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On Expediency of Closed Asynchronous Dynamic Cellular Learning Automata

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Highlights

- We suggest conditions under them an *CADCLA* is expedient.
- The expediency of *CADCLA* with L_{RP} Learning Automata was analyzed.
- The expediency of *CADCLA* with $L_{R\varepsilon P}$ Learning Automata was studied.

Abstract: Closed Asynchronous Dynamic Cellular Learning Automata (*CADCLAs*) have been reported recently. *CADCLAs* are hybrid models based on Cellular Automata (*CAs*) and Learning Automata (*LAs*). Because of distributed computation characteristic of *CAs* and probabilistic decision making nature of *LAs*, analyzing the performance of *CADCLA* based algorithms is difficult. The expediency metric has been used to study the performance of the *LA* based models. With respect to this metric, the performance of *CADCLAs* have not been studied in the literature. In this paper, we suggest sufficient conditions under them a *CADCLA* is expedient.

***Index Terms*— Cellular Automata, Learning Automata, Closed Asynchronous Dynamic Cellular Learning Automata, Expediency.**

I. INTRODUCTION

Cellular Automata (*CAs*) are computational models which composed of independent and identical cells. In these models, the cells are arranged into a lattice. In a *CA*, each cell selects a state from a finite set of states. A cell uses the previous states of a set of cells, including the cell itself, and its neighbors and then updates its state using a rule called local rule. *CAs* evolves in discrete time steps [1], [2]. On the other hand, Learning Automata (*LAs*) are models for adaptive decision making in unknown environments. A set of actions has been defined for this model. Each action has a probability which is unknown for the *LA* for getting reward by the environment. This model tries to find an appropriate action through repeated interaction with the environment. The appropriate action is an action with the highest probability of getting reward by the environment.

Cellular Learning Automata (*CLAs*) are hybrid models based on *CAs* and *LAs*[3]. These models inherit the computational power from *CAs* and the learning capability in unknown environment from *LAs*. A *CLA* is a