Abstract

In this thesis, we introduced a new cooperative communication strategy for single-relay Lossy Forwarding System, called Link Adaptation for Lossy-Forwarding Relaying system (LALFOR). This system aims to improve the energy efficiency and the throughput efficiency.
As many previous research has shown, the Lossy-Forwarding system can enhance the transmission reliability and expand the communication coverage. Unlike other systems, the relay of the Lossy-forwarding system will always decode, re-encode and forward the information sequences to the destination. However, since the relay will always work regardless of the channel condition, there may exist a room where the system performance can further be improved. If the channel condition is bad, relay may not be very helpful. Then always forwarding seems to cause waste of energy. On the other hand, if the channel condition is good, then keeping fixed code rate and modulation schemes will also cause the waste of throughout efficiency.
To improve the system performance, in this thesis, the LALFOR system will use two techniques, Partially-Lossy-Forwarding (PLF) technique and EXIT-based Link Adaptation Algorithm. The main idea of PLF technique is to set a threshold on the instantaneous signal-to-noise ratio of the $Source - Relay$ link. If the channel condition is bad, relay will discard the information sequences of relay. On the contrary, if the channel condition is good, relay will forward the information sequences to the destination according to the Lossy-Forwarding system. Then the energy efficiency is expected to improve by PLF although the communication coverage may decrease, then the trade-off between outage probability and communication coverage is needed. Also, since PLF will use point-to-point transmission method, it can also decrease consuming time and improve throughput efficiency. Another topic, the EXIT-based link adaptation algorithm is expected to select the code rate and modulation schemes for the $Relay-Destination$ link. The relay sends a short information sequence to acquire the quality of the $Relay - Destination$ link. Then according to the channel quality, the set of code rate and modulation scheme will be feedback from destination to relay. After that, the relay starts to forward information sequences to destination. The throughout efficiency is expected to improve by this algorithm. As the combination of PLF technique and EXIT-based Link Adaptation algorithm, LALFOR system is expected to save energy in the bad channel condition and improve the throughout efficiency whatever channel condition is.

Keywords: Lossy forwarding, Bit-Interleaving Coded Modulation with Iterative Decoding, Partially-Lossy-Forwarding, EXIT-based Link Adaptation Algorithm.