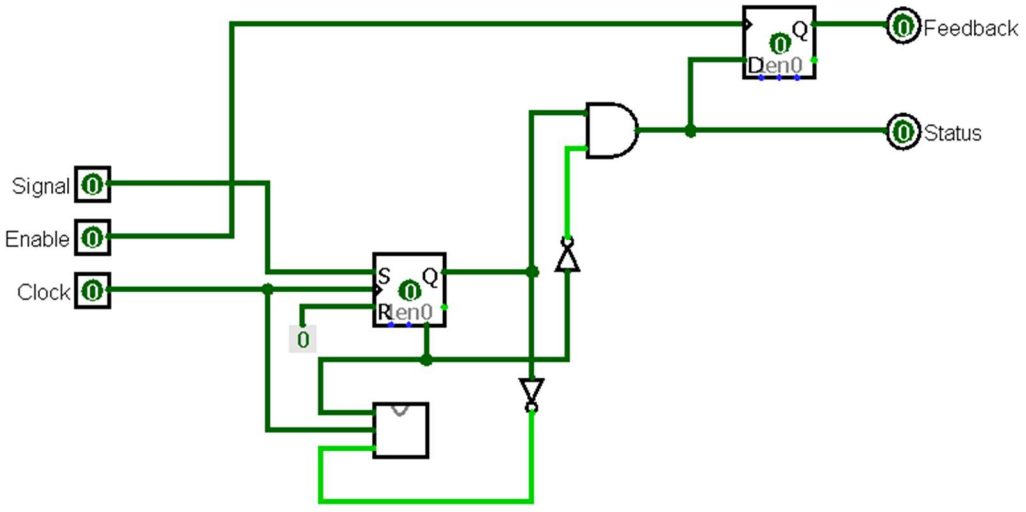
Output explanation:

The doctor status turns to 1

Doctor status is further given as feedback and becomes input for doctor_alloter

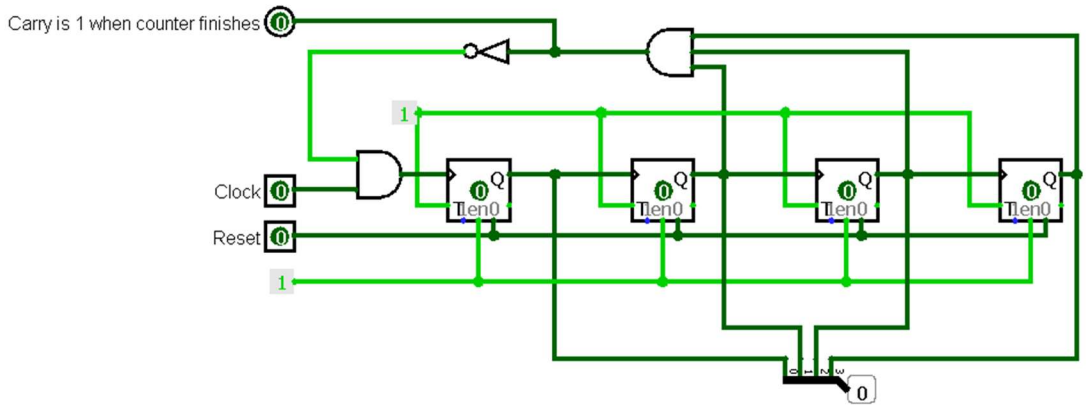
Timer

A circuit that combines the use of flip flop and counter to give status and feedback of doctors



4 bit up counter

A counter circuit that returns 1 and stops counting as soon as it reaches the 0xD



8. Conclusions and Future Work:

In conclusion, automating the reception process for scheduling appointments in a hospital can bring many benefits for both patients and staff. It can improve the matchmaking of patients to doctors based on their medical needs, reduce errors and redundancy, and provide accurate and up-to-date information. It can also improve the efficiency of the scheduling process and reduce the workload on receptionists, allowing them to focus on other tasks.

The scenario presented in this write-up is an example of how an automated system could work in a hospital with two doctors and a limited set of queries. In practice, an automated system would need to be tailored to the specific needs of the hospital, taking into account the number of doctors, specialties, and types of queries.

As a Future work, this system can be enhanced by using machine learning and natural language processing techniques to extract patient queries automatically, or even make a triage process. Also, incorporating the ability to handle different languages and multi-lingual customer service can be a great addition.

Additionally, integrating the system with advance electronic system can help to make the entire process seamless, and more data-driven as in Verilog is a slow Processing Language as compared to other Technologies available now a days so it can be modified above our expectations.

In any case, automating the reception process for scheduling appointments has the potential to greatly improve the patient experience and the efficiency of the hospital, and it's definitely worth considering for any healthcare organization.

9. REFERENCES:

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3. https://www.electronics-tutorials.ws/sequential/seq_2.html

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