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7 November 2013

Summary: Logistic Statistics for Optimal Radio Resource Allocation

Today, City Tech’s own professor Zory Marantz gave a glimpse of his work towards higher efficiency power consumption in mobile wireless communications for students with concentrations in the electrical engineering and telecommunication fields. His introduction observed the current state of wireless communication with particular focus on mobile tech. “How many of you have cellphones on you? How many of you carry chargers?” he asked. Most hands went up and stayed there. His point was to emphasize the regression of battery life with the advancement of mobile tech. The feature phones of yesteryear often last longer than modern smartphones on a full charge and this is a problem that is relatively ignored and usually dealt with simply by adding higher capacity batteries. But this doesn’t come without its own problems; bigger batteries mean less pocketable devices and often more heat emission. Marantz’s approach to longer battery life instead focuses on a reallocation of the preexisting resources; he asks “How many bits can we transmit per joule?”

Marantz’s system model aims to increase device utility, which he defines as “the number of successfully received bits per joule (BPJ) of radiated energy.” This is represented algebraically by the equation , where R\*L represents the total number of bits received and M is the length of the packets sent. He displays a series of plots detailing data transmission performance and calls attention to the “Optimality Point” or the highest achievable output (BPJ rate) observed, for which he also has an expression. Marantz generalizes the expression and takes its derivative with the inclusion of new , , and rf parameters, showing that f*′* equals or approaches 0 depending on the value of f. He takes the natural log of the resulting expression and removes the parameters and rf.

The Optimality Point:

Generalized Equivalent:

Natural log of :

Simplification

Professor Marantz’s intentions are clear; if one could achieve the same response with two parameters that one does with four, he or she can increase efficiency. Thus, if he can find a solution that maps the data transmission system to his generalized expression, a higher BPJ can be achieved. It’s key to note that through this method the amount of joules dissipated on a full charge would not change, hence the no need for added hardware.