



An adaptive algorithm for super-peer selection considering peer's capacity in mobile peer-to-peer networks based on learning automata

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Abstract

Mobile peer-to-peer (MP2P) networks refer to the peer-to-peer overlay networks superimposing above the mobile ad-hoc networks. Heterogeneity of capacity and mobility of the peers as well as inherent limitation of resources along with the wireless networks characteristics are challenges on MP2P networks. In some MP2P networks, in order to improve network performances, special peers, are called super-peers, undertake to perform network managerial tasks. Selection of super-peers, due to their influential position, requires a protocol which considers the capacity of peers. Lack of general information about the capacity of other peers, as well as peers mobility along with dynamic nature of MP2P networks are the major challenges that impose uncertainty in decision making of the super-peer management algorithms. This paper proposes an adaptive super-peer selection algorithm considering peers capacity based on learning automata in MP2P networks, called SSBLA. In the proposed algorithm, each peer is equipped with a learning automaton which is used locally in the operation of super-peer selection by that peer. It has been shown that the suggested algorithm is superior to the existing algorithms. The results of the simulation show that the proposed algorithm can maximize capacity utilization by minimum number of super-peer and improve robustness against failures of super-peers while minimizing selection communication overhead.

Keywords

Mobile peer-to-peer network Super-peer Learning automata

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Appendix

In this section, we present the results of statistical tests. To evaluate the result of experiment, one way ANOVs and tuky statistical tests are used.

Table 2

One way ANOVs test

ANOVA**Method****Sum of Squares df Mean Square F Sig**

Between Groups 27,412.433 2 13,706.217 215.501 .000

Fig. 4 Within Groups 3625.300 57 63.602

Total 31,037.733 59

Between Groups 24,255.633 2 12,127.817 84.002 .000

Fig. 5 Within Groups 8229.350 57 144.375

Total 32,484.983 59

Between Groups 1.848E9 2 9.240E8 4.115 .021

Fig. 6 Within Groups 1.280E10 57 2.245E8

Total 1.465E10 59

Between Groups 10,929.433 2 5464.717 33.811 .000

Fig. 9 Within Groups 9212.750 57 161.627

Total 20,142.183 59

Between Groups 13,939.300 2 6969.650 21.514 .000

Fig. 10 Within Groups 18,465.300 57 323.953

Total 32,404.600 59

ANOVA**Method**

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	2993.033	2	1496.517	23.478	.000
Fig. 11 Within Groups	3633.300	57	63.742		
Total	6626.333	59			

Table 3

Tuky test

Multiple Comparisons

method
Tukey HSD

		95 % Confidence Interval				
(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.		
Allscenario	Allscenario				Lower Bound	Upper Bound

SSBDC -1.45000000 2.52193883E0 .834 -7.5188394 4.6188394

MIS

SSBLA 44.60000000* 2.52193883E0 .000 38.5311606 50.6688394

MIS 1.45000000 2.52193883E0 .834 -4.6188394 7.5188394

Fig. 4 SSBDC

SSBLA 46.05000000* 2.52193883E0 .000 39.9811606 52.1188394

MIS -4.46000000E1* 2.52193883E0 .000 -50.6688394 -38.5311606

SSBLA

SSBDC -4.60500000E1* 2.52193883E0 .000 -52.1188394 -39.9811606

MIS 9.65000000* 3.79966527 .036 .5064165 18.7935835

MIS

SSBLA -37.00000000* 3.79966527 .000 -46.1435835 -27.8564165

MIS -9.65000000* 3.79966527 .036 -18.7935835 -.5064165

Fig. 5 SSBDC

SSBLA -46.65000000* 3.79966527 .000 -55.7935835 -37.5064165

MIS 37.00000000* 3.79966527 .000 27.8564165 46.1435835

SSBLA

SSBDC 46.65000000* 3.79966527 .000 37.5064165 55.7935835

Fig. 6 MIS

SSBDC -2370.10000000 4738.46128182 .872 -1.3772819E4 9032.6192591

	SSBLA	10,407.30000000	4738.46128182 .080	-995.4192591	21,810.0192591
	MIS	2370.10000000	4738.46128182 .872	-9032.6192591	13,772.8192591
SSBDC					
	SSBLA	12,777.40000000*	4738.46128182 .025	1374.6807409	24,180.1192591
	MIS	-10,407.30000000	4738.46128182 .080	-2.1810019E4	995.4192591
SSBLA					
	SSBDC	-12,777.40000000*	4738.46128182 .025	-2.4180119E4	-1374.6807409
	SSBDC	-.65000000	4.02028846	.986	-10.3244951
MIS					
	SSBLA	28.30000000*	4.02028846	.000	18.6255049
	MIS	.65000000	4.02028846	.986	-9.0244951
Fig. 9 SSBDC					
	SSBLA	28.95000000*	4.02028846	.000	19.2755049
	MIS	-28.30000000*	4.02028846	.000	-37.9744951
SSBLA					
	SSBDC	-28.95000000*	4.02028846	.000	-38.6244951
	MIS				-19.2755049
Fig. 10					
	SSBDC	-.85000000	5.69168368	.988	-14.5465710
MIS					
	SSBLA	-32.75000000*	5.69168368	.000	-46.4465710
	SSBLA				-19.0534290

	MIS	.85000000	5.69168368	.988 -12.8465710	14.5465710
SSBDC	SSBLA	-31.90000000*	5.69168368	.000 -45.5965710	-18.2034290
	MIS	32.75000000*	5.69168368	.000 19.0534290	46.4465710
SSBLA	SSBDC	31.90000000*	5.69168368	.000 18.2034290	45.5965710
	SSBDC	8.75000000*	2.52471989	.003 2.6744682	14.8255318
MIS	SSBLA	-8.55000000*	2.52471989	.004 -14.6255318	-2.4744682
	MIS	-8.75000000*	2.52471989	.003 -14.8255318	-2.6744682
Fig. 11 SSBDC	SSBLA	-17.30000000*	2.52471989	.000 -23.3755318	-11.2244682
	MIS	8.55000000*	2.52471989	.004 2.4744682	14.6255318
SSBLA	SSBDC	17.30000000*	2.52471989	.000 11.2244682	23.3755318

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