ABSTRACT

The mobile cognitive radio base station (MCRBS) is an alternative to the base station to recover the wireless networks with extended communications, such as unmanned aerial vehicle (UAV), to cover unreachable areas. However, the UAV should be simply applied in the field and consumes less power when being a transmitter or receiver. One of the solutions to reduce the power consumption or extend battery lifetime is by introducing a simple channel coding scheme. This thesis proposes Hybrid multi kernel-constructed Polar codes for UAV communications that can be suitable for devices requiring low power consumption assisting the MCRBS to find and evacuate the victims.

This thesis considers hybrid multikernel codes as the suitable channel coding schemes for the communications between MCRBS and UAVs. This thesis proposes the decoding schemes of hybrid multikernel codes with constructed from matrix constituents 3×3 and 2×2. The construction involves multiple boxpluses and decision operations corresponding to the multikernel sizes. This thesis investigates the location of information bits and frozen bits of hybrid multikernel codes using the Bhattacharyya parameters for short blocklength. This thesis also evaluates the bit-error-rate (BER) performances under the additive white Gaussian noise (AWGN) and block Rayleigh fading channels via a series of computer simulations.

The results confirmed that the hybrid multikernel codes with the proposed decoding provide better performances compared to the punctured single kernel Polar codes given the equal code lengths of the same code rates under the AWGN and block Rayleigh fading channels. It indicates that the channel polarization with hybrid multikernel codes with the proposed decoding are better even with short blocklengths. These results are expected to be helpful for the development of future coding techniques for disaster-and-recovery networks.

Keywords: Hybrid multikernel construction, Polar codes, List decoding, UAV Communications.