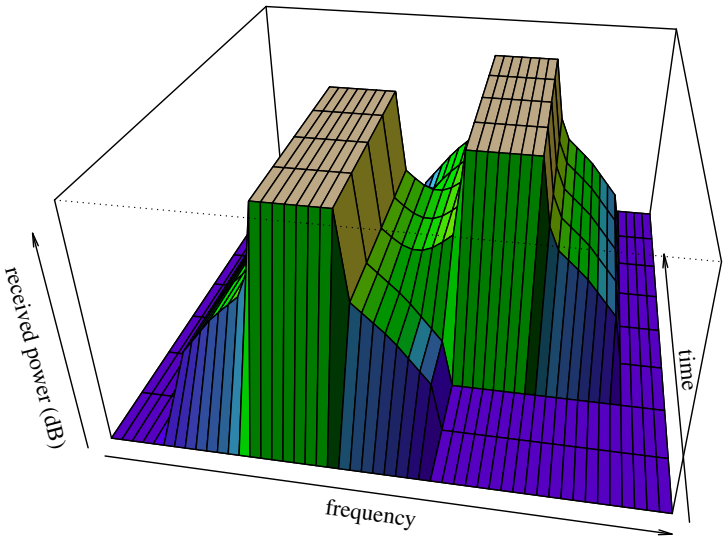
Bachelor Thesis

Efficient Multi-Channel Simulation for Wireless Communications

Simulation is a key methodology to assess the performance of wireless systems. Among the big challenges in this field is accurate modeling of the physical radio communication: at its most basic, designing a model that decides whether an incoming radio transmission can be received. Obviously, such a decision will be based on the distance between sender and receiver, but it must just as well be based on the amount of interference the transmission is suffering from. One popular approach bases decisions on the transmission's SINR (Signal to Noise and Interference Ratio) alone, calculating the received power for (a) the signal and for (b) all interfering transmissions as 3D functions of time and frequency, then dividing the two to ultimately derive a packet error rate.



Goals of the thesis

The simulation framework we are using in some of our recent research is based on precisely this approach, yet the code for handling 3D functions is highly generic, resulting in subpar performance – particularly when many simulated nodes are involved. We believe that performance can be improved by (a) tailoring the code to its use for the simulation of wireless networks, by (b) optimizing code for runtime performance, and by (c) exploiting concepts such as lazy evaluation or futures.

This project thesis will implement such improvements, check them against our reference implementation, and investigate their impact on memory and on runtime performance for both single-channel and multi-channel transmissions when running one or multiple simulations on one machine.

Keywords

C++, Profiling

Contact:
Christoph Sommer <sommer@ccs-labs.org>
Website:
http://www.ccs-labs.org