INSTITUTO TECNOLOGICO DE IZTAPALAPA I

COMPUTER SYSTEMS ENGINEER

PROJECT'S NAME:

KAHN PROCESS NETWORKS PROJECT

PRESENT:

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INTERNAL ADVISOR:

M.C. ABIEL TOMÁS PARRA HERNÁNDEZ

MEXICO CITY **JANUARY/2021**

SUMMARY

The goal is to create a distributed computing model in which a group of deterministic sequential processes communicate over unlimited FIFO channels so that the resulting process network exhibits deterministic behavior that is not dependent on various delays in computation or communication. .

The model is based on and developed to model distributed systems and, in this way, demonstrate its suitability for modeling signal processing systems. (1)

KPN is a common model for describing signal processing systems where infinite streams of data are incrementally transformed by processes that run in sequence or in parallel. Despite the parallel processes, multitasking or parallelism is not required to run this model. (2)

Properties

Channel delimitation

1. A channel is strictly limited by {\ displaystyle b} b if it has at most {\ displaystyle b} b unconsumed tokens for any possible execution. A KPN is strictly bound by {\ displaystyle b} b if all channels are strictly bound by {\ displaystyle b} b.
2. The number of tokens not consumed depends on the order of execution (scheduling) of the processes. A spontaneous data source could arbitrarily produce many tokens in a channel if the programmer will not run the processes that consume those tokens.
3. A real application cannot have unlimited FIFOs and therefore the maximum FIFO capacity and schedule must be designed in a practical implementation. The maximum capacity of FIFOs can be managed in several ways:
4. FIFO limits can be derived mathematically in the design to avoid FIFO overflows. However, this is not possible for all KPNs. It is an undecidable problem to test whether a KPN is strictly limited by {\ displaystyle b} Also, in practical situations, the limit may depend on the data. (3)

SCHEDULE

SEP | SECRETARÍA DE EDUCACIÓN PÚBLICA

TECNOLÓGICO NACIONAL DE MÉXICO

INSTITUTO TECNOLÓGICO DE IZTAPALAPA

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STUDENT: PEREZ ARMAS FAUSTO ISAAC MBER CONTR 181080037
CARRIER INGENIERIA EN SISTEMAS COMPUTACIONALES
PROJECT NAME PROYECTO KAHN PROCESS NETWORKS
INTERN ASESOR M.C. ABIEL TOMÁS PARRA HERNÁNDEZ
START DATE SEPTEMBER 21 ST 2020 ENDING DATE JANUARY 24 2021
PROJECT OBJECT CREATE A COMPUTATIONAL MODER FOR RESOLVING PROBLEMS

NO.	ACTIVITY		SEMANA WEEK															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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		REAL TIME																
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OPINIOS:	
STUDENT: CUANANEMI CUANALO MARIO ALBERTO	REPORTS
STUDENT: FERMIN CRUZ ERIK	
STUDENT: GUTIERREZ ARELLANO RAFAEL	
STUDENT: PEREZ ARMAS FAUSTO ISAAC	
INTERN ASESOR : M.C. ABIEL TOMÁS PARRA HERNÁNDE	
DEPARTAMENT BUSS: JAZMIN VILLEGAS	

RISK ANALYSIS

RISK	HOW WILL IT BE SOLVED?
1. One person on the team has COVID-19	You will not be disturbed for the time of 2 weeks and the work will be distributed with the other 3 participants of the team
2. Need to meet to clarify doubts about the project	Meetings will be held by google meet and thus doubts will be clarified since it allows us to connect in a synchronized way and be able to share the computer screens at the time we do the activities at the same time
3. Need for money to generate the project	Scholarships will be sought that can cover the minimum to be able to generate the project
4. Need of time	Although we know that it is necessary to work, we must be aware that this project matters since it generates the satisfaction of completing the degree
5. The project is not accepted	We would have to have another project as an alternative so that we can finish the preliminary project well,

DESCRIPTION

Kahn networks (in English, Kahn process networks are often abbreviated KPN, or more simply process networks) are a model of distributed computing in which a group of deterministic processes communicate with each other through unlimited queues. The network thus formed has a deterministic behavior independent of the different calculation times or the latency of the message exchanges. Although the model was originally developed to model distributed systems, it has proven suitable for modeling signal processing systems. As a result, Kahn networks are used to model embedded systems and distributed systems (especially for high-performance computing). Networks are named after Gilles Kahn, who described them in 1974 in an article titled The Semantics of a Simple Language for Parallel Programming 1 (literally: The Semantics of a Simple Language for Parallel Computing). (4)

JUSTIFICATION

Trigger semantics of process P modeled with a Petri net shown in the image above Assuming that the process P in the above KPN is built so that it first reads data from channel A, then from channel B, computes something, and then writes data to channel C, the process execution model can be modeled with the network of Petri dish shown on the right. The unique token in the PE resource place prohibits the process from running simultaneously for different input data. When the data reaches channel A or B, the tokens are placed in FIFO A and FIFO B places respectively. The transitions of the Petri net are associated with the respective I / O and computational operations. When data has been written to channel C, the PE resource fills with its initial mark again allowing new data to be read

1. Process as a finite state machine
2. A finite state machine of a process.
3. A process can be modeled as a finite state machine that is in one of two states:
4. Active; the process calculates or writes data
5. Wait; the process is blocked (waiting) for data

Assuming that the finite state machine reads the program elements associated with the process, it can read three types of tokens, which are "Calculate", "Read" and "Write token". Also, in the wait state, you can only return to the active state by reading a special "get token", which means that the communication channel associated with the wait contains readable data. (5)

DESCRIPTION OF THE HALTING PROBLEM

The Halting (stop) problem is to determine if there is a Turing machine capable of determining whether any Turing machine is going to stop or not. Given a Turing machine M and a word w it will be determined if M will finish in a finite number of steps using w as input. The problem is undecidable, according to Turing himself, no Turing machine can solve it. That is, there cannot be a generic program that shows that all the programs in the world end, it can be done for a specific program but there is no general solution. There are several demonstrations of why it is undecidable, we are going to see a demonstration written in javascript. Let's imagine that someone writes a function that receives a function and its arguments as parameters, and has a code capable of checking whether or not it will stop. (6)

Let's assume that this function is correct, it works and returns true if the program ends, and false if it would fall into an infinite loop. So we could use it as a subroutine inside another larger function called g like the one below:

```
var g = function (funcion) {
//Pasamos en el parámetro funcion la función y sus argumentos
  if (f(funcion,funcion)) {
    while (true); //esto provoca un bucle infinito
  }
  else {
    return false;
  }
}
```

METHODOLOGY

1. Phillips 6/6: Team work

The group is divided into subgroups of 6 people who must talk for 6 minutes (1 minute each person). Finally, a spokesperson presents the conclusions of each group. It favors knowledge, communication and collaboration. It is suitable for gathering opinions and promoting the participation of all group members

2. Brainstorming

It is carried out with groups of up to 20 people, who quickly and freely express their ideas or ideas on a specific topic, which cannot be criticized. It aims to develop individual and group creativity, looking for new ideas..

3. Role-Playing: Team work

It consists of a representation or dramatization of a situation, assuming the roles, before the rest of the members who act as the public. It seeks to become aware of a situation, to put oneself in the place of the other, to develop spontaneity and observation, which in turn allow the analysis and overcoming of a problem as well as decision-making.

4. Case Study: Guided Discussion

Groups of up to 20 people discuss a specific case (written in writing, which will be read) led by an animator. As it is a concrete story, it allows us to reflect on the subject, analyze it, obtain different points of view, seek solutions through the participation and opinion of all members. Examples: Elle Magazine Case, Lost on the Moon, etc. (7)

The methodology that we have chosen is 3. Role-Playing: Teamwork since it is the one that best adapts to the needs of the project and in this way we are dividing ourselves into a group so that the work is lighter and we all have knowledge of the project usually

HYPOTHESIS

Below are 2 hypotheses to which Kahn's alternatives could be handled with the use of actions in everyday life.

El dueño de un restaurante ha instalado una máquina dispensadora de bebidas. La máquina está diseñada para servir 530 ml de líquido en el vaso mediano. El dueño sospecha que la máquina podría estar sirviendo líquido en exceso en los vasos medianos. Se decide tomar una muestra de 30 bebidas de este tamaño de vaso para verificar si la cantidad promedio es significativamente mayor que 530 ml.

¿Cuáles son las hipótesis adecuadas para la prueba de significancia?

(A) $H_0 : p = 530$ mL
$H_a : p > 530$ mL
(donde p es la proporción del líquido servido)

H_0: "no diferencia"
H_a: "sí hay diferencia"

(B) $H_0 : p = 530$ mL
$H_a : p < 530$ mL
(donde p es la proporción del líquido servido)

$H_0 : \mu = 530$ ml
$H_a : \mu > 530$ ml

(C) $H_0 : \mu = 530$ mL
$H_a : \mu > 530$ mL
(donde μ es la media de la cantidad de líquido servido)

(D) $H_0 : \mu = 530$ mL
$H_a : \mu < 530$ mL
(donde μ es la media de la cantidad de líquido servido)

(8)

La Fundación Nacional para el Sueño recomienda que los adolescentes entre 14 y 17 años de edad duerman por lo menos 8 horas cada noche para una buena salud y bienestar.

Un grupo de estadística de una preparatoria sospecha que los estudiantes de su escuela duermen en promedio menos de 8 horas diarias. Para probar esta teoría, eligieron aleatoriamente una muestra de 42 estudiantes y les preguntaron cuántas horas duermen cada noche. La media para la muestra es $\bar{x} = 7.5$ horas.

La siguiente es su hipótesis alternativa:

H_a : La cantidad promedio que duermen cada noche los estudiantes de la escuela es... menor que 8 horas

¿Cómo se completa adecuadamente su hipótesis alternativa?

H_0: $\mu \geq 8$ horas
H_a: $\mu < 8$ horas

(9)

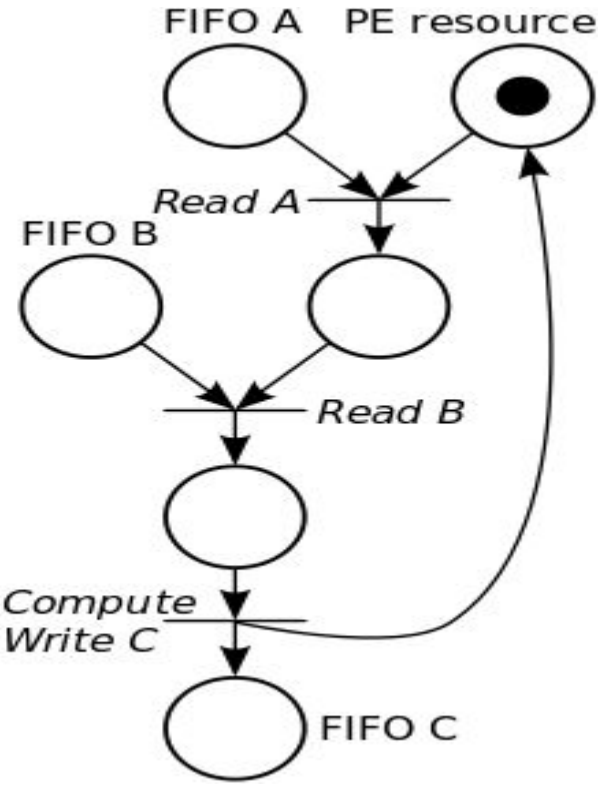
FUNCTIONAL REQUIREMENTS

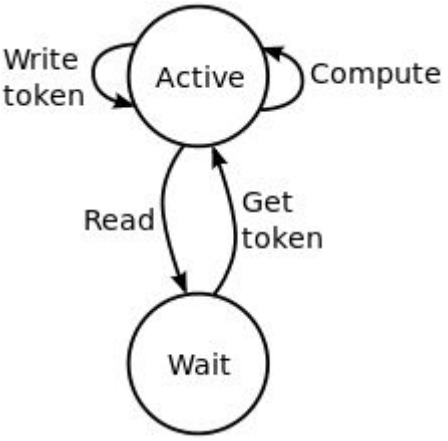
- A finite state machine of a process
- Active; the process calculates or writes data
- Wait; the process is blocked (waiting) for data
- Channel delimitation
- One channel is strictly limited
- The number of tokens
- FIFO limits can be increased upon request.
- Open and closed systems
- A real application cannot have unlimited FIFOs
- Network simulation
- The software can be used in Windows, Linux and OSX operating systems.
- The application must be usable without the need to install additional software in addition to a web browser.
- The application must be usable with the Chrome, Firefox and Internet Explorer web browsers and jflap
- Members of the managers user group can enter data
- Group members can make modifications to the software or the project
- Data exchange
- The system will control access and allow it only to authorized data
- The solution will automatically change to the character string associated with an order with the system.
- The accounting arrow accepts only data corresponding to accounting periods that are open in the system.

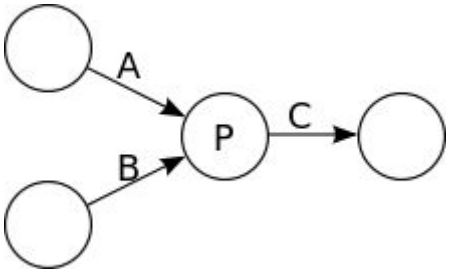
NO FUNCTIONAL REQUIREMENTS

- The name, total size, available space and format of a pen drive or flash drive connected to the computer's USB port will be displayed.
- The payment registration screen can print the data on screen to the printer.
- The name field accepts alphabetic characters only.
- The address field accepts alphabetic, numeric, and special characters.
- The country field will consist of a shortlist. The country associated with an address must be previously registered in the system.
- The state, province or department field will consist of a shortlist. Users will only be presented with the states associated with the previously selected country. The department or province to select must be registered in the corresponding functionality.
- The item material field on the purchase requisitions screen will be a preselection list, showing only the materials registered in the material master.
- The amount field accepts only numeric values with two decimal places.
- The transaction date field only accepts dates before today (current day).
- The database will be implemented with audit trails.
- The spreadsheets will secure the data using electronic signatures.
- The system will allow the elaboration and issuance of the regulatory report XX, according to the requirements established in the regulations and applicable law.
- The system will send an alert to the system administrator when any of the following events occurs: New account registration, customer login, 2 or more unsuccessful attempts to enter the user password and change the user password.

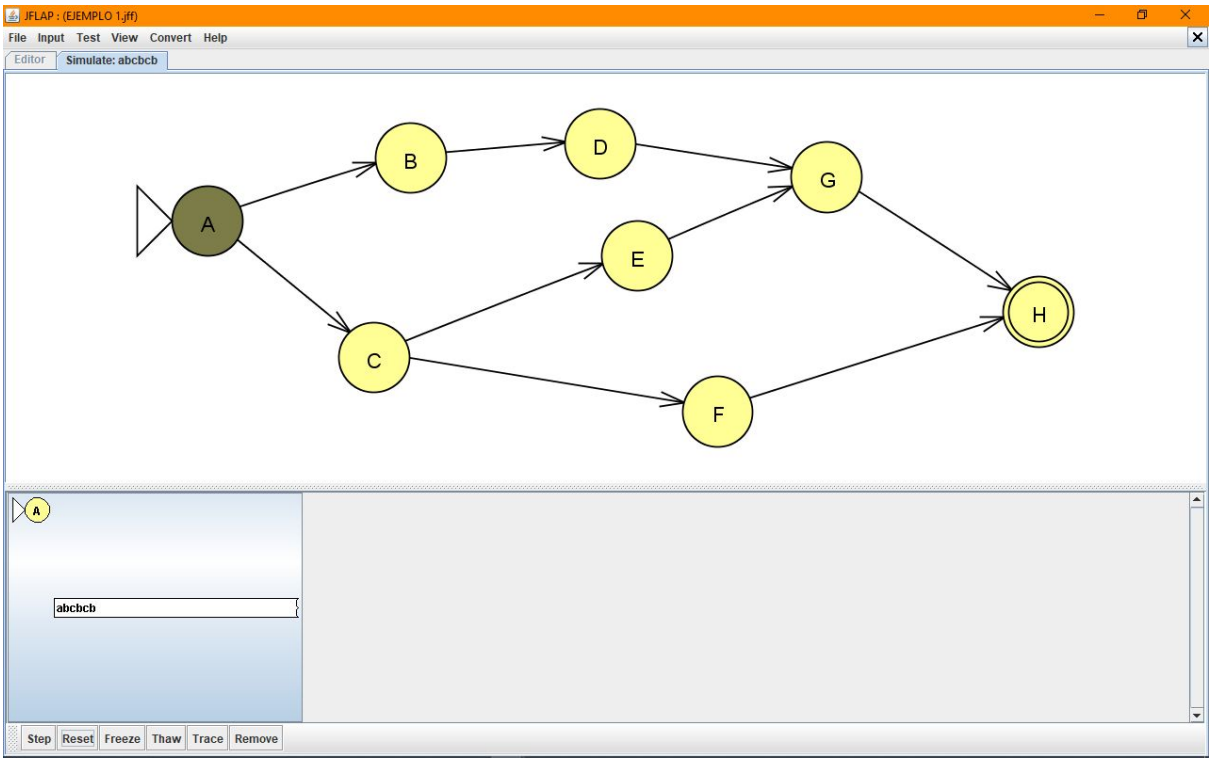
DISIGN

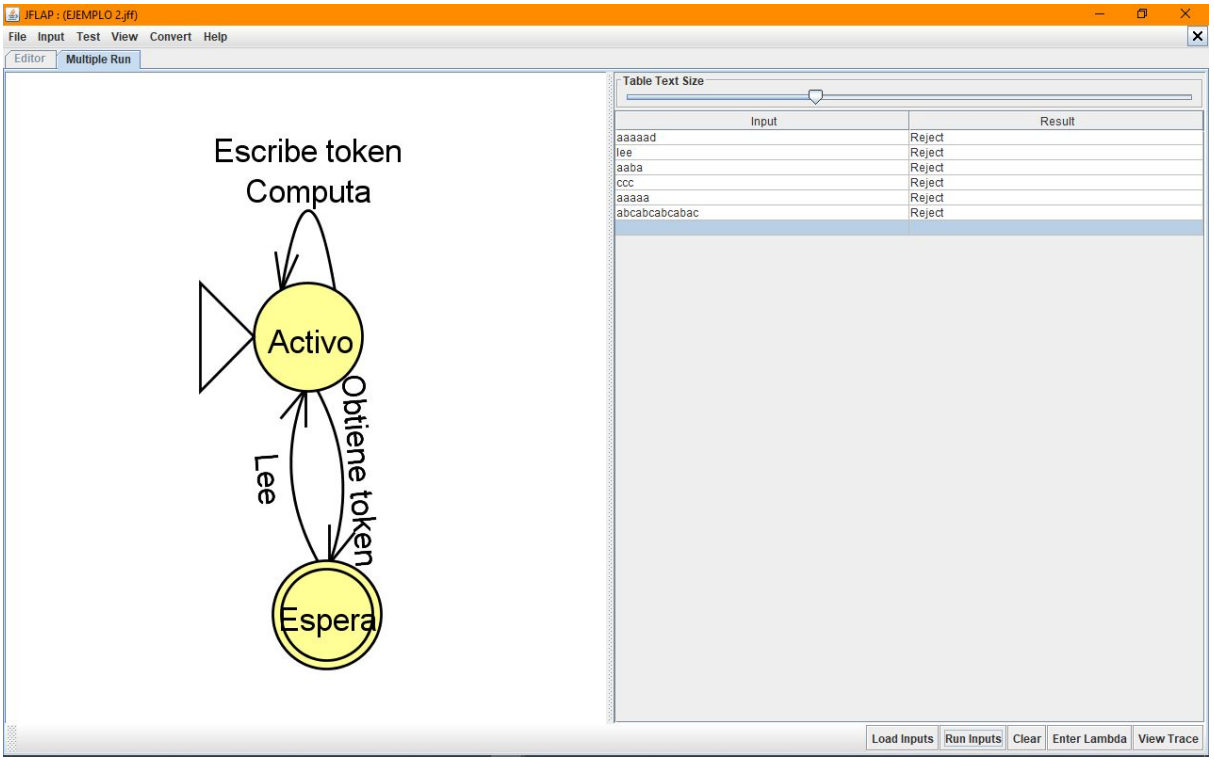

FIFO A
PE resource
Read A
FIFO B
Read B
Compute
Write C
FIFO C

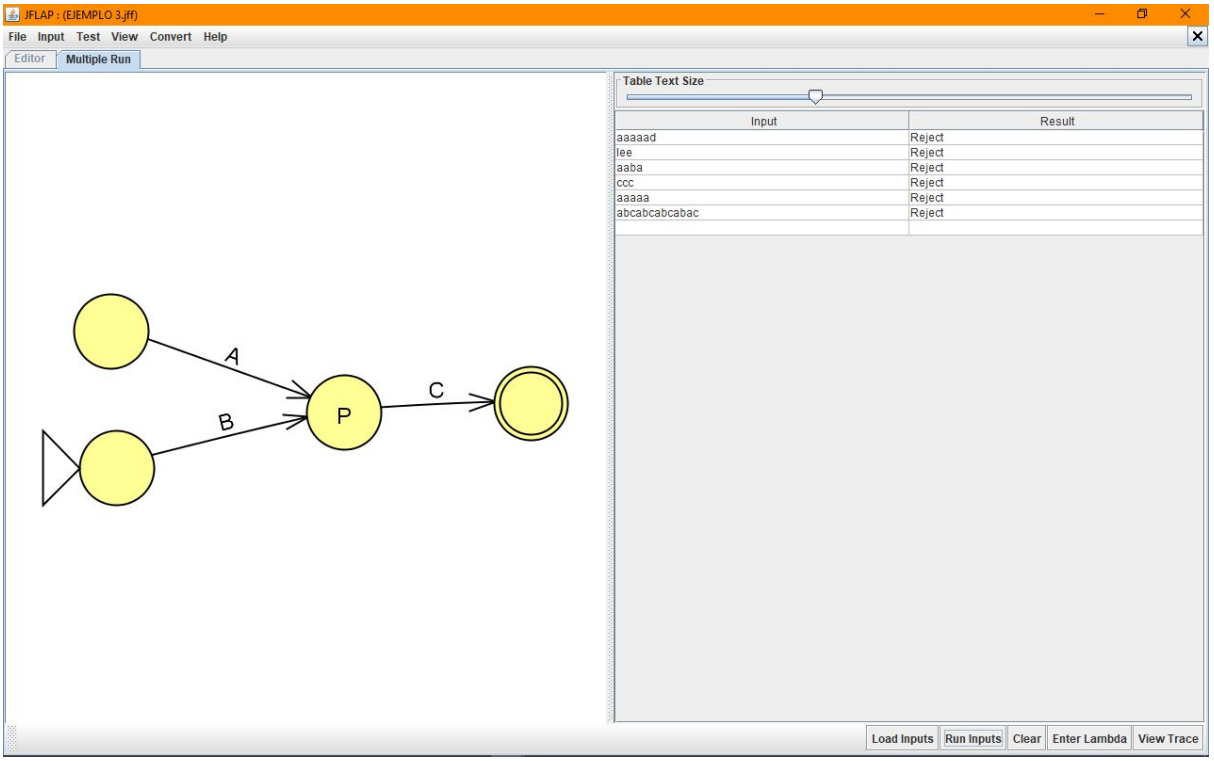

Write
token
Active
Compute
Read
Get
token
Wait


A
B
P
C

PROJECT DEVELOPMENT






JFLAP : (EJEMPLO 3.jff)
File Input Test View Convert Help
Editor Multiple Run
A
B
P
C
Table Text Size
Input Result
aaaaad Reject
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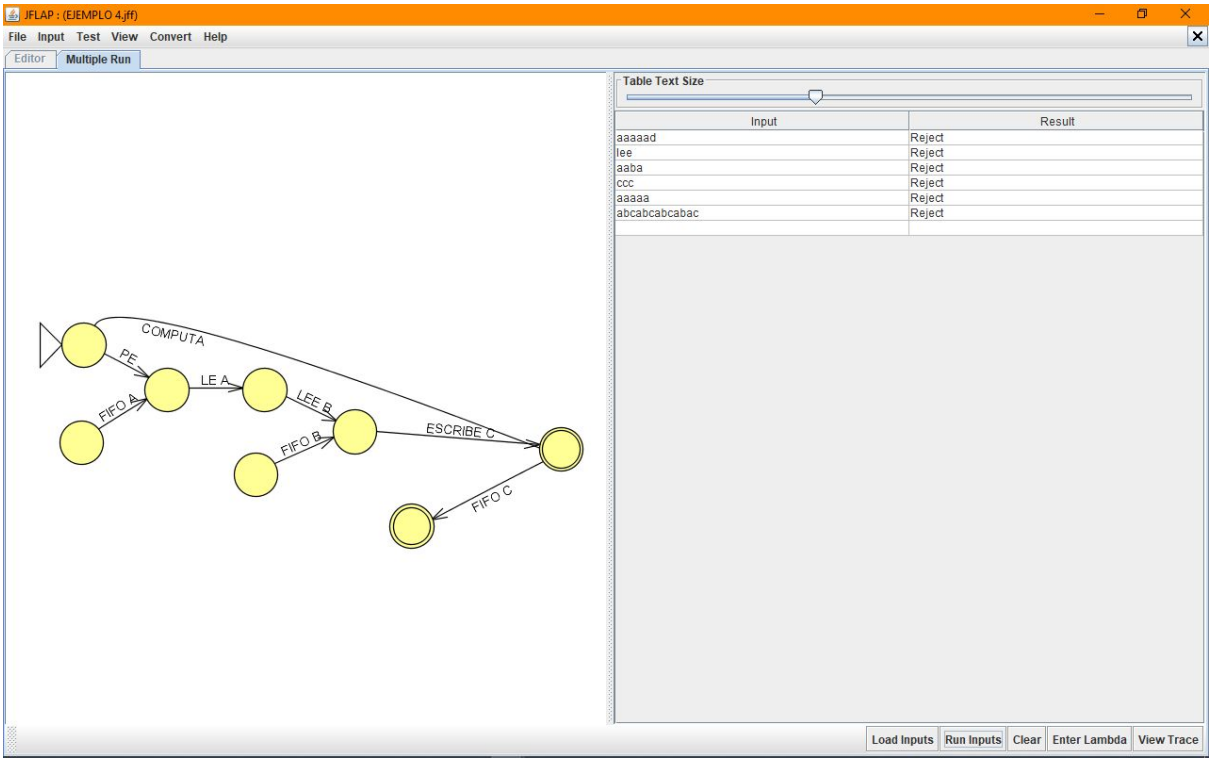
aaba Reject
ccc Reject
aaaaa Reject
abcabcabcabac Reject
Load Inputs Run Inputs Clear Enter Lambda View Trace


JFLAP : (EJEMPLO 4.jff)
File Input Test View Convert Help
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FIFO C
Table Text Size
Input Result
aaaaad Reject
lee Reject
aaba Reject
ccc Reject
aaaaa Reject
abcabcabcabac Reject
Load Inputs Run Inputs Clear Enter Lambda View Trace

FINAL SCHEDULE

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STUDENT: CUANANEMI CUANALO MAR	REPORTS
STUDENT: FERMIN CRUZ ERIK	
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INTERN ASESOR : M.C. ABIEL TOMÁS PA	
DEPARTAMENT BUSS: JAZMIN VILLEGAS	

CONCLUSION

In conclusion, we can say that KPN processes are monotonous, which means that they only need partial information from the inflow to produce partial information from the outflow. since thus, monotonicity allows parallelism. In a KPN there is a total order of events within a signal. However, there is no order relationship between events in different signals. Therefore, the KPNs are only partially ordered, which classifies them as a timeless model

Due to their high expressiveness and conciseness, KPNs as the basis of the computational model are applied in various academic modeling tools to represent streaming applications, which have certain properties (for example, stream-oriented, stream-based). The open source Daedalus framework maintained by the Leiden Embedded Research Center at the University of Leiden accepts sequential programs written in C and generates a corresponding KPN. This KPN could, for example, be used to map the KPN on an FPGA-based platform in a systematic way. The Ambric Am 2045 massively parallel processor matrix is a KPN implemented in real silicon. Its 336 32-bit processors are connected by a dedicated FIFO programmable interconnect. Therefore, your channels are strictly limited with write locks.

We can also say that a channel is strictly limited by itself having a maximum of unconsumed tokens for any possible execution. A KPN is strictly limited by itself all channels are strictly limited by .ell number of tokens not consumed depends on the execution order (scheduling) of the processes. A spontaneous data source could arbitrarily produce many tokens in a channel if the programmer will not run the processes that consume those tokens. A real application cannot have unlimited FIFOs and therefore the maximum FIFO capacity and schedule must be designed in a practical implementation. The maximum capacity of FIFOs can be managed in several ways: FIFO limits can be derived mathematically in the design to avoid FIFO overflows. However, this is not possible for all KPNs. It is an undecidable problem to test whether a KPN is strictly limited by. Also, in practical situations, the limit may depend on the data. FIFO limits can be increased on demand. Write blocking can be used to lock a process if a FIFO is full.

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:

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