ABSTRACT

The multiple access communications for harbor environment are suffering from both low quality transmission due many metallic obstacles and overloading networks due to the huge number of users/devices of logistic monitoring. This paper proposes a coded random access (CRA) scheme with a degree distribution specifically designed suitable for harbor environment to serve many devices and provide communications with high reliability.

The degree distribution is optimized using extrinsic information transfer (EXIT) charts by keeping that two EXIT curves do not intersect at low mutual information points. Since we are working on the network level, of which the benefit of broadband communications are directly observed, to keep the fairness with the narrowband channel, we convert the gain of broadband multipath fading channels into an equivalent gain to the narrowband based on Shannon capacity and channel coding theory. We then compare CRA to other multiple access, i.e, carrier sense multiple access with collision avoidance (CSMA/CA), because it has better performance than other random access scheme, such as ALOHA and Slotted ALOHA. In this paper, we evaluate the performance of the proposed CRA and CSMA/CA using a series of computer simulation in additive white Gaussian noise (AWGN) and Rayleigh fading channels in terms of packet loss rate (PLR) and throughput.

The results confirmed that CRA with degree distribution for harbor communication is more suitable than CSMA/CA as a multiple access technique for harbor wireless communication, because CRA has higher throughput on AWGN and Rayleigh fading channels with lower packet loss rate (PLR). The results of this study are expected to contribute to the development of future harbor communication systems.

Keywords: Harbor Communications Systems, Multiple Access, CRA, SIC, LDPC, CSMA/CA, AWGN, Rayleigh Fading.