

Popular Science Abstract

Thesis: Practical Aspects of Reduced Complexity for LDPC Decoding By: Muhammad Umar Farooq and Maria Garcia Garcia

Nowadays, people are using their mobile devices, i.e. mobile phones, more and more. According to the Smartphone Market Research, 340 million smartphones were shipped to the market in the first quarter of 2016. One of the main complains is the time their batteries last. With the solution we propose in our research project, it is possible for the battery to last longer in such devices.

When a message, for example, an image, is transferred wirelessly from the transmitter side to the receiver side, the wireless medium will introduce errors to the message. When we receive the message there are methods that can correct the errors but the correction requires more power from the battery. However, it might not be necessary to correct each and every error. For example, receiving a medium quality picture instead of the full-HD version might be good enough. Hence, an error control vs. energy efficiency trade-off is introduced using the results presented in this research.

First of all, an impact of having an energy efficient system would lead to longer periods between battery charging, resulting in saving energy consumption. Secondly, the chemicals contained in batteries are classified hazardous, by having an energy efficient device, the battery disposal rate would decrease, creating a more environmental friendly device. The results in this project presents a way to achieve good error control while not wasting too much energy.

We created a computer model (for a specific Wi-Fi standard) of an everyday life scenario of a user with a mobile station moving inside of a building. Then we investigated how the errors get introduced into the message sent by a transmitter in such indoor environment. Finally, we found a way to deal with those errors while not consuming too much power.

The implementation was done using a Low-Density Parity-Check (LDPC) decoder with Forced Convergence (FC) to shorten the amount of time the decoder takes to receive the message. Using this technique, the image received would be reliable enough. The image at the receiver side will not be the best quality, however, it will have a good enough quality. Without FC the decoder would take a longer time to decode the image to get the full-HD

version of it. Having a reduced amount of time at the decoder achieves lower energy consumption. The project was done in collaboration with the EIT department at Lund University.