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Secure Transmission in MIMO Wiretap Channels using General-Order Transmit Antenna Selection with Outdated CSI

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Abstract:
In general-order transmit antenna selection to enhance the secrecy performance of multiple-input-multiple-output multieavesdropper channels with outdated channel state information (CSI) at the transmitter. To evaluate the effect of the outdated CSI on the secure transmission of the system, we investigate the secrecy performance for two practical scenarios, i.e., Scenarios I and II, where the eavesdropper's CSI is not available at the transmitter and is available at the transmitter, respectively. For Scenario I, we derive exact and asymptotic closed-form expressions for the secrecy outage probability in Nakagami-m fading channels. In addition, we also derive the probability of nonzero secrecy capacity and the ε-outage secrecy capacity, respectively. Simple asymptotic expressions for the secrecy outage probability reveal that the secrecy diversity order is reduced when the CSI is outdated at the transmitter, and it is independent of the number of antennas at each eavesdropper NE, the fading parameter of the eavesdropper's channel mE, and the number of eavesdroppers M. For Scenario II, we make a comprehensive analysis of the average secrecy capacity obtained by the system. Specifically, new closed-form expressions for the exact and asymptotic average secrecy capacity are derived, which are valid for general systems with an arbitrary number of antennas, number of eavesdroppers, and fading severity parameters. Resorting to these results, we also determine a high signal-to-noise ratio power offset to explicitly quantify the impact of the main channel and the eavesdropper's channel on the average secrecy capacity.

Index terms: Cognitive radio networks, MIMO, secrecy outage probability, outdated channel state information.

1. INTRODUCTION

Cognitive radio, first coined by Mitola, has drawn considerable attention from the research community due to its ability to alleviate spectrum shortage problems. The key idea of cognitive radio is to enable unlicensed users (secondary users) to intelligently share the same spectrum resources with licensed users (primary users). Among spectrum sharing cognitive radio networks, taking into account its low complexity of implementation, the underlay scheme has been received much attention. In the underlay scheme, the secondary users (SUs) are allowed to transmit concurrently with the primary users (PUs) in the same spectrum as long as the quality of service of the PUs can be guaranteed. On the other hand, compared with wired transmission, wireless transmission suffers from a more serious eavesdropping due to the inherent openness of the wireless medium. As is well-known, cognitive radio networks can be regarded as a fundamental architecture of intelligent network, which includes large scale number nodes, a higher transmission rate, and more information exchange. Hence, cognitive radio networks are confronted with a challenge security issue due to the more complex and uncertain transmission environments. Motivated by this, physical layer security technique has emerged as a promising solution to prevent information from being intercepted and to achieve perfect secrecy in cognitive radio networks. The key idea of physical layer security is to differentiate characteristics between the main channel and the eavesdropper's channel, which was first investigated in. Recently, the authors in have introduced physical layer security into the cognitive radio networks for guaranteeing the secure transmission. Specifically, in, the authors proposed three different single-relay selection schemes for the secondary transmission in cognitive radio networks. Later, the authors in extended the analysis in to the more general multi-relay selection scheme. In, a new relay selection scheme was proposed to enhance the security of cognitive radio networks, where the first relay was selected to transmit the confidential information and the second relay was selected to transmit the jamming signal to confound the eavesdropper. However, these works only consider the single antenna scenario.

II. LITERATURE SURVEY

J. Mitolais proposed the regulative guidelines of interference limitations, a capable spectral sensing and user detection has to be provided. The performance requirements on analog-to-digital converters increase significantly compared to current wireless systems.

J. Lee, H. Wang, J. G. Andrews, and D. Hong is proposed cognitive relay networks with cooperation between secondary users based on the underlay approach. We also prove that cognitive relay networks achieve the same full selection diversity order as conventional relay networks, and that the decrease in outage probability achieved by increasing the selection diversity (the number of relays) is not less than that in conventional relay networks.

Y. Deng, M. Elkashlan, N. Yang, P. L. Yeoh, and R. K. Mallik, is proposed cognitive spectrum sharing with generalized selection combining (GSC) at the secondary user (SU) in the presence of multiple primary transceivers with outdated channel information. maximal-ratio combining (MRC) and selection combining (SC) in cognitive spectrum sharing. The outage probability decreases with the increasing correlation coefficient of the outdated channel.

B. Zhong, Z. Zhang, X. Zhang, J. Wang, and K. Long, is proposed partial relay selection on the decode-and-forward (DF) mode cognitive radio (CR) relay networks with some important factors, including the outage probability, the bit error ratio (BER), and the average channel capacity being analyzed. The full spatial diversity order can always be obtained at the signal-to-noise ratio (SNR) range of [0dB, 15dB] in the presence of multiple potential relays.

Problem Definition

Cognitive radio, first coined by Mitola, has drawn considerable attention from the research community due to its ability to alleviate spectrum shortage problems. The key idea of cognitive radio is to enable unlicensed users (secondary users) to intelligently share the same spectrum resources with licensed users (primary users). Among spectrum sharing cognitive radio networks, taking into account its low complexity of implementation, the underlay scheme has been received much attention. In the underlay scheme, the secondary users (SUs) are allowed to transmit concurrently with the primary users (PUs) in the same spectrum as long as the quality of service of the Pus can be guaranteed On the other hand, compared with wired transmission, wireless transmission suffers from a more serious eavesdropping due to the inherent openness of the wireless medium As is well-known, cognitive radio networks can be regarded as a fundamental architecture of intelligent network, which includes a large scale number nodes, a higher transmission rate, and more information exchange. Hence, cognitive radio networks are confronted with a challenge security issue due to the more complex and uncertain transmission environments. Motivated by this, physical layer security technique has emerged as a promising solution to prevent information from being intercepted and to achieve perfect secrecy in cognitive radio networks.

Architecture Diagram

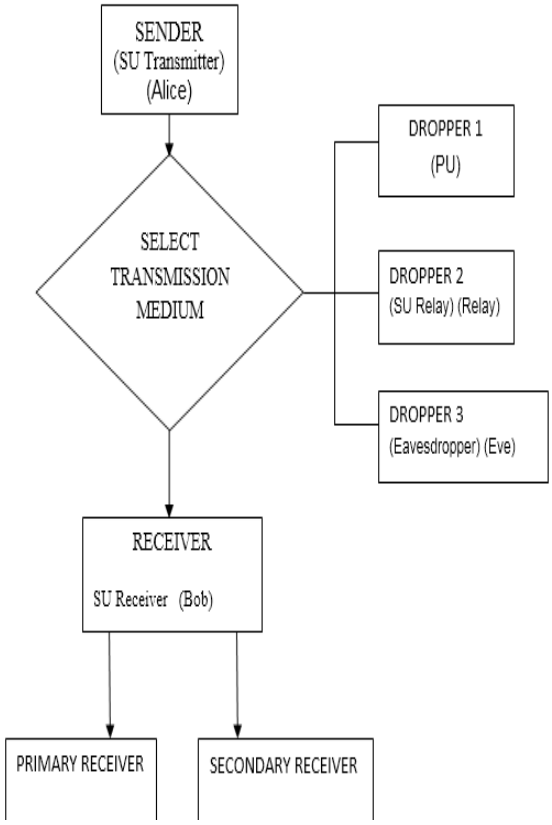

Figure.1.Architeture Diagram

The derived analytical expression provides an efficient means to evaluate the impact of key system parameters, i.e, feedback delay, the interference threshold and the number of antennas on the secrecy performance of dual-hop RaF cognitive MIMO wiretap networks. In addition, we find that the RaF relaying strategy achieves better secrecy performance than the DF relaying strategy for dual-hop cognitive MIMO wiretap networks. To achieve more insights on the application of TAS/MRC scheme, we present the tractable asymptotic secrecy outage probability for dual-hop RaF cognitive MIMO wiretap networks under two Scenarios. In Scenario I, i.e., the main channel has a good quality while the eavesdropper's channel is severely blocked due to heavy shadowing, the considered system with outdated CSI achieves the secrecy diversity gain of min (*N*R,*N*B). In Scenario II, i.e., both the main channel and eavesdropper's channel have a good quality, no secrecy diversity gain can be obtained regardless of the outdated CSI. Our results demonstrate that the outdated CSI reduces the secrecy diversity order of TAS/MRC scheme

MODULES

- Cognitive radio networks
- MIMO
- Transmition Selection

COGNITIVE RADIO NETWORKS

Cognitive Radio (CR) is an adaptive, intelligent radio and network technology that can automatically detect available channels in a wireless spectrum and change transmission parameters enabling more communications to run concurrently and also improve radio operating behavior cognitive computing.

MIMO:

MIMO (multiple input, multiple output) is an antenna technology for wireless communications in which multiple antennas are used at both the source (transmitter) and the destination (receiver). The antennas at each end of the communications circuit are combined to minimize errors and optimize data speed.

TRANSMITION SELECTION

Transmition Selection is related to the sharing of the communication medium among different types of traffic. Each type of traffic has its own issues, such as storage traffic needs no package loss and real-time applications demands a low delay network.

III. CONCLUSION

In this paper, we introduced TAS/MRC scheme in dualhopRaF cognitive MIMO wiretap networks with outdated CSI. In our analysis, the secondary transmitter adopted TAS scheme to choose the antenna that maximizes the received SNR to transmit information, while the secondary receiver and eavesdropper adopted MRC scheme to combine the received signals. We derived new closed-form expression for the secrecy outage probability of dual-hop RaF cognitive MIMO wiretap networks. Further, tractable asymptotic secrecy outage probabilities at high SNR regime were analyzed under two distinct scenarios. From the analysis, we observed that the outdated CSI reduced the secrecy diversity gain of TAS/MRC scheme from NR min (NA,NB) to min (NR,NB). Finally, our results demonstrate that although TAS/MRC scheme could not attain more secrecy diversity gain for the considered system

with outdated CSI compared with RAS/MRC scheme, it could provide more secrecy coding gain.

IV. REFERENCE

[1]. J. Mitola, "Cognitive radio: An integrated agent architecture for software defined radio," Ph. D. dissertation, Royal Inst. Technol. (KTH), Stockholm, Sweden, Dec. 2000.

[2]. J. Lee, H. Wang, J. G. Andrews, and D. Hong, "Outage probability of cognitive relay networks with interference constraints," IEEE Trans. Wireless Commun., vol. 10, no. 2, pp. 390-395, Feb. 2011.

[3]. Y. Deng, M. Elkashlan, N. Yang, P. L. Yeoh, and R. K. Mallik, "Impact of primary network on secondary network with generalized selection combining," IEEE Trans. Veh. Technol., vol. 64, no. 7, pp. 3280-3285, Jul. 2015.

[4]. B. Zhong, Z. Zhang, X. Zhang, J. Wang, and K. Long, "Partial relay selection with fixed-gain relays and outdated CSI in underlay cognitive networks", IEEE Trans. Veh. Technol., vol. 62, no. 9, pp. 4696-4701, Nov. 2013.

[5]. Y. Huang, F. S. Al-Qahtani, C. Zhong, Q. Wu, J. Wang, and H. M. Alnuweiri, "Cognitive MIMO relaying networks with primary user's interference and outdated channel state information," IEEE Trans. Commun., vol. 62, no. 12, pp. 4241-4254, Dec. 2014.

[6]. H. M. Wang, F. Liu, and M. Yang. "Joint cooperative beamforming, jamming and power allocation to secure AF relay systems", IEEE Trans. Veh. Technol., vol. 64, no. 10, pp. 4893-4898, Oct. 2015.

[7]. L. J. Rodriguez, N. H. Tran, T. Q. Duong, T. Le-Ngoc, M. Elkashlan, and S. Shetty, "Physical layer security in wireless cooperative relay networks: state of the art and beyond," IEEE Commun. Mag., vol. 53, no. 12, pp. 32-39, Mar. 2015.

[8]. A. D. Wyner, "The wire-tap channel," Bell Syst. Tech. J., vol. 54, no. 8, pp.1355-1367, Oct. 1975.

[9]. T. Q. Duong, T. T. Duy, M. Elkashlan, N. H. Tran, and O. A. Dobre, "Secured cooperative cognitive radio networks with relay selection," in Proc. of IEEE Globecom, 2014, Austin, US, pp. 3074-3079.

[10]. Y. Zou, B. Champagne, W.-P.Zhu, and L. Hanzo, "Relay-selection improves the security-reliability trade-off in cognitive radio Systems," IEEE Trans. Commun., vol. 63, no. 1, pp. 215-228, Jan. 2015.