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Turbo code based physical layer network coding for free space optical channel

Alaa A Saeed Al Rubaie¹, Z Abu Almaalie² and Z Ghassemlooy³ ¹Ministry of Higher Education and Scientific Research, Iraq ²University of Karbala, Iraq ³Northumbria University, UK

Physical layer network coding (PNC) for a two-way relay (TWR) channel has been utilized for increasing the system throughput in a TWR, where the two users exchange their information via a relay node. PNC with a TWR channel is adopted free space optical (FSO) communication link (TWR-FSO) to enhance the link availability under the atmospheric turbulence condition. FSO has attracted significant attention in a range of application, where the radio frequency (RF) based wireless technologies may not be used or be suitable. In fact, the use of FSO in certain applications releases the pressure on already highly congested RF spectrum, which can be used in areas where the demand for RF is very high. In this research, we introduce the turbo code in the TWR-FSO PNC system and evaluate the end-to-end (E2E) in terms of the bit error rate (BER) for weak and strong regimes. The performance of E2E turbo code in terms of iterative manner combined with TWR-FSO PNC is presented to improve the system performance and then compared with both non-iterative convolutional code and uncoded systems under the different influences turbulence. The simulation results shows that the proposed scheme can achieve a significant BER performance improvement through the introduction of an iterative process between turbo decoders. Furthermore, we investigate the decoding process of the system by using a graphical description, this involved implementing the extrinsic information transfer (ExIT) charts. The ExIT chart was implemented as a tool to analyze the convergence properties of iterative receivers. We review the ExIT chart, the simulation setup and the construction to analyze the major features of system architecture. The ExIT functions of the two decoders are thoroughly analyzed for a range of parameters under the influence of a turbulence-induced channel fading to demonstrate the convergence behavior.



Figure 1: Block Diagram for turbo code with PNC TWR-FSO link

Biography

Alaa A Saeed Al Rubaie has completed his PhD in Communications from Communications, Sensors, Signal and Information Processing (ComS2IP) Group, School of Electrical and Electronic Engineering, Newcastle University, Newcastle Upon Tyne, UK He has MSc in Computer Network from University of Technology, Baghdad, Iraq. He is currently working as the Director in the Department of Information Technology in the Ministry of Higher Education and Scientific Research, Baghdad, Iraq. He has his expertise in wireless communication networks with a focus on an advanced modulation, coding technique, equalization, radio frequency and free-space optical channels.

alaa.sd1@gmail.com