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ras_reza@yahoo.com

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² عضو هیات علمی دانشکده مهندسی کامپیوتر، دانشگاه صنعتی امیر کبیر

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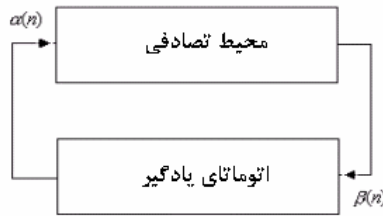[9][11](                                )                [2][3](                                )

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$\alpha = \{\alpha_1,...,\alpha_r\}$        $E \equiv \{\alpha, \beta, c\}$     .

   $\beta$     .         $c = \{c_1,...,c_r\}$        $\beta = \{\beta_1,...,\beta_m\}$

     $\beta_2 = 0$       $\beta_1 = 1$      .     P

S        [0,1]            $\beta(n)$ Q     .

      .        $\alpha_i$       $c_i$ .     [0,1]       $\beta(n)$

      .               $c_i$

.



| $\alpha(n)$ | محیط تصادفی |
| | اتوماتای یادگیر |

$\beta(n)$

:

$\alpha = \{\alpha_1,...,\alpha_r\}$       $\{\alpha, \beta, p, T\}$

       $p = \{p_1,..,p_r\}$          $\beta = \{\beta_1,...,\beta_m\}$

.           .     $p(n+1) = T[\alpha(n), \beta(n), p(n)]$

        .      $n$     $\alpha_i$

$$p_i(n+1) = p_i(n) + a[1 - p_i(n)]$$
$$p_j(n+1) = (1-a)p_j(n) \qquad \forall j \quad j \neq i$$
   ( )

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[6] Finite State Machine

$$p_i(n+1) = (1-b)p_i(n)$$
$$p_j(n+1) = (b/r-1) + (1-b)p_j(n) \quad \forall j \quad j \neq i \qquad (\ )$$

$b$   $a$           .          $b$          $a$ ( )   ( )

$L_{R\varepsilon P}$          $a$   $b$        $L_{RP}$         $b$   $a$     .

..[7][18]     $L_{RI}$        $b$     .

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:       $CLA = (Z^d, \phi, A, N, F)$       d        (       )

.          d      $Z^d$

.          $\phi$

.          (LA)        A

.        $Z^d$        $N = \{\bar{x}_1,...,\bar{x}_{\bar{m}}\}$

$\underline{\beta}$      CLA      $F: \underline{\phi}^{\bar{m}} \to \underline{\beta}$

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[7] General

[8] Totalistic

[9] Outer totalistic

| (-1,1) | (0,1) | (1,1) |
|--------|-------|-------|
| (-1,0) | (0,0) | (1,0) |
| (-1,-1)| (0,-1)| (1,-1)|

|        | (-1,0) |        |
|--------|--------|--------|
| (0,-1) | (0,0)  | (0,1)  |
|        | (1,0)  |        |

( )                    ( )

( )        ( ) :

$$\underline{p}(k) = (\underline{p}'_1(k),...,\underline{p}'_n(k))$$         k         :( )

$\underline{p}'_i(k)$         $i$  .

:( )         $\underline{p}$   .

:( )         $\Lambda : K \to K$

$K$ .   .

:( )         $\{\underline{p}(k)\}_{k \geq 0}$         . :

$$\underline{p}(k+1) = \Lambda(\underline{p}(k))$$   ( )

:( )

.

( )         $$S : \prod_i \phi \to Z$$

.         :

( )         $$S(CLA) = (y_1...y_N)_m$$

$(.)_m$         m  N         $(y_1,...,y_N)$         .

10011

$$(10011)_2 = 19$$

$m^N$ .

$\{0,...,m-1\}$     $m$                              $\underline{\beta} = \{0,1\}$            :(            )
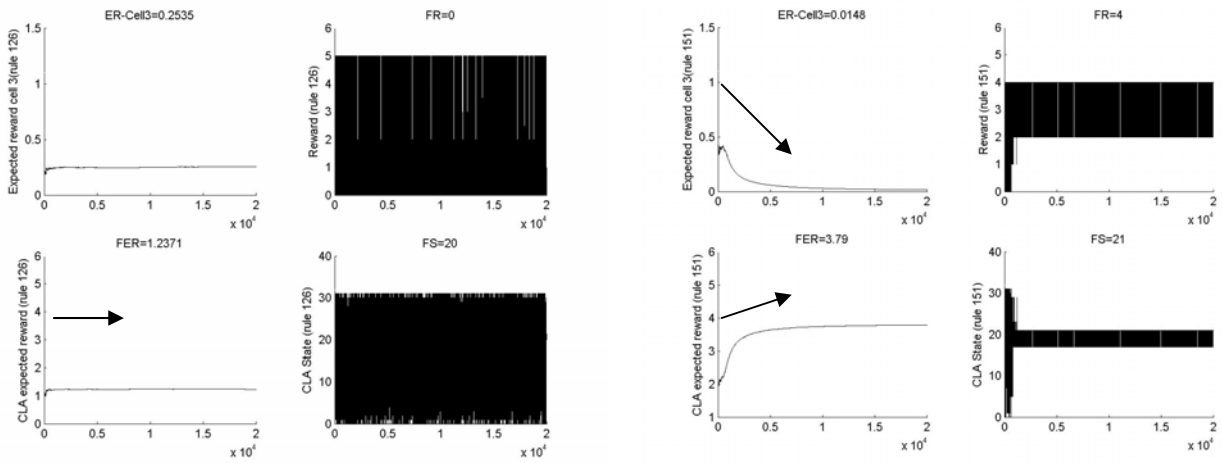
.                                                    $m^{\underline{m}}$        .

.                                    $m$

$\underline{\beta} = \{0,1\}$    $\phi = \{0,1\}$                    .

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[10] Wolfram numbers

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.                $L_{RP}$   $L_{RI}$                        .

$L_{RP}$  $L_{RI}$

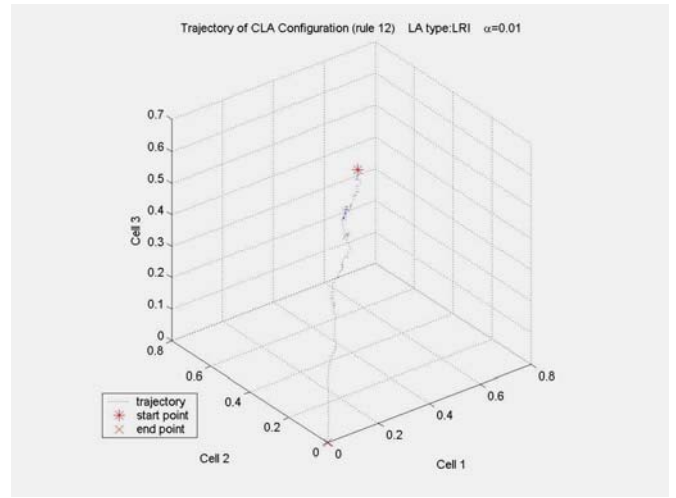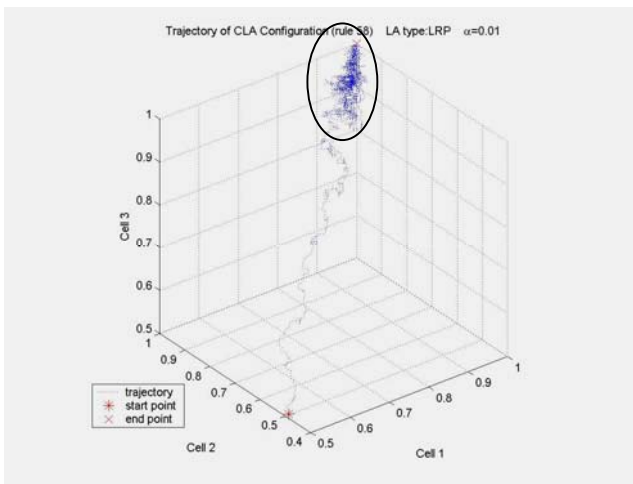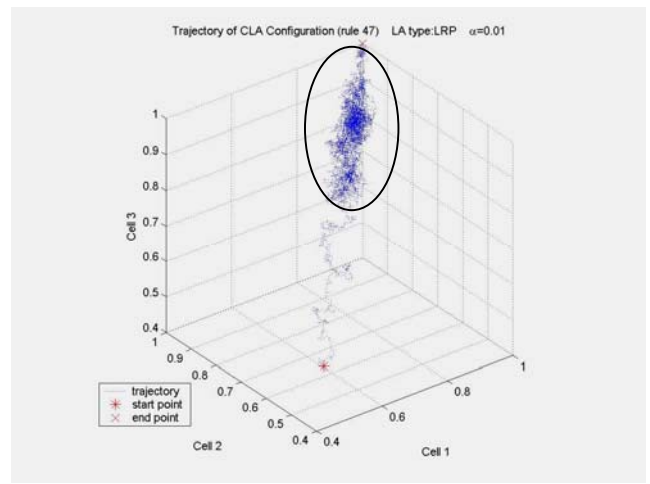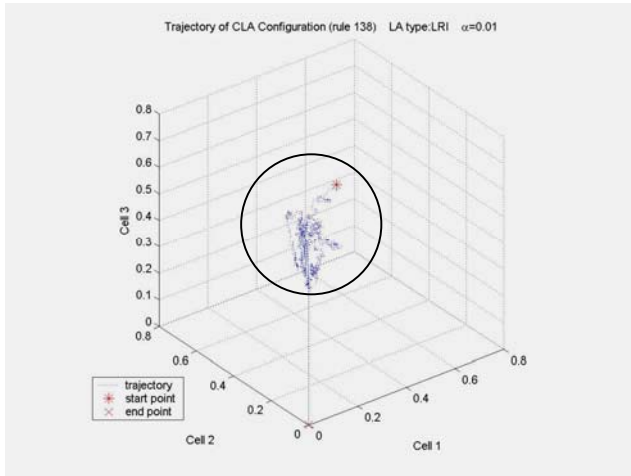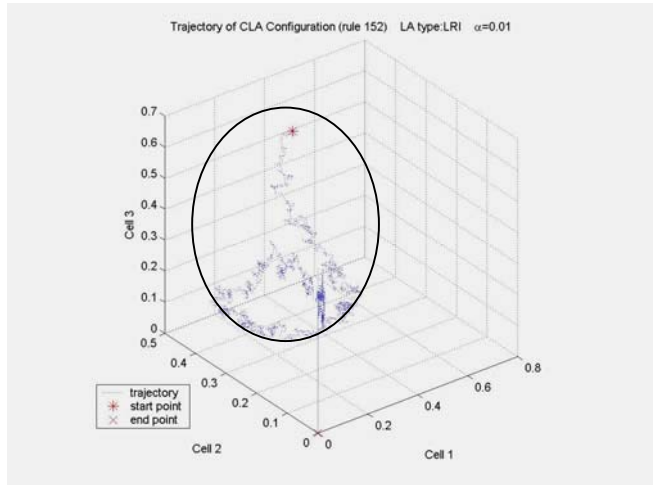.                                                    ( )

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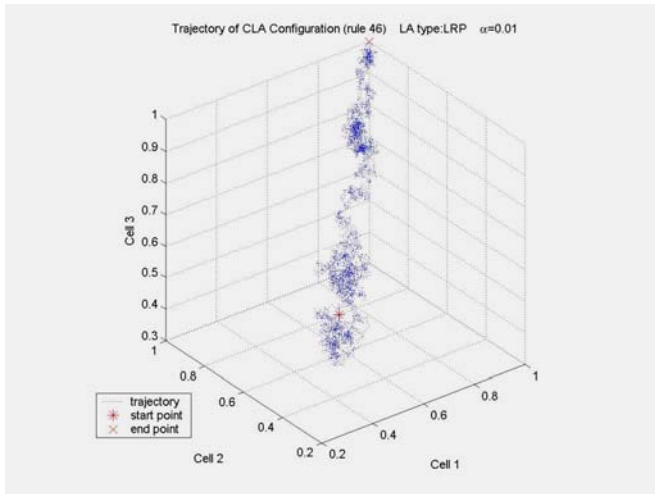
( )                              ( )                                              ( )

L$_{RI}$          ( )( )              ,              L$_{RI}$          ( ) CLA          ( )



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( )                              ( )                                              ( )

L$_{RI}$          ( )( )              ,              L$_{RP}$          ( ) CLA          ( )

ER-Cell3=0.2535

Expected reward cell 3(rule 126)

FR=0

Reward (rule 126)

FER=1.2371

CLA expected reward (rule 126)

FS=20

CLA State (rule 126)

ER-Cell3=0.0148

Expected reward cell 3(rule 151)

FR=4

Reward (rule 151)

FER=3.79

CLA expected reward (rule 151)

FS=21

CLA State (rule 151)

x 10⁴

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(       )                        ,                                        L $RI$                                                                                      :

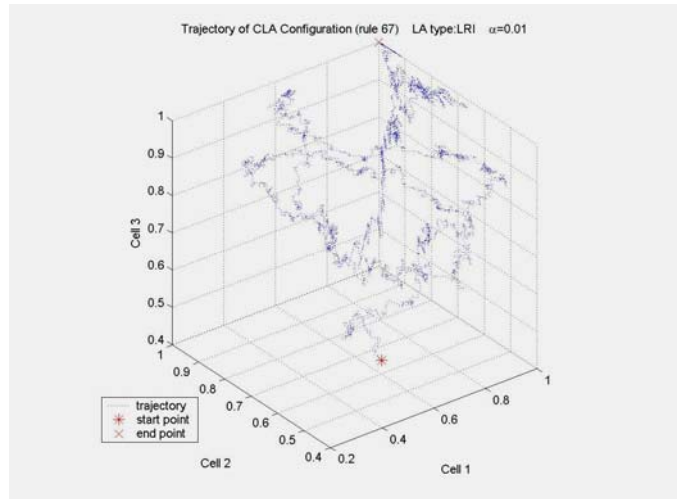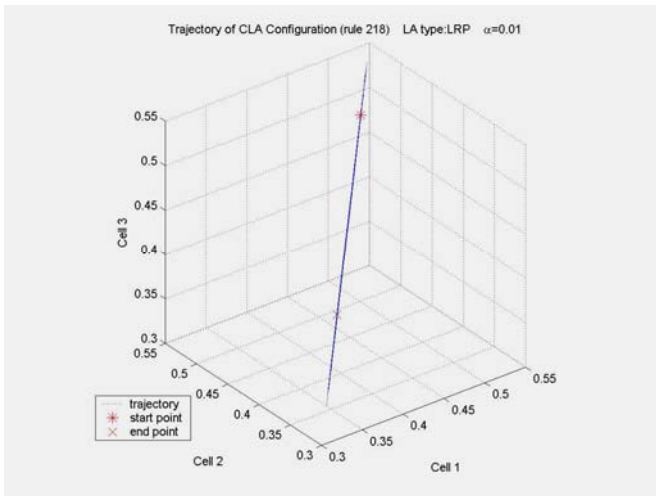CLA                    (          )                                        (          )                                      (          )
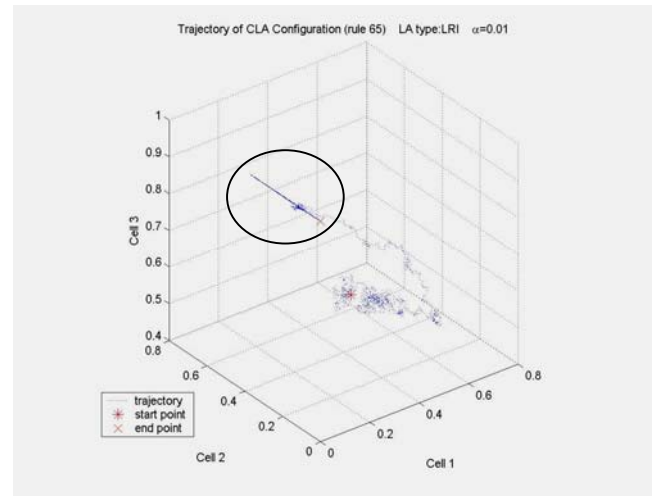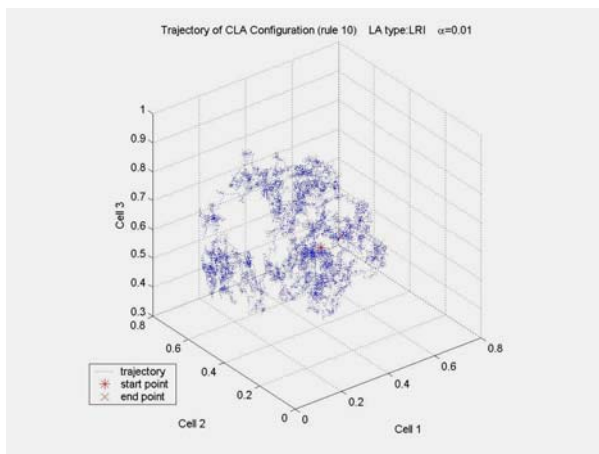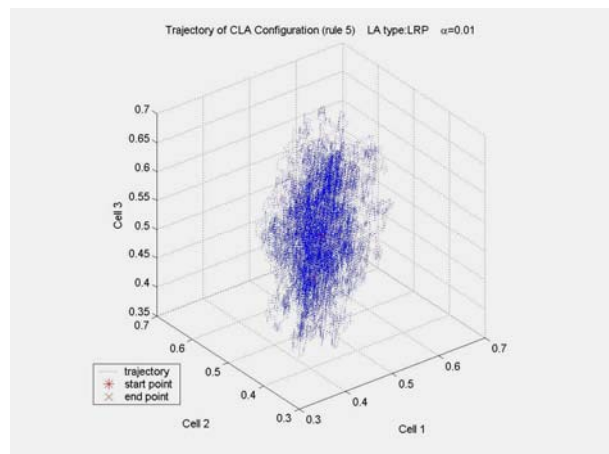
(       )                        ,                                        L $RP$                                                                                ( ) .

CLA                    (            )                                        (          )                                    (          )

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$L_{RI}$ ،
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(کلاس سوم) نامنظم: در این کلاس هیچ رفتار منظمی در تکامل اتوماتای یادگیر سلولی مشاهده نمی شود. به عبارت دیگر اتوماتای یادگیر سلولی همگرا نمی شود و در عین حال رفتار پریودیک نیز از خود نشان نمی دهد. نمونه هایی از این گونه رفتار در شکل ۱۴ تا شکل ۱۵ دیده می شود. در جدول ۱ و

جدول ، اتوماتای یادگیر سلولی خطی (با ۳ سلول) و با توجه به قوانین و الگوریتمهای یادگیری متفاوت طبقه بندی شده اند.
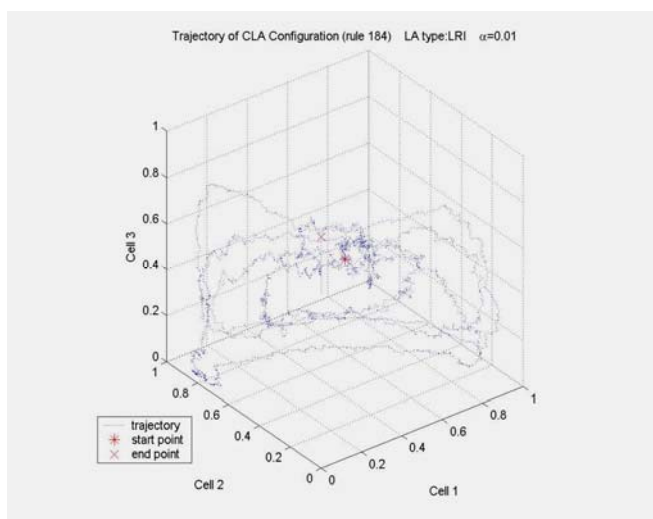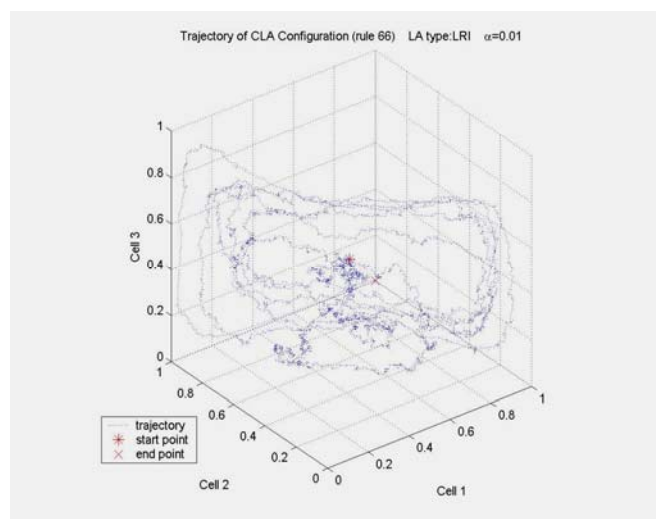


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$L_{RI}$

| (I ) | (II ) | (III ) |
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| (I    ) | (II     ) | (III      ) |
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