

hnasiri@aeoi.org.ir

meybodi@ce.aku.ac.ir

()

[2]

[3] [7]

[4]

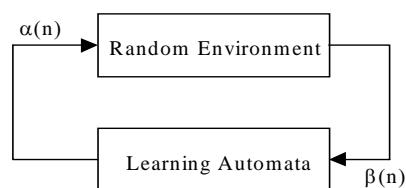
()

[3]

[3]

/

[Mars96][Nare89].



$$\alpha \equiv \{\alpha_1, \alpha_2, \dots, \alpha_r\}$$

$$\beta$$

$$\beta_2 = 0$$

$$E \equiv \{\alpha, \beta, c\}$$

$$c \equiv \{c_1, c_2, \dots, c_r\}$$

$$\beta_1 = 1$$

$$\beta \equiv \{\beta_1, \beta_2, \dots, \beta_m\}$$

$$P$$

$\beta(n)$

S

c_i

$\{\alpha, \beta, F, G, \phi\}$

$\phi \equiv \{\phi_1, \phi_2, \dots, \phi_s\}$

$\beta \equiv \{\beta_1, \beta_2, \dots, \beta_m\}$

$G: \phi \rightarrow \alpha$

$\beta(n)$

Q

$[0,1]$

α_i

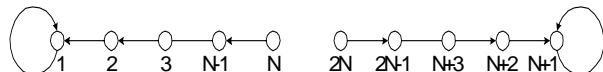
c_i

:

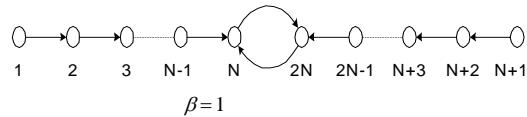
$\alpha \equiv \{\alpha_1, \alpha_2, \dots, \alpha_r\}$

$F: \phi \times \beta \rightarrow \phi$

$: L_{2N,2}$



$\beta=0$



$\beta=1$

$L_{2N,2}$

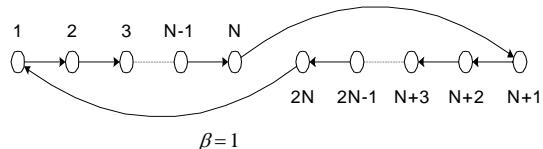
α_1

N

α_2

$L_{2N,2}$

$G_{2N,2}$



$\beta=1$

$G_{2N,2}$

$L_{2N,2}$

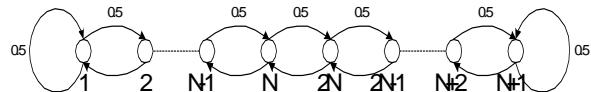
ϕ_{i+1}

/

$\phi_i (i \neq 1, N, N+1, 2N)$

: Krylov

ϕ_{i-1}



$\beta=1$

Krylov

:

Unfavorable

Stationary

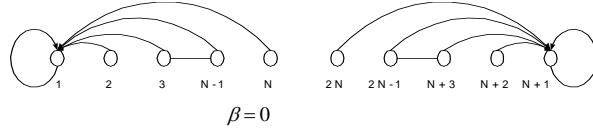
Non-Stationary

Fixed Structure

Actions

—————

$$\begin{array}{ccc}
L_{2N,2} & & \text{Krinsky} \\
\phi_1 & \phi_i (i=1,2,\dots,N) & \\
& N & \\
& L_{2N,2} & \\
& \phi_{N+1} & \phi_i (i=N+1,N+2,\dots,2N) \\
& &
\end{array}$$



Krinsky

$$\begin{array}{ccc}
\{\alpha, \beta, p, T\} & & \\
p = \{p_1, p_2, \dots, p_r\} & \beta \equiv \{\beta_1, \beta_2, \dots, \beta_m\} & \alpha \equiv \{\alpha_1, \alpha_2, \dots, \alpha_r\} \\
\alpha_i & p(n+1) = T[\alpha(n), \beta(n), p(n)] & \\
p_i(n) & & n \\
& & p_i(n) \\
& & p_i(n) \\
& & [Nare89]
\end{array}$$

$$\begin{aligned}
p_i(n+1) &= p_i(n) + a[1 - p_i(n)] \\
p_j(n+1) &= (1-a)p_j(n) \quad j \neq i \quad \forall j
\end{aligned}$$

$$\begin{array}{ccc}
p_i(n+1) = (1-b)p_i(n) & p_j(n+1) = \frac{b}{r-1} + (1-b)p_j(n) & \forall j \quad j \neq i \\
\text{b} & \text{a} & \text{b} \\
L_{RP} & a \quad b & L_{RP} \\
\text{[Nare89]} & & \text{[Mars96] [Meyb84] [Meyb82] [Laks81]}
\end{array}$$

[6]

[2,6]

Variable Structure

Linear Reward Pealty

Linear Reward Epsilon Penalty

Linear Reward Inaction

()

(BallDir_t) (BallDist_t)

(turn direction)

()

L_{RP}

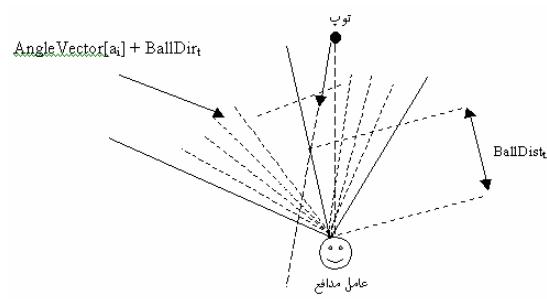
L_{RP}

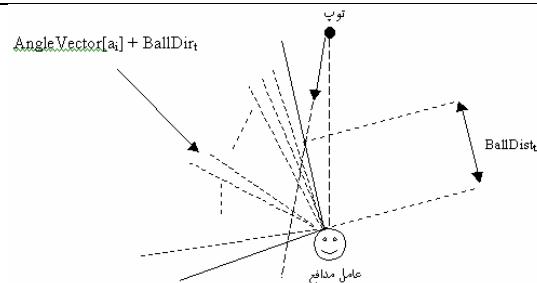
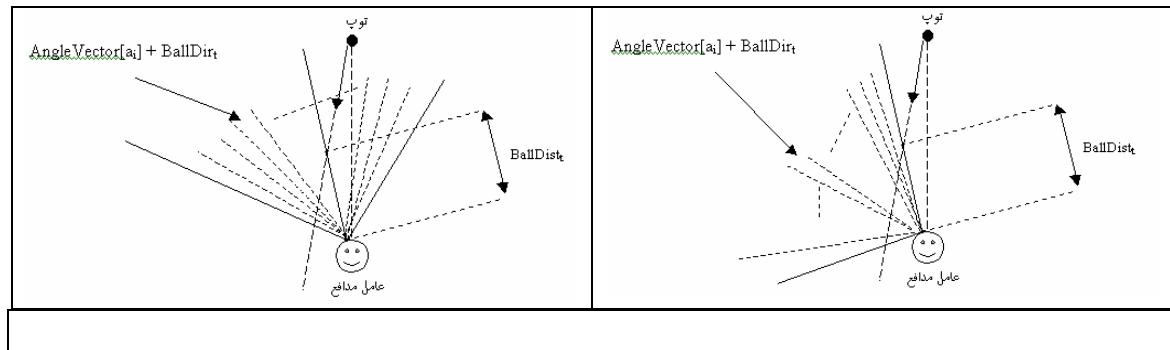
L_{RI}

()

Pentium III 500

()





L_{RI}

$: L_{RI}$

L_{RI}

/

/ L_{RI}

%	%	%	%	%	
%	%	%	%	%	

L_{RI}

/	/	/	/	/	/		
%	%	%	%	%	%	%	
%	%	%	%	%	%	%	

L_{RP}

$: L_{RP}$

L_{RP}

(/ /) = ()

$$(/ /) = (\quad \quad) \quad L_{RP} : \quad$$

%	%	%	%	%	
%	%	%	%	%	

$$L_{RP} : \quad$$

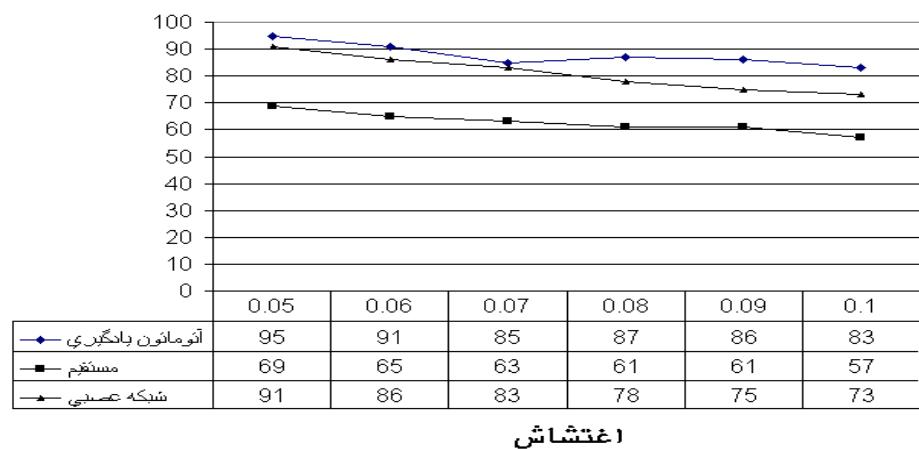
/	/	/	/	/	/		
%	%	%	%	%	%	%	
%	%	%	%	%	%	%	

$$L_{RI} \quad L_{RP} \quad L_{RI} \quad L_{RP} : \quad$$

$$(/ /) = (\quad \quad) \quad L_{RP} \quad L_{RP}$$

$$(\quad \quad) \quad L_{RI} \quad L_{RP}$$

مقایسه کارآیی روش‌های دریافت توب



[7]

[6]

[3]

)

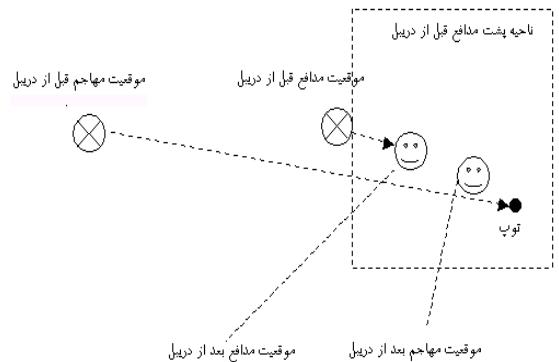
(

()

().

¹ Kickable Area

(SoccerServer)



(kick pow dir)

(kick pow dir)

L_{rp}

()

) (

$$\begin{array}{c} \mathbf{R}^2 \\ \mathbf{L}_{\text{rp}} \\ \mathbf{R}^4 \end{array}$$

()

()

		()				()		
%	%	/ /		Lrp	%	/ /		Lrp
%	%	/ /		Lrp	%	/ /		Lrp
%	%	/ /		Lrp	%	/ /		Lrp
%	%	/ /		Lrp	%	/ /		Lrp
%	%	/ /		Lrp	%	/ /		Lrp
%	%	/ /		Lrp	%	/ /		Lrp*
%	%	/ /		Lrp	%	/ /		Lrp
%	%	/ /		Lrp	%	/ /		Lrp
%	%	/		Lri	%	/		Lri*
%	%	/		Lri	%	/		Lri
%	%	/		Lri	%	/		Lri

% L_{ri}

L_{ri}

L_{rp}

L_{rp}

		()				()		
%	%	/		Lri	%	/		Lri
%	%	/ /		Lrp	%	/ /		Lrp*

%	%	%	%	

%	%	%	%	
%	%	%	%	

(kick power direction)

[7]

()

[6]

[6]

/

[9]

[10]

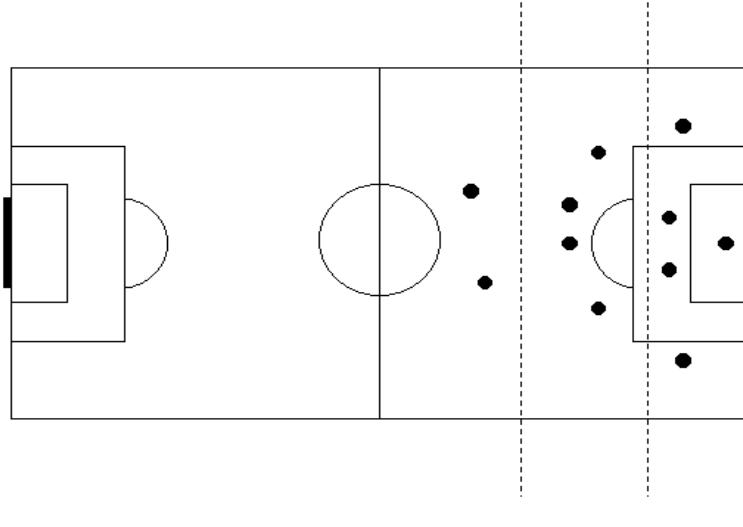
CMUnited)

([7]

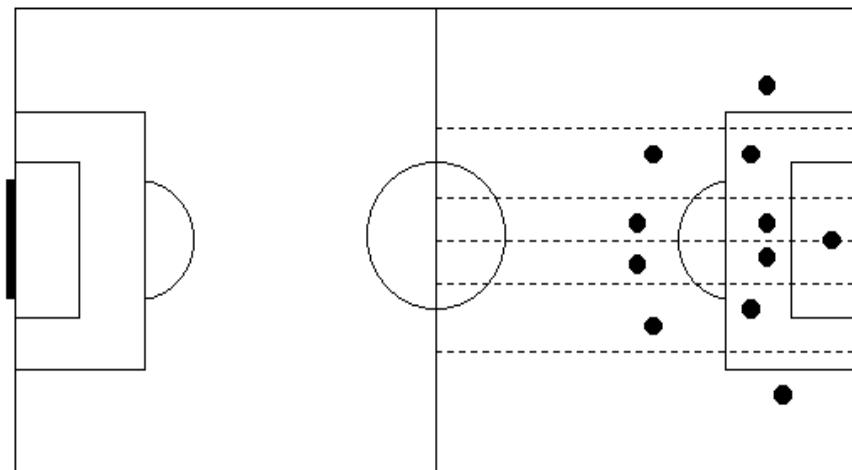
([10] FC Portugal)

[10]

()



()



$L_{2N,2}$,

$G_{2N,2}$, Krinsky

N

$L_{2N,2}$

N

N

$G_{2N,2}$

$L_{2N,2}$

N

N

N

N

Krinsky

$G_{2N,2}$

$L_{2N,2}$

N

N

n

N

(
L_{2N,2},

$G_{2N,2}$, Krinsky

N ≤ 4

$G_{2N,2}$

$L_{2N,2}$

Krinsky

/		

(%)

•
•
•
•

()

()

()

- [1] Flantge ,F. , C. Meyer , B. Schappel , Th. Uthmann , Enhancing the Adaptive Abilities , Department of computer science,Johannes Gutehberg-university Mainz D-55099Mainz , Germany , 2001.
- [2] Stone , P., and M. Velso , “Broad Learning from Narrow Training” ,Carnegi Melon University, Technical Report, Nov 1995.
- [3] Kaelbling, L. P., Littman, M. L., and Moore, A.W. (1996). Reinforcement Learning: A Survey, *Journal of Artificial Intelligence Research* Volume 4, pp. 237-285.
- [4] Narendra,K.S.,M.A.LThathachar,LearningAutomata,Prentice_Hall Inc. , Newyork , 1989.
- [5] Noda ,I.,M. Hitoshi,and H. Kazuo,“Learning Cooperative Behavior in Multi-Agent Enviroment” , PRICAL’96 Carins , Australia , pp.570-579, Aug,1996.
- [6] Stone ,P.,“Multilayered Learning in Multi-Agent Systems”,M.Sc. Thesis , Carnegi Melon University , USA , 1998.
- [7] Weiss,G. , Multi Agent Systems , The MIT Press , USA , 1999.
- [8] Gupta ,A.,R. Raina, and A. Mukherjee,Towards a “Perfect” dribbling strategy for Robot Soccer,Department of Computer Science and Engineering,Indian Institute of Technology,Kanpur,India,2001.
- [9] Dorer K., Robocup-99, “Extended Behavior Networks for the magmaFreiburg Team”, Team Descriptions Simaulation League, Team magmaFreiburg , <http://www.ep.liu.se/ea/cis/1999/007/17/>.
- [10] Asada, M.,A.Birk,E. Pagllo,Progressing in Robocup Soccer Research in 2000.