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Performance Enhancement of Spectral efficiency and throughput with Distributed Dynamic channel allocation using genetic algorithm

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ABSTRACT- The efficiency associated with mobile systems will depend on a good channel allocation method. Some sort of genetic algorithm (GA) dependant on distributed dynamic channel allocation model is offered. Mobile service stations (MSS) help to make every one of the channel allocation decision intended for mobile hosts in that cell based on the local information. Proposed model which reuses available channels more efficiently. A reserved pool associated with channels in each and every cell to make the model fault tolerant which allows any mobile or portable to continue communication with its mobile hosts within the absence of adequate channel within the cell. Therefore, the offered GA intended for distributed dynamic channel allocation to reinforce the spectral efficiency along with throughput of the cell network. Simulation results evaluate the performance of the distributed dynamic channel allocation based on genetic algorithm.

Keywords- Spectral efficiency, throughput, distributed dynamic channel allocation, genetic algorithm.

1. INTRODUCTION

An important problem within the operation of the cellular phone method is actually how effectively utilize accessible bandwidth to provide very good services to as many customers as possible. This matter has grown important using the swift growth in the number of cellular telephones. Mobile telephone systems leverage the idea that numerous callers can use any communication channel i.e. a group of frequencies can be employed concurrently in case these types of callers tend to be spaced actually far separated in a way that their message or calls tend not to intervene together. The particular minimal distance at which there is no disturbance is called the channel reuse constraint [2]. In the cellular system, the particular area is usually divided into several regions known as cells. Within each cell there exists a base station that addresses all the cell phone calls made within the cell. The total obtainable bandwidth is usually divided into a number of channels. Channels must then be allotted to cells and to calls without violating the particular channel reuse constraint. There are lots of methods to do this, most of that are much better than other in terms of how reliably they make channels for available to new calls. If no channel is available for a new the call is usually missing, or maybe impeded, which can be undesirable [1-2]. The Genetic Algorithm (GA), useful for optimization problems, is dependent on the Darwin's idea theory of "survival of the fittest." Individuals, from the population of potential solutions, reproduce as well as solutions are enhanced successively over the number of generations. Not too long ago, the use of GA has captivated the attention regarding researchers of several disciplines (e.g., operation research, economics, social sciences, life sciences, etc.) pertaining to trouble solving [3, 4].

2. SYSTEM MODEL

The model is suggested [5] by utilizing GA based techniques for distributed dynamic channel allocation. The proposed model falls under the resource planning model. With this model, each of the channels is kept within a collection which is known to each cell. Channels are not pre-allocated to any cell except reservation of some channels for handoff calls for real time connections. In the proposed model, a MSS tends to make the channel allocation decision on behalf of the mobile hosts using genetic algorithm. When a mobile host in a cell needs a channel to support a session, if it is unavailable in the cell, it sends a request to the neighboring MSSs to learn accessibility of any free channel [6]. From a rounded of concept exchange together with neigh-boring cells, the channel will be transferred to the particular requesting cell.

Local Variables

Ac is the offered load, N is the number of channels, W is the bandwidth of the channel, *c* is cluster size and *a* is area in square meters. T_h is the throughput of the system, W is the bandwidth of the channel.

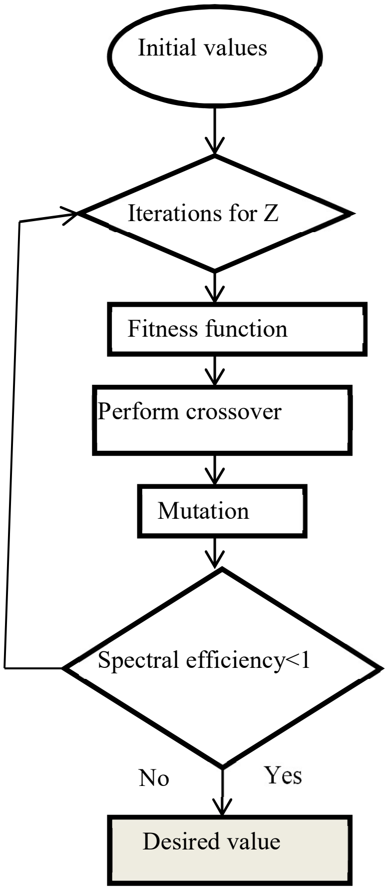

Fig.1. Operations in Genetic algorithm

3. GENETIC ALGORITHM

The processing steps for the genetic algorithm for distributed dynamic channel allocation is shown in Fig.1 are as follows

1. Generate chromosome of Z elements. Each element in the chromosome is a cell allocated to a user. Thus the population is a 2D array, where the row represents the cell number and column of the array represents the channels.
2. Evaluate the DDCA-G (Distributed dynamic channel allocation based genetic algorithm) method to allocate channel bandwidth for a specified area of a given offered load and cluster size calculates the spectral efficiency and throughput.
3. Perform the crossover operation for the given fitness function between MDDCA (Modified Distributed Dynamic channel allocation) and DDCA-G.
4. Perform the mutation operation between MDDCA and DDCA-G to obtain the optimum value of Spectral efficiency and throughput.

4. RESULTS AND DISCUSSIONS

To show the performance of proposed algorithm in this paper, N is the number of channels 8, 16, 32 for an area of 10m^2 with different bandwidths of 900 KHz, 500 KHz and 400 KHz and number of user's β are 64. Respective plots are shown in Figs (2-7). The Fitness function (spectral efficiency) 'S' is represented in Equation [1]

$$S = Ac/ (N*W*c*a) \; (b/sec/KHz/m^2) \text{ --- } [1]$$

The Fitness function (throughput)

$$T_h = S*W \quad \text{bits/sec} \quad \text{-------------------} \; [2]$$

The mean spectral efficiency at 400 KHz using DDCA-G from (n=1 to 8) is 0.20875 b/sec/KHz/m^2, with MDDCA is 0.111875 b/sec/KHz/m^2 is shown in Fig.2.The performance improvement of spectral efficiency with DDCA-G at (n=1 to 8) for 400 KHz is 86.57% when compared with MDDCA technique. The mean spectral efficiency at 500 KHz using DDCA-G from (n=1 to 8) is 0.175875 b/sec/KHz/m^2, with MDDCA is 0.0955 b/sec/K Hz/m^2. The performance of spectral efficiency with DDCA-G from (n=1 to 8) for 500 KHz is 87.17% is better than the MDDCA technique. The improvement in the performance of spectral efficiency at 900 KHz channel bandwidth for (n=1 to 8) is 92.85.06% is better than the MDDCA technique. The spectral efficiency with DDCA-G is better than MDDCA for channel bandwidth of 400 KHz, 500 KHz and 900 KHz. The performance of mean throughput with DDCA and MDDCA at (n=1 to 8) at 400 KHz channel bandwidth is 32.3%. The variation in mean throughput with DDCA-G (for n=1 to 8) of 500 KHZ results in 34.53% is better than MDDCA. The variation in mean throughput with DDCA-G (for n=1 to 8) of 900 KHZ results in 44.093% is better than MDDCA is shown in Fig.3.

The mean spectral efficiency at 400 KHz using DDCA-G from (n=2 to 16) is 0.33 b/sec/KHz/m^2, with MDDCA is 0.21 b/sec/KHz/m^2 is shown in Fig.4.The performance improvement of spectral efficiency with DDCA-G at (n=2 to 16) for 400 KHz is 57.14% when compared with MDDCA technique. The mean spectral efficiency at 500 KHz using DDCA-G from (n=2 to 16) is 0.28875 b/sec/KHz/m^2, with MDDCA is 0.1825 b/sec/K Hz/m^2. The performance of spectral efficiency with DDCA-G from (n=2 to 16) for 500 KHz is 58.21% is better than the MDDCA technique. The improvement in the performance of spectral efficiency at 900 KHz channel bandwidth for (n=2 to 16) is 70.43% is better than the MDDCA technique. The spectral efficiency with DDCA-G is better than MDDCA for channel bandwidth of 400 KHz, 500 KHz and 900 KHz. The performance of mean throughput with DDCA and MDDCA at (n=2 to16) at 400 KHz channel bandwidth is 34.71% is shown in Fig.5. The variation in mean throughput with DDCA-G (for n=2 to 16) of 500 KHZ results in 28.83% is better than MDDCA. The variation in mean throughput with DDCA-G (for n=1 to 8) of 900 KHZ results in 17.70% is better than MDDCA.

The mean spectral efficiency at 400 KHz using DDCA-G from (n=4 to 32) is 0.53875 b/sec/KHz/m^2, with MDDCA is 0.47 b/sec/KHz/m^2 is shown in Fig.6.The performance improvement of spectral efficiency with DDCA-G at (n=4 to 32) for 400 KHz is 14.62% when compared with MDDCA technique. The mean spectral efficiency at 500 KHz using DDCA-G from (n=4 to 32) is 0.48875 b/sec/KHz/m^2, with MDDCA is 0.3355 b/sec/K Hz/m^2. The performance of spectral efficiency with DDCA-G from (n=4 to 32) for 500 KHz is 45.67% is better than the MDDCA technique. The improvement in the performance of spectral efficiency at 900 KHz channel bandwidth for (n=4 to 32) is 98.92% is better than the MDDCA technique. The spectral efficiency with DDCA-G is better than MDDCA for channel bandwidth of 400 KHz, 500 KHz and 900 KHz. The performance of mean throughput with DDCA and MDDCA at (n=4 to 32) at 400 KHz channel bandwidth is 52.03%. The variation in mean throughput with DDCA-G (for n=4 to32) of 500 KHZ results in 53.88% is better than MDDCA is shown in Fig.7. The variation in mean throughput with DDCA-G (for n=4 to32) of 900 KHZ results in 30% is better than MDDCA.

5. FIGURES

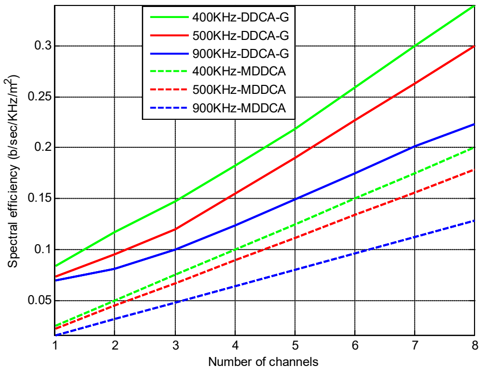

Fig. 2. Spectral efficiency Vs number of channels (n=8)

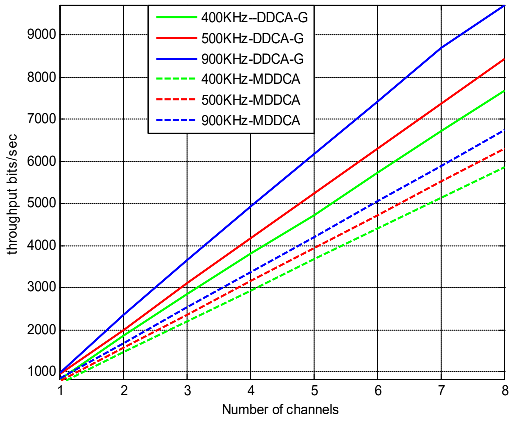

Fig. 3.Throughput Vs number of Channels (n=8)

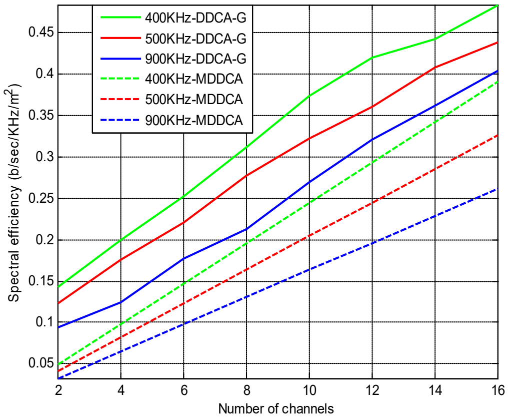

Fig. 4.Spectral efficiency Vs number of channels (n=16)

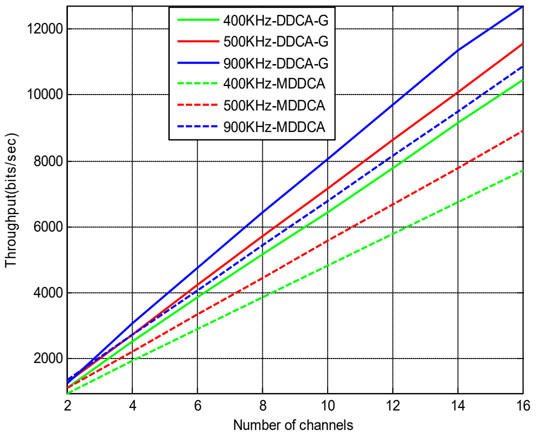

Fig. 5. Throughput Vs number of Channels (n=16)

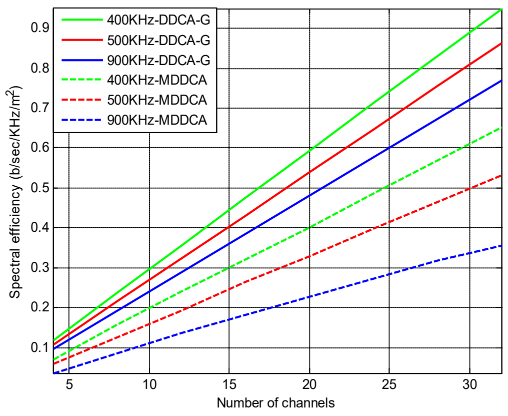

Fig. 6. Spectral efficiency Vs number of Channels (n=32)

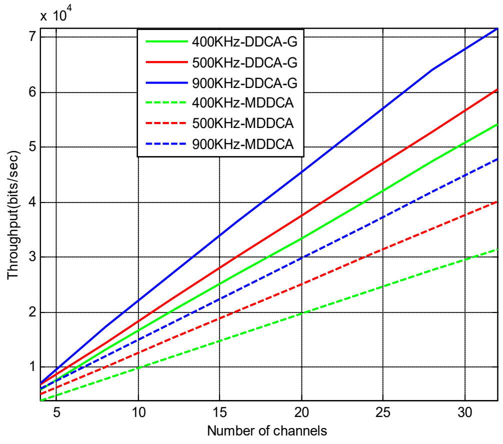

Fig. 7.Throughput Vs number of Channels (n=32)

GA based model with regard to distributed dynamic channel allocation to optimize channel usage in a mobile computing network. Curves for the Spectral efficiency and Throughput have been generated and compared with DDCA-G and MDDCA. Performance of the proposed model was evaluated by simulation results to observe that improvement of spectral efficiency with genetic algorithm for distributed dynamic channel allocation. Throughput of the system is improved for the required number of channels using genetic algorithm [7-10].

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