Adaptive new dynamical priority coding for cooperative cognitive radio networks

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Abstract-An Adaptive New Dynamic Priority Coding (ANDPC) scheme conceived for Cooperative Cognitive Radio (CCR) is proposed for conceiving a novel ANDPC-CCR system. The framework is intended for supporting interchanges between various Primary Users (PUs) and a typical Base Station (BS), where the free source data is transmitted from the PUs to the BS with the guide of numerous Cognitive Users (CUs) going about as Relay Nodes (RNs). With a specific end goal to encourage the recuperation of the source data at the BS, the CUs conjure the ANDPC strategy, which is helped by our agreeable convention working by trading the CCR-based control data between close immediately Adaptive Turbo Trellis Coded Modulation (ATTCM) and system coding codec and also between the CUs and the BS. This paper tends to relay selection (RS), power allocation (PA) issues for a physical layer network coding (PNC) hand-off based secondary user (SU) correspondence in psychological radio systems. Subsequently, our novel ANDPCCCR framework built on the essential of our all encompassing methodology is equipped for giving an expanded throughput, in spite of decreasing the transmission-time of the PU. This lessened transmission period can likewise be straightforwardly converted into an expanded term for auxiliary interchanges of the CUs. In our proposed ANDPC-CCR plot, both the PUs and CUs utilize previous ATTCM scheme. Quantitatively, it was discovered that the joint all encompassing plan of our ANDPC-CCR plot is either equipped for arranging for an PU’s bandwidth is efficient in contrast with its non-agreeable partner, or expanding the achievable throughput by 3 bit/symbol.

I. INTRODUCTION

The well known Cognitive Radio (CR) system is fit for misusing the briefly accessible range openings in the recurrence area. In the event that a phantom space isn't utilized by the Primary Users (PUs), at that point the Cognitive Users (CUs) (or optional clients) would pick up a chance to get to it for [1]– [3]. Spectrum distribution and sharing techniques have been widely investigated, so as to abuse the spectral bands more efficiently and to provide mutual benefits for the PUs and CUs [4]. However, both the availability and quality of a released spectral band is crucially influenced by both the specific activity and the competition between the PUs and CUs [4]. In this specific situation, the most widely recognized ideal models in range portion and sharing are the underlay, overlay and interwave plans [5]. In the underlay conspire, the CUs are permitted to transmit their information all the while with PUs, gave that the impedance forced stays underneath as far as possible. As opposed to the underlay plot, the impedance forced on the PUs under the overlay plan might be counterbalanced by utilizing some portion of the CU's energy to transfer the PU's data. At long last, in the interwave conspire; the CUs maintain a strategic distance from synchronous transmissions with the PUs [5].

Cooperative correspondence constitutes a novel worldview that guarantees noteworthy changes by giving either an enhanced uprightness or an expanded throughput with the appearance of client collaboration [6], [7]. Subsequently, as of late, various energizing new utilizations of transfer helped correspondences have risen [8]. More specifically, we have researched the utilization's of hand-off helped interchanges which may include the Physical Layer [9], as well as the Medium Access Control [10], and the system layer and additionally their cross-layer activity [11]. One of the rising applications depends on supporting correspondences between the source and goal hubs with the guide of helpful conventions. A refined medium access convention was planned in [10], [12] for interchanges between the source and transfer hubs, which depended on proficient regulation and coding [13], [14]. Additionally, in organize coding supported frameworks intended for multi-client activity, the clients can likewise go about as participating accomplices or transfers keeping in mind the end goal to share their assets and to help each other in their data transmission [15]– [18].

Nonetheless, since every single diverse connection in remote transmissions have joint power requirements, the factual postponement bound QoS provisioning should be together considered for all connections all the while. Under this situation, the clients in the remote portable systems need to fulfill diverse deferral bound QoS necessities under the joint power constraint. This kind of technique is defined as the heterogeneous statistical delay bound QoS provisioning [19] [20] [21], which have imposed many new challenges for resource allocation for different wireless links. Various current works has been centered on a singular kind of organization passed on by SUs. Starting late CRN needs support to heterogeneous organizations with various QoS necessities. Two tier game approach like RA-Game and PS-Game technologies are used to improve the maximize utility of the entire network and improved significant throughput [22].

II. RELATED WORK

Optimal selection approach (OSA) was proposed by Sribindu sattu in [23], to select the user before knowing position of user and knows efficiency of user. They used two users. Second user transmission depends on first user transaction process. Dynamic Network Codes (DNC) were proposed by Ming in [15], where every client communicates its own particular data outlines both to the Base Station (BS) and in addition to alternate clients amid the principal transmission period. After this stage, every client transmits a non-double straight blend of its own casing and in addition of the other clients' data outlines, to the BS [15]. The group of Generalized Dynamic Network Codes (GDNC) [16], [17] constitutes an expansion of DNCs. As opposed to [15], in the proposition of [17] every client is permitted to communicate a few data outlines amid the communicate stage through orthogonal channels [17], and also to transmit a few non-paired direct blends, as equality outlines amid the helpful stage by means of orthogonal channels. Keeping in mind the end goal to expand the normal transmission rate of GDNC without diminishing its decent variety arrange, in [16] a versatile system code configuration has been proposed.

In this paper, we think about collaboration between the Pus and CUs, where the CUs may go about as system coding supported relay nodes (RNs) for passing on data transmitted from the PUs. Our commitments in [24], [25] just thought to be straightforward RNs without the ability of conjuring system coding. All the more unequivocally, the system coding plans of [15]–[18] were naturally amalgamated with a dynamic participation based overlay arrange considered for a CR framework.

The CRN system has primary users (PUs) and secondary users (SUs) with dissimilar service requirements in heterogeneous networks. The secondary base station (BS) is in charge of asset portion for various SU's [26] present in the system. The secondary users have different scenario are: SU with minimum-rate guarantee (MRG) [13], SU with minimum delay guarantee (MDG), SU with minimum rate and postpone guarantee (MRDG) and SU with best exertion benefit (BE).

III. PROPOSED SYSTEM

In the existing problem, ATTCM (Adaptive Turbo Trellis Coded Modulation) is advocated for judiciously selecting a suitable modulation mode as per the close momentary direct condition experienced in every transmission connect, which would prompt the lessening of the PU's transmission control or potentially to the expansion of the by and large system throughput, hence simultaneously saving bandwidth for the CUs.

In our ANDPC scheme, we assume that the network-coding decoder at the BS is capable of sending back a feedback flag to the network encoders at the CN/RNs. The transmission of the parity frames from the CUs is controlled by this feedback flag. Additionally, we conceive and analyze an efficient ANDPC scheme using two methods, namely C1 and C2 associated with different amount of feedback requirements.

i) ANDPC-C1: The ANDPC-C1 adaptively adjusts the number of frames transmitted from the CUs for each transmission session. The BS feeds back a single bit, S_f, following the reception of a set of (L x c_1) information frames from the L PUs. If the CU/RNs received V_f = 0, this implies that the BS has failed to correctly decode the information frames received from all the PU/SNs and hence the CU/RNs have to transmit (P x c_2) parity frames to the BS. Otherwise, if the BS successfully decoded the PU's information, the value of the feedback flag is set to V_f= 1. Let us a chance to signify the quantity of CUs invoked in an actual transmission by employing the ANDPC technique during the cooperative phase as P'. The actual number of information frames, $K'm_2$, transmitted from the P CUs by the ANDPC-C1 technique obeys the following rules:

$$P'c_2 = \begin{cases} 0, & V_f = 1; \\ Pc_2, & V_f = 0; \end{cases}$$

Where c_2 denotes the number of information frame transmitted per CU.

ii) ANDPC-C2: In contrast to ANDPC-C2, in the ANDPC-C2 scheme we assume that the BS feeds back L bits associated with the L PUs, namely V_{f_l}, to the CUs. Additionally, if the CUs received

$$\sum_{l=1}^{L} (V_{f_l}) = 0,$$

This implies that the BS has failed to correctly decode all the information packets received from the PUs and hence the CUs have to transmit the same number of parity frames to the BS. Otherwise, the CUs do not have to transmit, provided that we have

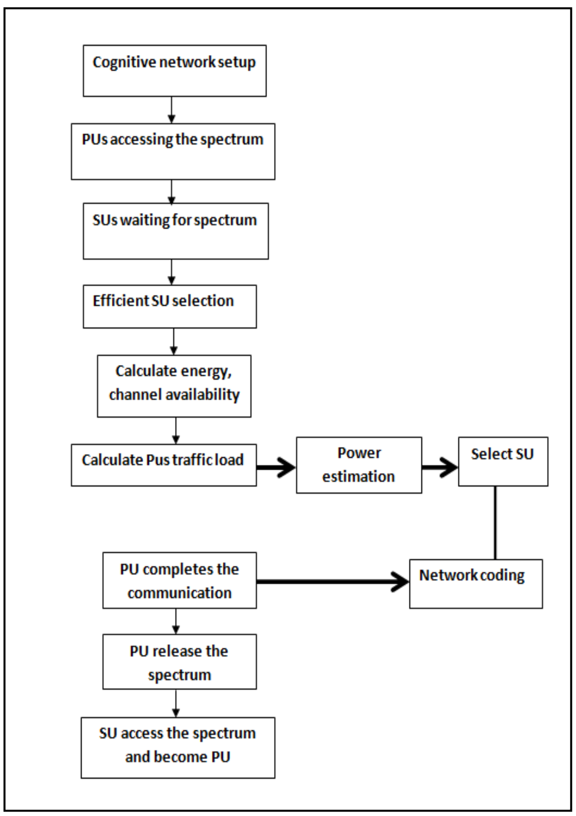
$$\sum_{l=1}^{L} (V_{f_l}) = 1,$$

This indicates that the BS has indeed succeeded in flawlessly decoding all PU's frames. Moreover, if most of the PU's information frames are successfully received by the BS, except for the failed detection of ϑ PUs, then the CU may only have to transmit ϑc_2 number of parity frames to the BS. Hence the number of parity frames required can be calculated by counting the specific number of the feedback flags indicating successful reception by the BS. More specifically, if the BS successfully received a portion of the data frames from the PUs; it will send a feedback flag to CUs, which will hence retransmit the failed information frames to the BS. Hence the adaptive configuration of the actual number of P' CU's information frames obeys the following rules:

$$P'c_2 = \begin{cases} 0, & \sum_{l=1}^{L} (V_{f_l}) = 1; \\ Pc_2, & \sum_{l=1}^{L} (V_{f_l}) = 0 \ ; \\ \vartheta c_2, & Otherwise; \end{cases}$$

Where ϑ denotes the number of CU's that have to hand-off the PU's data to the BS, $\vartheta \in L$. For example, the value of ϑ in our C_{2x4}- based scheme is 1, which implies that the BS failed to successfully decode a single PU's transmission. Additionally, in

$C_{N_T \times N_C}$ based scheme, the value of ϑ is given by (P-i). The CUs would relay the required ϑ parity frames to the BS during the cooperative phase.



In proposed system, at first system setup process then auxiliary user sitting tight for range until the point that essential user getting to the range. Here proficient optional user choice is real concern. The following level of system process is figuring vitality esteems for each user and check the channel accessibility. The PU's activity stack figures then estimation of energy in light of select the SU. Here the channel accessibility base on arrange coding and PU finishes the correspondence by the discharge the range for next users. When PU discharge the range SU get to the range and moves toward becoming PU. The productivity of range in spectrum of PU and SU users.

IV.EXPERIMENTAL RESULTS

In this paper, we assume that 10 sensor nodes are arbitrarily appropriated over a 1000x1000m^2 field where four obstacles exist. In this paper, we accept that no gap exists in the detecting field and static sensors are the same in their abilities. In the meantime, we accept that the primary user is located in the top-left corner of the two-dimensional territory and its coordinates are (50 m, 50 m). Table1 shows the system parameters used in our simulations. In this paper, in order to simplify scheduling time for the secondary user, we accept that the information gathered by sensor nodes is the deferral tolerant information, i.e., they can wait for the primary user finish the task.

PARAMETER	VALUE
Application Traffic	FTP
Transmission rate	25 packets/sec
Radio range	250m
Packet size	512 bytes
Maximum speed	15m/s
Simulation time	150s
Number of nodes	10
Area	1000x1000
Channels/radio	5
Maximum number of packets	10000
Total packets in node	50
MAC type	Mac/Macng
Routing protocol	AODV

Table1: System parameters

- **Evaluation results**

In this segment, we use the adaptive new dynamical priority coding to conduct numerous experiments in the sensing field with traffic levels. According to the network lifetime and the system availability of secondary user, we present experimental results of the algorithm which are introduced below.

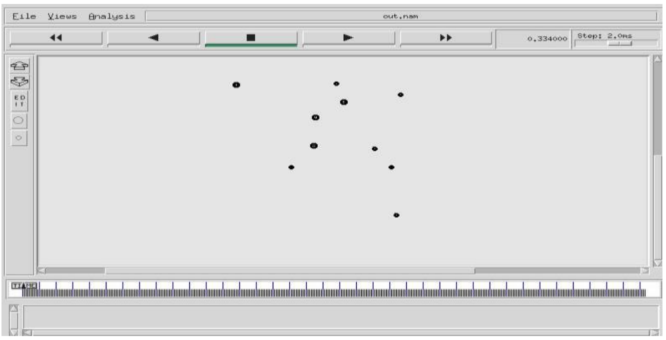


Figure 1: Network Deployment

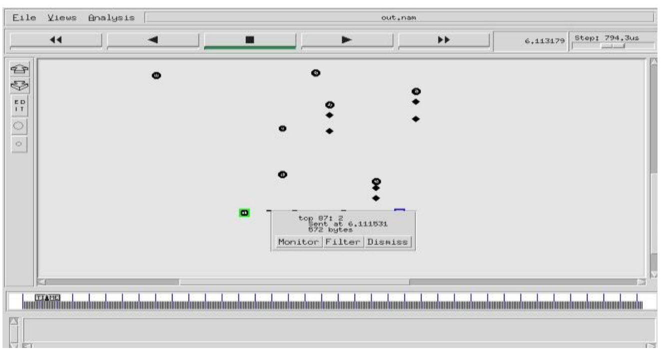


Figure 2: Data transmission in Network

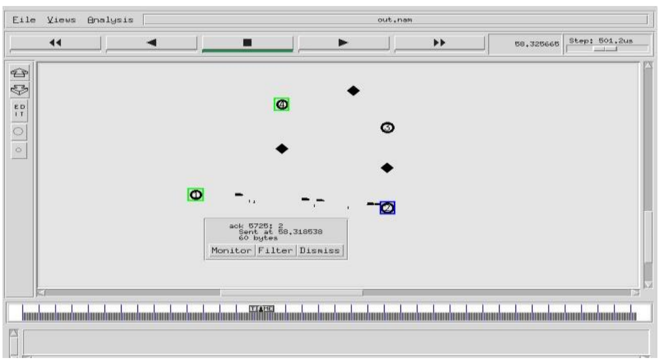


Figure 3: Acknowledgement of data process

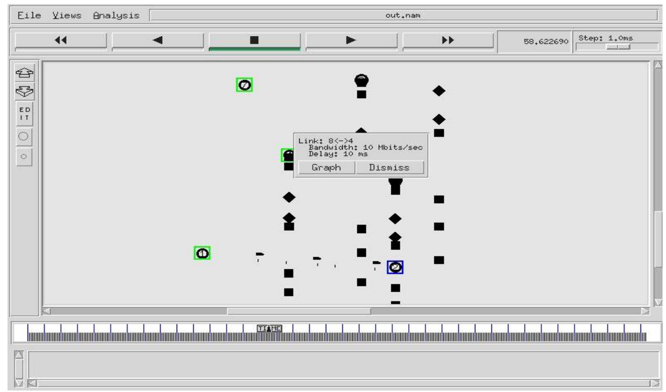


Figure 4: Checking of spectrum availability

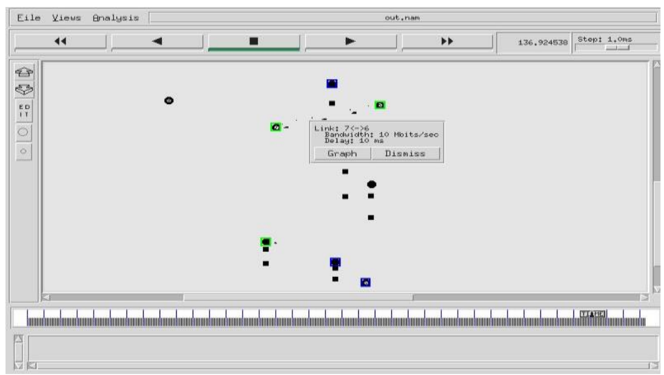


Figure 5: Linking factor in network process

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Messages Sent,18949
Messages Recieved,14284
Messages Dropped,0
Drop Rate,0.00753812866114307
Drop Rate,1.14272
```

Figure 6: Output values in network

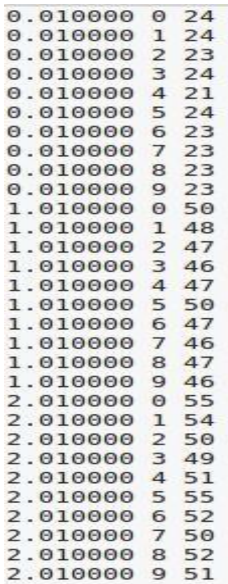
```
0.010000 0 24
0.010000 1 24
0.010000 2 23
0.010000 3 24
0.010000 4 21
0.010000 5 24
0.010000 6 23
0.010000 7 23
0.010000 8 23
0.010000 9 23
1.010000 0 50
1.010000 1 48
1.010000 2 47
1.010000 3 46
1.010000 4 47
1.010000 5 50
1.010000 6 47
1.010000 7 46
1.010000 8 47
1.010000 9 46
2.010000 0 55
2.010000 1 54
2.010000 2 50
2.010000 3 49
2.010000 4 51
2.010000 5 55
2.010000 6 52
2.010000 7 50
2.010000 8 52
2.010000 9 51
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Figure 7: Trace file in network

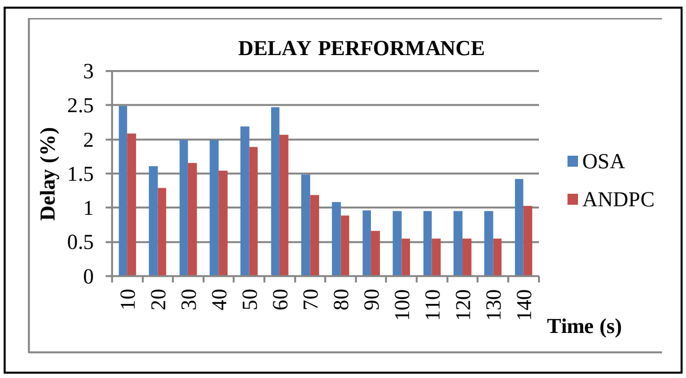

Figure 8: Performance on Delay

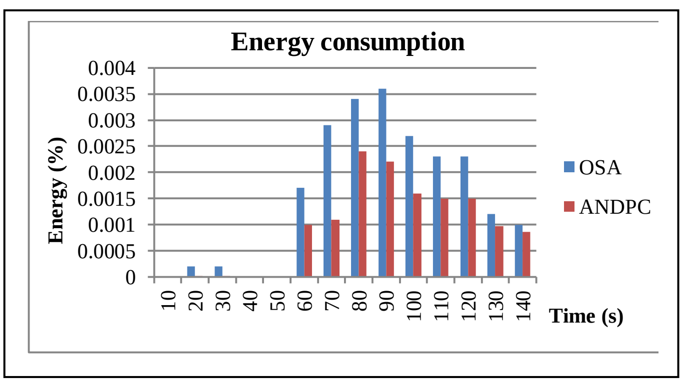

Figure 9: Energy level routing

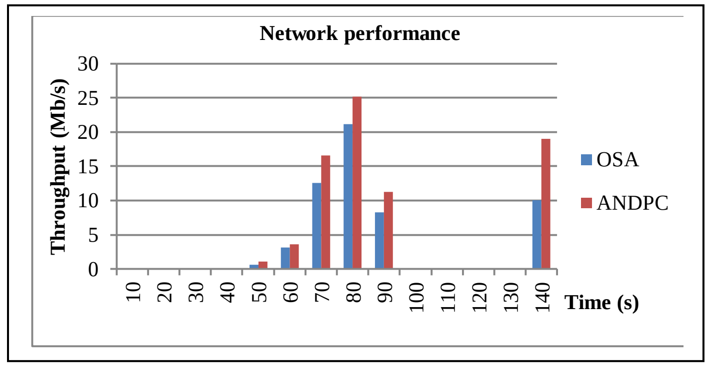

Figure 10: Network performance

In above screenshots, Fig 1 shows all nodes placed in network and deployment of nodes is in network properly. Here all nodes displayed based on topology values and all properties of NAM window it should be mentioned. Fig 2 shows the broadcasting occur and communication between users by using TCP protocol. Fig 3 shows that, after receiving data, user sends the acknowledgement of data packet can be represented.

Fig 4 shows that, all nodes participate and which node consider as which type of node mentioned above screenshot of nam. Here users checks the spectrum availability and knows the who is transmitting the data process. Fig5 shows that, data delivery from PU to specified destination. In this, data delivering through which user, bandwidth and delay time these all are shows. Fig6 shows that output values of network. Here how many messages are sent, receiving, dropping and dropped data rate should be represented. Fig 7 shows that trace file representation. In this, all nodes and time interval with data values shows.

In Fig 8, graph shows and represents end2end delay and it shows a simulation time versus delay. The performance of adaptive new dynamical priority coding method improves delay time it means decrease the delay between communications nodes compare to optimal selection approach. Fig 9 shows and represents energy consumption and it shows a simulation time versus energy. The performance of adaptive new dynamical priority coding method improves energy values compare to optimal selection approach. Fig 10 shows and represents throughput and it shows a simulation time versus throughput. The performance of adaptive new dynamical priority coding method improves the throughput compare to optimal selection approach.

V. CONCLUSION

In this paper, we present joint RS and PA in a network consisting of a set of cognitive two-way relay nodes that assist transceivers communicating with each other while sharing the spectrum with PUs. We propose an ANDPC scheme to select the best relay to minimize total energy consumption per bit with the sum rate constraint and IPT constraints for the PNC based cognitive multiple-relay system. Closed-form solutions for optimal transmit power among SU nodes and relay node are derived. The execution of the proposed scheme was illustrated for different operating conditions and shown to yield enhancements compared to the random relay selection with equal power allocation. We found that the proposed ANDPC aided CCR scheme enables the PU to either transmit 3bit/symbol of system bandwidth for exploitation by the CUs.

VI. REFERENCES

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