Max-Relay Selection in Cooperative Wireless Networks with Data Compression

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Abstract— The secure wireless communication has been an important field of research. The proposed max-ratio relay selection techniques introduced to security of transmission in buffer aided cooperative wireless network. The data transmitted from source to relay and relay to destination. An eavesdropper can used to intercept the data from source to relay and relay to destination. Assume, data buffer are available at each relay to select best link source to relay and relay to destination. An eavesdropper channel strength, introduced two cases, exact and average gain respectively. In this paper proposed two new scheme, data compression and fast communication scheme. RC6 block cipher has been purposed for data security and RLE (Run Length Encoding) has been proposed for data compression and fast communication in cooperative wireless network. This both the scheme has been proposed to improve the performance and security of wireless communication.

Keywords— Max-Ratio Relay Selection, Cooperative Wireless Network, Secure Wireless Communication, Buffer, RC6 Block Cipher, RLE (Run Length Encoding), Data Compression.

INTRODUCTION

Max-Ratio Relay selection is very useful method for security of wireless network. The finite size data transmitted from source to relay and relay to destination links. Generally, the relay nodes used for the improving the coverage, reliability and quality-of-service in wireless network. [1]. A selection amplify-and-forward (AF) relaying is one another scheme in cooperative wireless network to improve the performance of wireless communication. In this scheme source to destination (SR) link varies with time and we obtained the diversity gain [2].

In this paper, the two relay nodes are used to increase the security against the eavesdroppers. The first relay operates as conventional mode and second relay is used to crate intentional interference at the eavesdropper nodes. This approach is used to improve the security. This method is protecting the network to jamming problems and hybrid method proposed for switching between jamming and non-jamming [3]. In relay based wireless communication the relay node receives a message node from a source node, process it and forward the message to destination node. An adaptive relay selection scheme proposed some protocol for wireless networks which is very useful and good for the gains in robustness energy-efficiency in wireless networks [4].

The output rate and timing are the two main factors which are analysis in cooperative wireless network. The object of this paper increase spectral efficiency, mitigates error propagation, and maximizes the network lifetime. To achieve this result used Distributed Optimal Relay Selection in Wireless Cooperative Networks. The obtained relay-selection policy reduces the computation and implementation complexity [5].

A simple distribution method can be used to find the end-to-end path between source and destination. The distributed method required space-time coding and coordination among the terminals. In this paper, to get the benefits of cooperative diversity, by using two simple software and hardware implementation approach [6]. In this paper, the term cooperative communications are related to multiple fading effects which are used to improving the adaptively, reliability and network throughput in wireless networks. After the simulation can achieve near-optimal performance on both diversity gain and channel efficiency [7]. The Physical-layer Network Coding (PNC) on the throughput can reduce the effect of interference for the one-dimensional networks and throughput bound for the two-dimensional network. The throughput of wireless ad hoc networks can be improved by the transmission schemes [8].

Generally the data compression method is used to reduce the electronic space or data bits. It used in representing a piece of information, by eliminating the repetition of identical sets of data bits (redundancy) in an audio/video, graphic, or text data file. Data compression involves encoding information using fewer bits than the original representation. An an improved test data compression scheme based on a combination of test data compatibility and dictionary for multi-scan designs. This test data compression scheme is used to reduce test data volume and thus test cost [9]. The Compression is useful because it helps reduce resource usage, such as data storage space or transmission capacity. The data compression scheme in not always beneficial for energy conversion. In this paper, introduced new adaptive compression arbitration system which are uses a new prediction modeling and adaptation. This paper proposed energy-efficient arbitration mechanism that enhances the performance of compression algorithms [10].

Traditionally, the compression is a one way to reduce the number of bits in a frame but retaining its meaning. It reduces the transmission cost, latency and bandwidth and also data compression method reduce the number of intermediate node in the wireless networks. In wireless communication, data compression algorithms proposed different data compression method, i.e. distributed source modeling (DSM), Distributed Transform Coding (DTC), Distributed Source Coding (DSC) and Compression Sensing (CS) respectively [11].

SYSTEM MODEL

To enhance the performance of wireless communication, Relay Selection is one of the most important issues. To solve this problem we proposed the max ratio relay selection with minimum distance. Relay selection can improve the secrecy capacity and can maximize the signal to eavesdropper channel gain ratio [1]. The relay selection scheme is based on the concept on the eavesdropper intercepts signals from both the source and relay nodes which are showing in Fig.1.

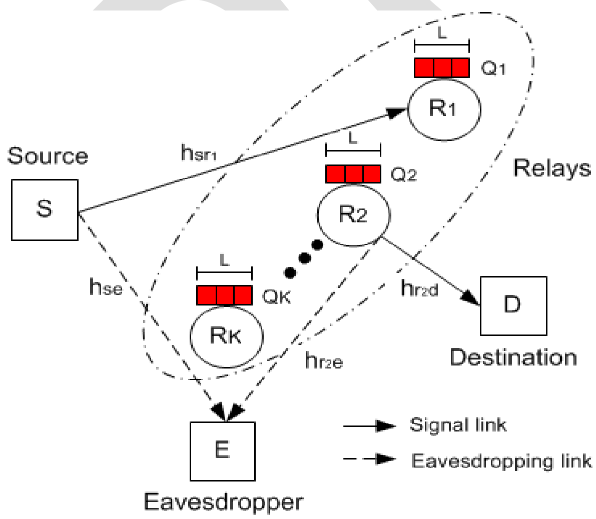


Fig.1. Relay selection system model in secure transmission for wireless communication with eavesdropper.

An eavesdropper placed in middle of source and destination which are intercepting the data incoming from the source links. For the wireless data transmission scheme, the instantaneous secrecy capacity for the overall system is obtained as,

$$C_k(t) = \max\left\{\frac{1}{2}\log_2\frac{\min[1+E_s|h_{sr_k}(t)|^2,\ 1+E_s|h_{r_k d}(t)|^2]}{1+E_s|h_{se}(t)|^2+E_s|h_{r_k e}(t)|^2}\right\} \tag{1}$$

Where C_k (t) is the secrecy capacity and the source-to-eavesdropper channel gain is denoted as E_s\h_{se}(t)\2. In this buffer-aided relay selection in secure transmission approach the eavesdropper can intercept signals from both the source and relay nodes. The data transmitted from source to relay and relay to destination links with signal to eavesdropper channel gain ratio. The finite size data are available in each buffer which is available in each relay present in cooperative wireless network.

PROPOSED WORK

A simple characteristic of data compression is that it involves transforming strings of character in some representation into new string of bits which contain the same information but whose length is as small as possible. Data compression is also used for backup utilities, spreadsheet application and data base management systems. Some types of data such as bit-mapped graphics can be compressed to small fraction of their normal size. Wireless network can support data compression techniques. Generally, Data compression techniques are used for save energy and increase network capacity in wireless networks. Data compression proposed to increase data rate in wireless network. Data compression is categories into two types, one is loss less data compression and other is lossy data compression.

1. Loss less data compression

Lossless data compression can be compressed to exactly its value. No information is lost in lossless compression. Lossless data compression algorithms usually exploit statistical redundancy to represent data more concisely without losing information, so that the process is reversible. Lossless compression is possible because most real-world data has statistical redundancy. Lossless data compression is used in many applications. For example, it is used in the ZIP file format and in the GNU tool gzip. It is also used as a component within lossy data compression technologies.

2. Lossy data compression

Lossy data compression is used to reduce data by identifying unnecessary information and removing it. By using lossy compression, a substantial amount of data reduction is often possible before the result is sufficiently degraded to be noticed by the user. Lossless data compression is used in many applications. It permits reconstruction only of an approximation of the original data, though this usually allows for improved compression rates. Lossy compression is commonly used to compress audio, video and still images.

In this paper, proposed Run Length Encoding Method for data compression. Run-length coding (RLE) is a very simple and famous method of data compression.

A. Run Length Encoding:

Run-Length Encoding is a data compression algorithm that is supported by bitmap file format, such as TIFF, BMP and PCX. Run Length Encoding is simple form of data compression in which data are stored as a single data value and count, rather than as the original run. RLE is mostly used for compressing any type of data regardless of its information content, but the content of the data will affected the data compression ratio achieved by Run Length Encoding. RLE are very easy to implement and quick to execute operation. RLE works for reducing the size of a repeating string of data. This types of string are knows as run. RLE are also used to a graphics file format supported by CompuServe for compressing black and white images. RLE is a lossless type of compression and cannot achieve great compression ratios, but a good point of that compression.

Run-Length Encoding is based on the replacement of a long sequence of the same symbol by a shorter sequence and is a better introduction into the data compression techniques. The sequence of the length of a repeated symbol's' is replaced by a shorter sequence, containing one or more symbols of 's', get the length information and sometimes an escape some symbol.

Fig.2. Basic flow chart of Run Length Encoding method.

B. RC6 Block cipher:

A block cipher is a set of code books and every key produces a different code book. The encryption of a plaintext block is the corresponding cipher text block entry in the code book. RC6 (Rivest Cipher 6) is a symmetric key block cipher which are derived from RC5. The RC6 block cipher is very simple, fast and secure AES (Advanced Encryption Standard). The new version of RC5 block cipher is RC6. The RC5 cipher use data dependent rotation to achieve a high level of security. RC6 is one of the families of encryption algorithms. RC6 are easily available in a block size of 128 bits and supports key sizes of 128, 192, and 256 bits, but, like RC5. The RC6 Block Cipher shown in Fig.3.

The RC6 has provided a simple cipher yielding numerous evaluations and adequate security in a small package. RC6, like RC5, consists of three components: a key expansion algorithm, an encryption algorithm, and a decryption algorithm. RC6-*w/r/b*, where *w* is the word size, *r* is the non-negative number of rounds, and *b* is the byte size of the encryption key. RC6 makes use of data-dependent rotations, similar to DES rounds. RC6 is based on seven primitive operations. Normally, there are only six primitive operations;

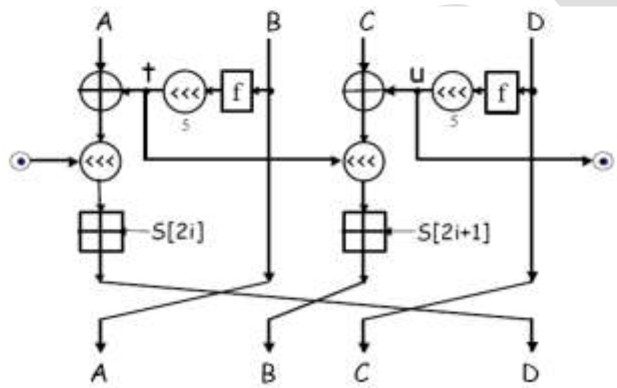


Fig.3. The RC6 Block Cipher.

However, the parallel assignment is primitive and an essential operation to RC6. The addition, subtraction, and multiplication operations use two's complement representations. Integer multiplication is used to increase diffusion per round and increase the speed of the cipher. The parts of run-length encoding algorithms that differ are the decisions that are made based on the type of data being decoded (such as the length of data runs). RLE schemes used to encode bitmap graphics are usually divided into classes by the type of atomic (that is, most fundamental) elements that they encode. The three classes used by most graphics file formats are bit-, byte-, and pixel level RLE.

DISCUSSION

We consider two most important cases for max-ratio relay selection i.e. Exact Knowledge of eavesdropping channel and knowledge of average channel gains for eavesdropping channel. We plot basic graph of target secrecy capacity in -axis and secrecy output probability in y-axis shown in Fig.4. for both the two different cases. Fig.4. shows the secracy output probability of max-ration scheme for case1 and case 2.

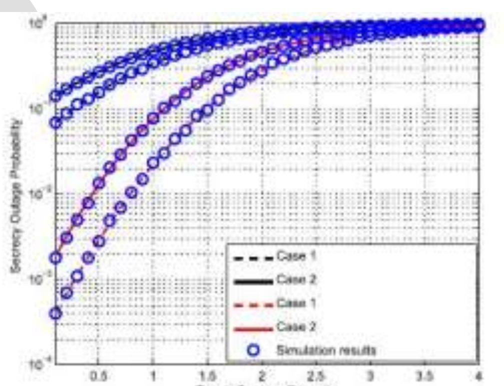
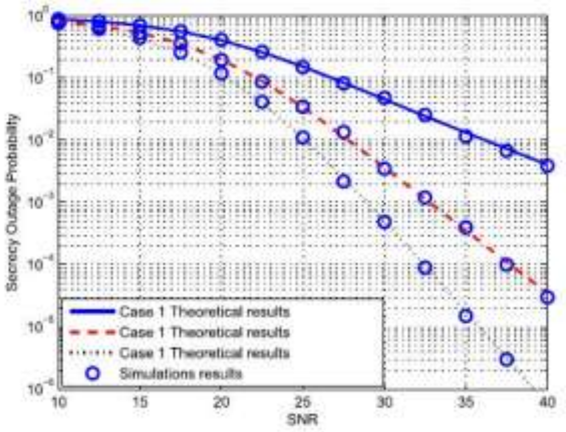
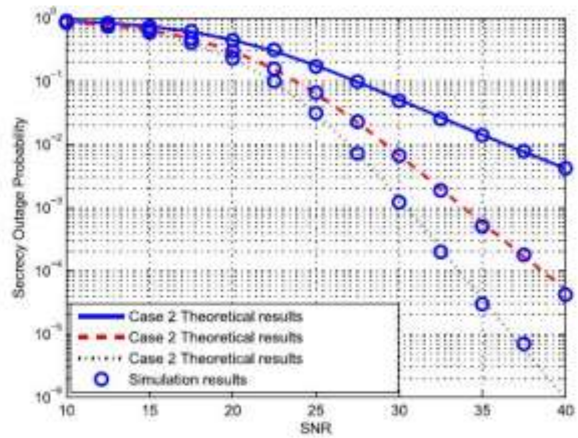


Fig.4. The secrecy outage probabilities of the max-ratio scheme for cases 1 and 2.

Similarly, Fig.5. shows the secracy output probability vs signal-to-noise ratio where gain is 30db and target secracy capacity is unity.



Case 1



Case 2

Fig.5. The secrecy outage probabilities *vs* Signal-to-Noise Ratio for cases 1 and 2.

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CONCLUSION

This paper we proposed max-ratio relay selection policy for cooperative wireless network with data compression techniques. We proposed max. hops with minimum distance scheme. Buffer is present in each relay node, which is used to send the data from one relay to another relay. Relay was selected with the largest gain ratio among all available source-to-relay and relay to-destination path. We proposed data compression method called RLE (Run Length Encoding) to reduce the data size in wireless network and increased the communication speed and RC6 block cipher for security of the data in cooperative wireless network. We proposed both the scheme to improve the security and efficiency of wireless communication.

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