ABSTRACT

The damage of the base station (BS) and limited energy resources due to power outages are major problems that occur in the post-disaster area. Mobile cognitive radio base station (MCRBS) can temporarily replace the damaged BS. However, MCRBS may constrain if the road to the location of victims is severely damaged or even disconnected, such that MCRBS should stop. This thesis proposes a solution, i.e., unmanned aerial vehicle (UAV) functioning as an extension of MCRBS. Both MCRBS and UAV require efficient use of power to provide service as long as possible.

This thesis proposes a concept of simple virtual Turbo codes that involve MCRBS and UAV by considering low complexity but can provide good communication quality. Simple virtual Turbo codes in this thesis is simple, because it uses memory just one bit, such that the power consumption is low. The performance of simple virtual Turbo codes is evaluated using computer simulation for bit-error-rate (BER) performance based on soft decoding using Bahl-Cocke-Jelinek-Raviv (BCJR) algorithm on the additive white Gaussian noise (AWGN) and Rayleigh fading channels using binary phase shift keying (BPSK).

This thesis uses two configurations of 45° and 90° angle configurations that are suitable for UAV. This thesis found that: (i) UAV is significantly useful to aid communication in post-disaster areas, (ii) the performance of simple virtual Turbo codes is determined by the updating function when direct and UAV link are different, and (iii) when channel is perfect (AWGN channel) and signal on direct link is available 100 %, simple virtual Turbo codes with vertical iteration in 45° and 90° configurations are significantly useful to improve signal-to-noise power ratio (SNR) of 3.9 and 6.5 dB, respectively. The results of this thesis are expected to contribute to the development of the UAV communication system as an emergency recovery network technology in Indonesia.

Keywords: UAV, Simple Virtual Turbo Codes, BCJR Algorithm, BER.