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Neighborhood Detection Using CA

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Abstract— ***Cellular automata (CA) with given evolution rules have been widely investigated, but the inverse problem of extracting CA rules from observed data is less studied. Current CA rule extraction approaches are both time-consuming, and inefficient when selecting neighborhoods'. We give a novel approach to identifying CA rules from observed data, and selecting CA neighborhoods' based on the identified CA model. Our identification algorithm uses a model linear in its parameters, and gives aunified framework for representing the identification problem for both deterministic and probabilistic cellular automata. Parameters are estimated based on a minimum-variance criterion.An incremental procedure is applied during CA identification to select an initial coarse neighborhood. Redundant cells in the neighborhood are then removed based on parameter estimates, and the neighborhood size is determined using a Bayesian information criterion. Experimental results show the effectiveness of our algorithm, and that it outperforms other leading CA identification algorithms.***

Index Terms— ***Cellular automata (CA), neighborhood selection,rule identification***.

I.INTRODUCTION

A. Overview

WIRELESS local area networks (WLANs) have now become a common means of access to the Internet for both multimedia and data services. Voice-over-Wi-Fi (Vo-Fi) or Voice-over-WLAN (VoWLAN), which is a direct extension of Voice-over-IP (VoIP), is an important and most appealing application for business environments. Voice is scheduled through the highest priority AC_VO queue in 802.11e enhanced distributed channel access (EDCA) protocol. Many schemes are proposed in the past to improve throughput performance of AC_VO queue. Some of these schemes are energy inefficient as they send black bursts to gain channel access. Some schemes tend to further reduce the contention window (CW) size used for AC_VO queues to give priority to handover traffic. Moreover, these schemes do not realize that CW sizes for AC_VO queues are already small to provide any appreciable voice service.

cellular automata are a class of spatially and temporally discrete mathematical systems characterized by local interaction and synchronous dynamical evolution.CA were proposed by von Neumann in the early as models for self-replicating systems. Since then,CA properties have been widely investigated, and CA havebeen applied to simulating and studying phenomena in complexsystems in such diverse fields as pattern recognition and physical, biological, and social systems. Currently, much research still focuses on analyzing CA with known or designed evolution rules and using them in particular applications such as urban modeling and image processing.However, in many applications, formulating suitable rules is not easy Often, only the desired initial and final patterns or the evolution processes are known. To be able to apply a CA, underlying rules for the CA must be identified. Some research already exists on this topic, but various fundamental problems remain. In particular, rule identification is typically computationally expensive, and neighborhood selection is also a tricky problem.

Most carrier sensing multiple access (CSMA) protocolshave similar performance under low-load scenarios. Many variations (commonly referred as schemes) are proposed to

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improve a protocol's performance when contention level on the channel increases [9]. The efficiency of a protocol is expressed as the fraction of channel bandwidth used for actual data transmission.Cellular Automata was widely spread over educational concept but less implementin our IT based researches.Networking was my dream concept to be get through , so this title would lead me to know about networking concept in a real time programming. A cellular automata (cellular automata, abbrev. CA) is a discrete model studied in computabilitytheory, mathematics, physics, complexity science, theoretical biology and microstructure modeling. It consists of a regular grid of *cells*, each in one of a finite number of *states*, such as "On" and "Off" (in contrast to a coupled map lattice). The grid can be in any finite number of dimensions. For each cell, a set of cells called its *neighborhood.*

B. Need for ECA

A QoS-enabled wireless station (QSTA) maintains four separate queues to serve different priority traffic as stipulated by IEEE 802.11e standard . Each queue is known as an access category (AC) and uses different contention parameters summarized in Table 3. Voice transmission is scheduled through AC_VO queue, which receives the highest priority to transmit among all the four queues. For convenience, the AC_VO queue contention process of a QSTA is referred simply as voice station (VSTA) contention process and ECA as the proposed modification to voice stations contention process.

C.Scope and Objective of the project

The CW size should generally be large to reduce the number of collisions. For simple illustration, consider an ad hoc network scenario containing _ stations. Each station on the network maintains a single queue and has backlogged traffic to transmit. Assume that all stations are identical and draw values for their backoff counters from uniform distribution . Initially, let the CW size be fixed equal to the network size . The variation of collision probability as a function of network size is plotted as shown in Fig. 1 (by a thick solid line, displayed along with black dots to indicate line crossings).

The stations that may wrongly conclude a successful data packet transmission as collision. Stations with data packets for transmission will first grab the channel using their CG packets. When they send CG packet, they do not expect any acknowledgment. So whether or not a CG packet collision occurs, these stations will use EIFS time duration (available immediately after the end of CG packet transmission) for initiating transmission of their actual data packets. For this purpose, they use a collision avoidance counter q to arbitrate channel among stations that have sent CG packet.

The deferred transmission during EIFS period is where stations select a slot corresponding to their generated value of q. If channel becomes busy before their selected slot, stations will initiate a defer process. During defer process, stations prepare for transmission of data packet by starting a new backoff process and reselecting a new value for their collision avoidance counter q. It is essential to note that the value of Q should always be such that the deferred transmission does not start after "EIFS."

D. Organization of the report

In the following chapters we can see sections based on existing system, its limitations, the proposed system, the process descriptions, system specifications such as software and hardware specifications and software descriptions, system architecture, data flow diagram, system implementation and different module description and system testing. Finally, the conclusion of our project is given along with future enhancements and screen shots of the output is also provided. The different references are also mentioned.

II.SYSTEM ANALYSIS

A.Existing System

Deterministic CA(DCA) depend on central cell and collect data. Probabilistic CA(PCA) can find maximum neighborhood size but lead to redundant neighbors. Proposed cannot be applied without central cell pattern

Disadvantage of existing system

Runtime cell(Client) Cannot be added the network map , it need overlay for rearranging the network lay. Restructuring was more and more difficult in normal distributed data transferring method.

High In redundancy
Data losses cannot be recover
Unauthorized user can access data while transferring

B.Proposed System

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A novel approach to identifying CA rules from observed data and selecting CA neighborhoods based on the identified CA model, The identification algorithm uses a model linear in its parameters and gives a unified framework for representing the identification problem for both deterministic and probabilistic CA.Proposed CA rule has less redundancy comparing to existing CA

Proposed system advantages

The cells were each time authenticated while making transaction so that the system with more secure and less in redundancy

The proposed rule provide validate user profile and server has the facilities to even restructure ,after network was design and developed.

III. SYSTEM IMPLEMENTATION

A. Modules

a).Rule Identification With Known neighborhood
b).Rule Identification With Incremental neighborhood
c).Neighborhood Selection
d).Neighborhood Reduction
e).Rule Identification With Known Neighborhood

First we identify from collected data pairs.A parameter estimation algorithm for a CA with are determined neighborhood is first introduced and generalized to an incremental algorithm when the neighborhood is not known.

a.Rule Identification With Incremental Neighborhoods

The above works if the correct neighborhood is known or an a priori neighborhood is set. Otherwise, typically, a large enough initial neighborhood is chosen to guarantee that the correct neighborhood is included within it.After identifying the CA rules, the neighborhood is reduced using some neighborhood selection algorithm

b.Neighborhood Selection

Algorithm 1

Determines a large initial neighborhood and CA parameter values. Typically, this neighborhood contains some redundant neighbors, which can be removed from the neighborhood without changing the CA behavior

c.Neighborhood Reduction

Neighbors which are not redundant but have very small effect on the CA behavior, may also be removed to make the model parsimonious.We next discuss the approaches for removing neighbors from the neighborhood.

In the PCA case, we can also use the above method to get rid of redundant neighbors while keeping the variance unchangedand then use some criterion to eliminate nonredundant neighbors while balancing accuracy and parsimony. CA rule identification is a parameter estimation problem for a model linear in its parameters, allowing model selection techniques to be used to determine the neighborhood size.Many model selection criteria exist; the Akaike information criterion and the BIC

are the most popular. We have tried both criteria in our experiments and have found that the BIC tends to give better results—it always results in the true neighborhoods of ground-truth CA used in experiments. We next give a brief introduction to the BIC and then describe our neighborhood selection method.

IV.CONCLUSION

Considerable research has been done on analysing and simulating CAs with known or designed evolution rules. However, the inverse problem of finding CA rules from observed CA evolution patterns has been relatively little tackled. Most early efforts on this issue used genetic algorithms as a tool to learn CA rules from experimental data. Unfortunately, genetic algorithms can be very time-consuming in real applications.Adamatzky's CA identification algorithms can extract rules fast from observed data, but the neighbourhood identified by them usually contains some redundant cells, which makes the CA rules overly complex. Maeda and Sakama's heuristic procedure can remove redundant cells, but only DCA is dealt with. Another drawback of Maeda and Sakama's algorithm for redundant cell removal is that each time a cell is removed, all data needed to be reconsidered, and identification needs to be recomputed. Billings and colleagues developed a series of relatively fast CA rule identification and neighbourhood selection algorithms based on orthogonal least-squares method, but their algorithms are not efficient for large neighbourhoods.

This project gives a new fast algorithm, which is a significant improvement on the current CA identification algorithms. The proposed algorithm is consistently faster than Adamatzky's algorithm, and more importantly, it provides a unified approach to rule identification and neighbourhood

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selection for both DCA and PCA, while Adamatzky's algorithm does not perform neighbourhood selection. Our algorithm removes redundant cells from neighbourhoods simply based on the parameter estimates, without resorting to reconsidering data,unlike Maeda and Sakama's algorithm. The Bayesian information criterion has been used in the proposed algorithm to determine neighbourhoods, which is shown through experiments to work well. Compared to Billings' most recent fast identification algorithm (FCA-OLS), the proposed algorithm is significantly faster, even when the FCA-OLS algorithm runs.

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