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Reduce Intervention in Cognitive Cellular Network By Applying Cuckoo Search Algorithm

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Abstract:- Now a day's mobile customers are will increase tremendously, to finish their necessities with growing channel allocation the Cognitive Cellular Network is crucial to do not forget. CCN be made up a subscribe as mobile and cognitive as unsubscribe person which can be makes use of the mobile band through stopping intervention. The Cuckoo Search Algorithm is taken into consideration to lessen intervention among spectrum allocation for subscriber and unsubscribe customers. CS is cutting-edge nature-stimulated algorithms, that is invited through Yang and Deb [10]. CS do not forget the brood parasitism hobby of a few cuckoo species .Proposed CS is determined greater higher than BCO PSO and ABC , SINR acquired with proposed CS is determined to be higher in comparison to pronounced paintings with Particle Swarm Optimization (PSO), Artificial Bee Colony (ABC) .

Keywords:- *Cuckoo Search Algorithm(CS) ,Cognitive Cellular Network (CCN), Subscribe User(SU), Unsubscribe User (UU), SINR.*

I. INTRODUCTION

The cellular user population is increases tremendously due to that the restriction in spectral space becomes an essential subject now a day's .The operators are assign with less number of spectrum and users are more today which are increases the data cost . Hence we need to optimize the use of limited spectrum efficiently [1]. In real time each operator has to provide spectra to the unsubscribe user dynamically to each cell .The unsubscribe user can use the spectrum without disturbing the subscribe user this is the concept of cognitive radio. 'Spectrum mobility' state that when the spectrum is hold by the subscribe user then unsubscribe user switches to the other spectrum [2]. The spectrum can be used optimally by properly co-ordination between subscribe and unsubscribe user. The numbers of users are present within the spectrum in real time because of that this process is computationally complex.

The AI (Artificial intelligence) provides an excellent solution for the complex computation problem like spectrum allocation. Particle Swarm optimization, Genetic algorithm and Artificial Bee Colony Optimization Algorithm are the different AI techniques.[6][7]

To get optimal spectrum allocation the cuckoo search algorithm is used in this proposed system.

We will see the following section in this paper
Section II Cuckoo search algorithm ,Section III employing CS to CCN section IV parameters ,section V Results and Conclusion is describe in section IV.

II. CUCKOO SEARCH ALGORITHM

CS is present day nature-stimulated algorithms, that is invited with the aid of using Yang and Deb [10]. CS considers the brood parasitism pastime of a few cuckoo species. Proposed paintings nation that CS offers the higher outcomes than BCO, PSO and ABC. To growth the hatching opportunity in their personal eggs, Cuckoo birds use the nest of different host birds to put their eggs with extraordinary competencies along with deciding on nests containing lately laid eggs and doing away with present eggs. Some of the host birds are capable of combat this parasitic conduct of cuckoos and throw out the located alien eggs or construct a brand new nest in a awesome location. This assessment manner of cuckoo birds is used to increase the CS algorithm. Three idealized regulations proposed with the aid of using Yang and Deb to simplify the cuckoo replica manner:

1. An egg represents an answer and is saved in a nest.
2. An synthetic cuckoo can placed handiest one egg at a time.
3. The maximum appropriate nest searched with the aid of using cuckoo birds to lay the eggs (solution) to maximize its eggs'
4. Survival rate. An elitist choice approach is applied, So that handiest awesome eggs (fine answers near the most fulfilling value) which can be greater much like the Host chook's eggs have the possibility to develop (next generation) and come to be mature cuckoos.
5. The wide variety of host nests (population) is fixed. The worse eggs are located with the aid of using the host chook with a possibility of $pa \in [0, 1]$, and those eggs are vanishes or nest is immoderate, and a totally new nest is constructed in a brand new location. Otherwise, the egg matures and lives to the subsequent generation. New eggs (answers) lay with the aid of using a cuckoo pick the nest with the aid of using Levy flights across the Current fine answers.

III. EMPLOYING CS TO WIRELESS NETWORK

By considering the action of the cuckoo bird's life cycle The CS algorithm is developed. Three different process define the reproduction mechanism of cuckoo birds. Steps for CS are explained as follows.

Algorithm: CS algorithm

1) Take Input**:** p, N and gene
(2) Initialize $\mathbf{E}^0(k = 0)$
(3) **until** (k = 100. gene)
(5) $\mathbf{E}^{k+1} = \mathbf{e}^{k+1}{}_i = \mathbf{e}^k{}_i + \mathbf{c}_i$.
%If E^{k+1} is worst select the new nest
%enlist selecting strategy
(6) $\mathbf{E}^{k+1} = \mathbf{e}^{k+1}{}_i = \mathbf{e}^{k+1}{}_i = \mathbf{e}^{k+1}$, if $f(\mathbf{e}^{k+1}{}_i) < f(\mathbf{e}^k{}_i)$
$= \mathbf{e}^k$, otherwise,
% Constructing New Solutions by replacing of Some Nests
(7) $\mathbf{E}k+2. = \mathbf{e}^k{}_i + \text{rand}(\mathbf{e}^k{}_{d1} - \mathbf{e}^k{}_{d2})$,with probability pa,
$\mathbf{e}k$, with probability $(1 - pa)$
(8) $\mathbf{E}k+1 = \mathbf{e}^{k+1}{}_i = \mathbf{e}^{k+1}{}_i = \mathbf{e}^{k+1}$, if $f(\mathbf{e}^{k+1}{}_i) < f(\mathbf{e}^k{}_i)$
$= \mathbf{e}^k$, otherwise
(9) **end until**

3.1 Wireless Network

To use the spectrum successfully in CCN the intervention corporation is required among the subscribed consumer and unsubscribe consumer. the first cell is thought as macro and secondary called a Femto within side the CCN concept. The subscribe consumer called macro at the same time as unsubscribe consumer known as Femto which makes the priority in spectrum get entry to and warfare resolution. the help allocation hassle thanks to sharing of the spectrum of the subscribe consumer via way of means of the unsubscribe consumer. Hence device have to be layout in any such manner that the unsubscribe consumer does now not make intervention with the subscribe consumer.[4] during this paper we're puzzling over the a pair of macro consumer and base stations those are positioned near the center of insurance region are protected via way of means of micro mobile . The secondary Femto cells are unfold similarly everywhere within the macro mobile region [3]. during this process among the subscribe and unsubscribe mobile hyperlink is created (the hyperlink among Femto base station and Femato users). The most energy is transferred via way of means of the Macro base station and Femto base station as a result the final energy is consistent over the community [6]. From LTE cell community 25 MHz bandwidth is recall for favored channel.

3.2 Relation between CS and wireless network parameters

CS algorithm are related to wireless network as follows.

Table 1: Relation between CS and wireless network parameters

Sr. No.	CS parameters	CCN Parameters
1	Number of Cuckoo's egg used for searching (S)	Number of unsubscribe user
2	Dimension of search space (p)	Searching range of unsubscribe user zone
3	Number of new generation	Increment in searching step for unsubscribe consumer
4	Probability of discarding eggs	The probability that every unsubscribe user going to be rejected .

IV. PARAMETERS

For cluster formation Signal to Noise and Interference Ratio (SINR) is taken into account, SINR is defining because the ratio of amount of inference power received at receiver to the ability of noisy signal. SINR for unsubscribe links is given by [6].

$$SINR = \frac{P(a)/lds(b)^{\beta}}{\sum_{m\in\Phi} P(c)/dss(c,a)^{\beta} + P(e)/dps(e,a)^{\beta}}, 1 \le a \le uu \quad (1)$$

Where, P (a), P (c) is that the power transmitted by the unsubscribe transmitter a and c respectively while P (e) is that the power transmitted by the subscribe transmitter e, lds(b) is that the distance between transmitter and receiver referred as link distance. dss(c, a) is that the distance between transmitter and receiver of secondary users. dps (e,a) is that the distance between subscribe transmitter and unsubscribe receiver,.

At each primary link SINR is given by

$$SINR = \frac{P(e)/ldp(e)^{\beta}}{\sum_{k\in\Phi} P(c)/dps(c,e)^{\beta}}, 1 \le e \le s(u) \quad (2)$$

Where dps(c,*el*) is the distance between subscribe transmitter and unsubscribe receiver. s(u) is the number of primary links presented in the area. β is SINR threshold.

V. RESULTS

For simulation in CCN we are considering the 6 subscribe consumer and 25 unsubscribe consumer which are located in the area of 6000X6000.We are considered 100 iterations in order to allocate the unsubscribe users optimally by using CS Fig.1 shows the scenario of CCN, the small dots indicate Pri, the astric mark indicates Sri. Base station is centrally located. The final optimized locations after applying CS is represented **in Fig.2**

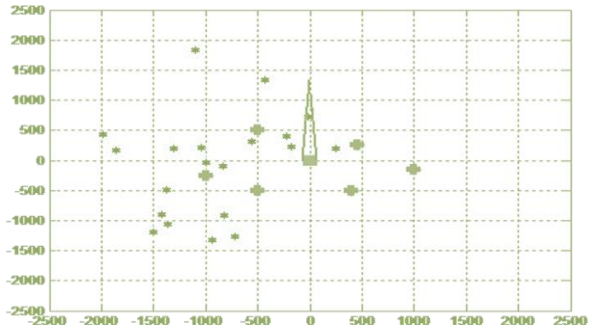

Fig.1 Starting position of Subscribe and unsubscribe user

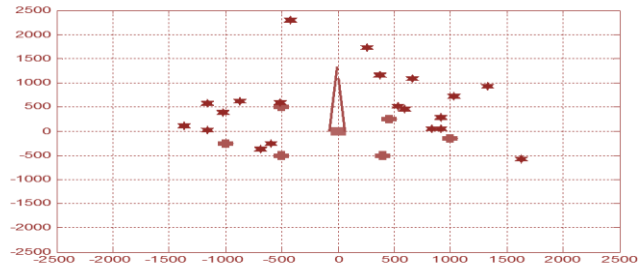

Fig.2 Location of subscribe and unsubscribe user after applying CS

Table 1: Results for CS

Sr. No.	Results for CS	Value
1	Iterations	25
2	SINR Threshold value(β)	0
3	Time required	20.03 Secs

The SINR is determined with different threshold values i.e. β=4,6. This simulation is done in MATLAB. The PC configuration is given in Table 2.

Particle Swarm Optimization (PSO) is AI technique inspired by bird flocking together [8].

Ant bee colony (ABC) [9] technique explores the behavior of honey bees to gather food. It is use for solving complex and high dimensional benchmark optimization functions. But drawback is lack of use of secondary information. Computational cost can be increases with increase in population of solution.

BCO[10] technique is based on life cycle of E-coil bacteria . In BCO [10] the time required to execute the algorithm for beta=6 is 25.32 sec ,for CS is better as compare to PSO and BCO it requires only 20.03 sec.

In [8][9] the same scenario is simulated with PSO, and ABC ,BCO. The results obtain with CS is compared with PSO [8],ABC[9],BCO[10].

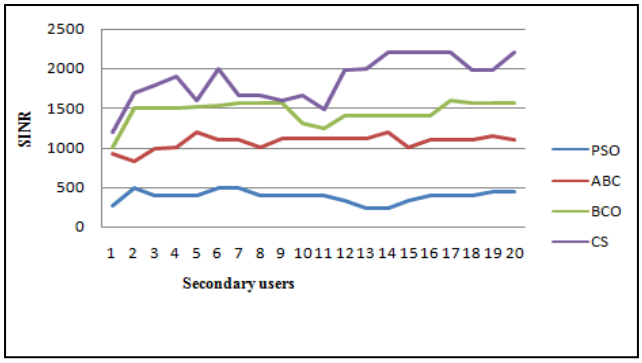

Fig.3. Result analysis between PSO[8] ,ABC[9] , BCO[10] with CS for SINR threshold β=4

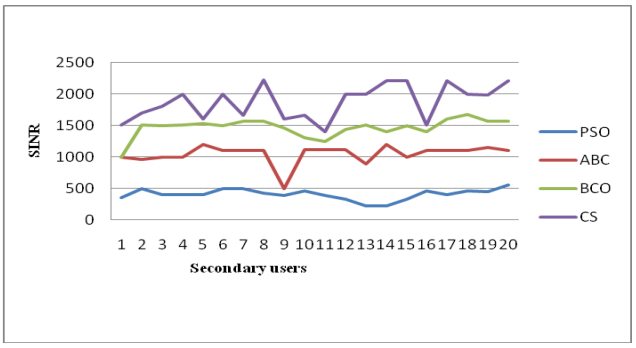

Fig.4. Result analysis between PSO [8] ,ABC[9] , BCO [10] with CS for SINR threshold β=6

VI. CONCLUSION

The interference in CCN can be reduce by using CS technique which is proposed in this work .The unsubscribe secondary user is assigned optimally. The maximum SINR can be achieved by using the CS technique which is also used to minimize the intervention between subscribe and unsubscribe user. The results show CS gives better performance than existing work with PSO, ABC and BCO.

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