International Journal For Recent Developments in Science & Technology
2581-4575
Crossref
A Peer Reviewed Research Journal

PERFORMANCE EVALUATION OF RAILWAY RESERVATION SYSTEM USING REWRITING CYCLIC NORMAL TIMED AUTOMATA

DR.U.M.FERNANDES DIMLO[1], MR.V.SHIVA KUMAR[2]

1. Professor & Head, Narsimha Reddy Engineering College, Hyderabad, India,umfernandesdimlo@gmail.com
2. Assistant Professor, Narsimha Reddy Engineering College, Hyderabad, India, kumarcse70@gmail.com

ABSTRACT

Timed automata can be used to introduce timing delays when behavior of a real time system is modeled. An attempt is made to model an online transaction processing of reservation system. The transaction represents the reservation or the cancellation that a customer makes. The transactions are reordered at a specific period of time in a reservation which is dynamic in nature. A reservation centre with multiple counters and clerks taken into consideration.

1. INTRODUCTION

Real time system is a system which require to process given data correctly within a specified time limit. Hence before implementing each system there is a need for evaluating basic design one of the methods is to develop a model and verify safety and performance requirements. The modeling method can be finite state machines, process algebra, Petri nets and temporal logic .The model checking using timed automata is best method for real time systems became it can handle timing conditions.The applications such as verification of multitasking jobs [7], distributed systems [5] and verification of real time system [8] are using timed automata. To add one more application with that online transaction processing of reservation system was taken into consideration. The different scenarios of the customer arrival at the various counters and their service from the clerks are considered.

2. REWRITING CYCLIC NORMAL AUTOMATA

Let us consider a normal algorithm N consisting of n totally [4] ordered substitution formulas $\{u_i \rightarrow v_i: 1 \leq i \leq n\}$ and its EPT version. We shall define a rewriting cyclic normal automaton for the EPT system in the following manner:

Let Q be the set of states corresponding to the semi-Thue productions contained in the scheme of the EPT rewriting system where $Q = \{q_{ij} \mid 0 \leq i \leq n-1; 0 \leq j \leq k$: i represents the i^{th} substitution formula, j represents the j^{th} semi-Thue production of the i^{th} substitution formula and k represents the number of states, that is, the number of semi-Thue productions corresponding to the i^{th} substitution formula$\}$. [1] For convenience, the state corresponding to the i^{th} substitution formula is termed as a *major state* and the states corresponding to the k semi-Thue productions of the i^{th} substitution formula as *minor states*. Let $u_i \rightarrow v_i$ be the i^{th} substitution formula. Then, the number of minor states corresponding to the i^{th} major state is given by the following rules.

International Journal For Recent Developments in Science & Technology
2581-4575
Crossref
A Peer Reviewed Research Journal

(i) if $|u_i| = |v_i| = l_m$, then $k = 2l_m$
[NOTE: $|u_i|$ is the length of u_i]
(ii) if $|u_i| < |v_i|$ then $k = 2l_m$
(ii) if $|u_i| > |v_i|$ then $k = 2l_m - 1$

3. TIMED AUTOMATON

A timed automation is a finite automation extended with a finite set of real valued clocks [2]

A timed automation is a type A= (Q, ∑, C, E, q0) where

Q is finite set of states of A

∑ is alphabetical or actions of A

E≤ Q*∑*B(c)*P(c)*Q set of edges called transaction of A

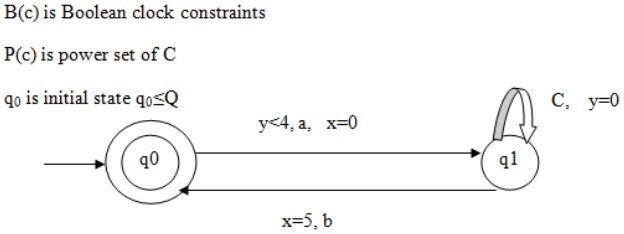

Fig 1. Timed Automata

x, y are clocks

a, b , c are actions

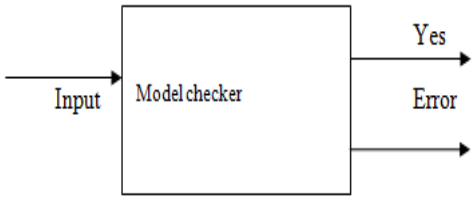

Fig 2. Timed Automata as Model Verifier

4. ONLINE RESERVATION SYSTEM

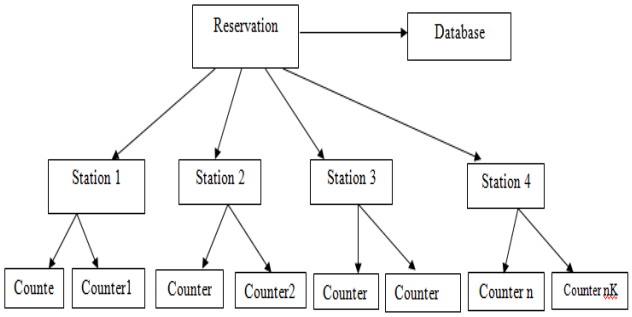

Fig 3. The Reservation System

The online reservation system with timed automation is modeled. In figure 2 the organization of the reservation id depicted. It consists of multiple reservation centers with multiple counters at each center. The transactions that are performed represent the work done when a customer makes a reservation or a cancellation. Transactions are handled by a database system which considers them concurrent processes. For each transaction there is a set of records each one of which can be is a locked or unlocked state. The way the concurrent processes are processed by the database system is functioning presented in figure 3

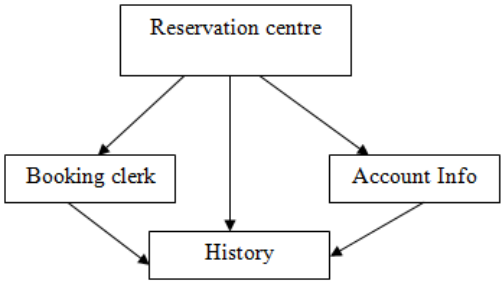

Fig 4. The Data Base System Components

The following tables such as reservation center, booking clerk. History and account info are the components of database systems. The history task contains the information about the

International Journal For Recent Developments in Science & Technology
2581-4575
Crossref
A Peer Reviewed Research Journal

transaction. The system first locks access to the records and its logs there data as transactions on a buffer.

5. THE TIMED AUTOMATA MODEL OF RESERVATION SYSTEM

A model with three reservation centers and number of booking clerk is considered where some customers are served while they may arrive.

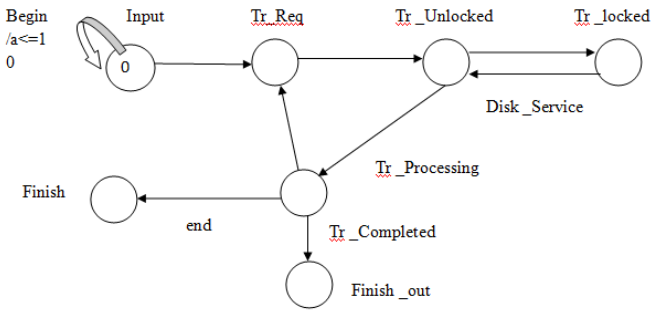

Fig 5. Basic Automaton

The customer waiting time is less than 10 units. The condition specified as a<=10.Initially request to the transaction was done after all records are unlocked and locked.

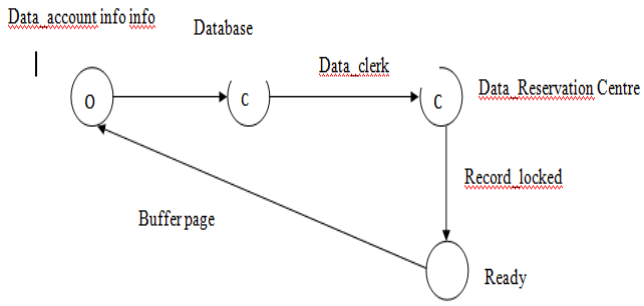

Fig 6. Database Actions

The Figure 5 database management system of reservation system is modeled. The locations Data_clerk, Data_reservation centre are committed when the transaction begin clerk and reservation center are locked once transaction ends both are unlocked.

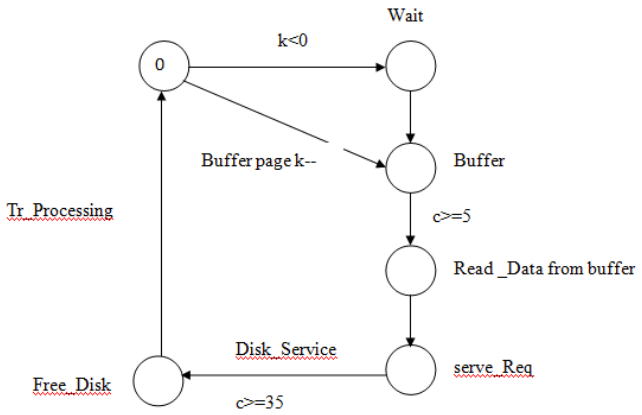

Fig 7. Disk Service

6. THE UPPAAL TOOL

UPPAAL is a tool for Modeling, simulating and verifying real time systems .The simulating model consists of five major components such as state variables, function relation, inputs and outputs .This tool is appropriate for deterministic process with finite control structure and real valued clock, communicating through channels or shred variable .The three main parts of a UPPAAL are description Language, a simulator and a model checker .In UPPAAL time is modeled using clock variables .A transition can contain clocks , Boolean variables and integer variables .A system in UPPAAL[3] is collection of Automata .The Synchronization of two channels are indicated by 1 and 0.which are used for sending and receiving signals respectively.

7. CONCLUSION

This paper shows how the timed automata can be utilized in modeling, simulating and verifying real time computer systems. For

this the online reservation system is taken as a model, the factors such as response time was demonstrated by simulating the model .The non functional requirements such as usability, availability of the system are studied.

REFERENCES

[1] Theory of Algorithms by A. A. Markov, Soviet Math Dokladi, 1961.

[2] A theory of timed automata, Rajeev Alur and David L. Dill, Theoretical computer science (126), 183-235, 1994.

[3].UPPAAL in a Nutshell, K.G.Larsen, P.Petterson and W.Yi, International. Journal on Software Tools for technology Transfer, Springer-Verlag, volume 1, number 1-2, pp.134-152, 1997.

[4] Symbolic Computing – Signal and Image Processing by E G Rajan, Anshan Publications, UK, 2003.

[5] Timed Automata Approach to Real Time Distributed System Verification, Jan, Libor, Pavel and Zdenek, Proceedings of IEEE, 2004.

[6] Application of the timed automata abstraction to the performance evaluation of the architecture of a bank On-line transaction processing system,Maria Kourkouli and George Hassapis, proceedings of the second south-East European work shop on formal methods, pp.142-153, 2005.

[7] Formal verification of multitasking applications based on timed automata model, Libor and Zdenek, Journal

Real-Time Systems, Volume 38 Issue 1, Pages 39 – 65, 2008.

[8] Performance analysis of real time task systems using timed automata, Georgeta Igna, 2013.