Mobile Radio Channels GUI

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Introduction

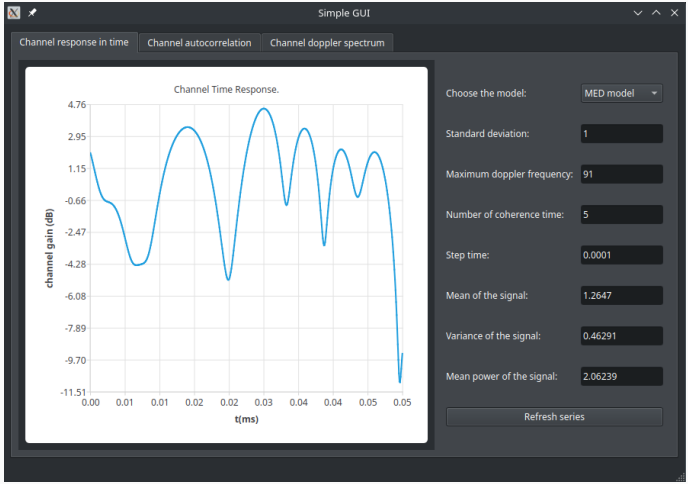
Through this discipline, it was performed the study of the principles of channel modelling, having as main reference the book "Mobile Radio Channels" by Matthias Pätzold. The first part (AICT I) consisted of the study and implementation of channel models using C++, in C++20 standard. The second part (AICT II) consisted of the development of a GUI for the execution and observation of the behaviour, the properties and the statistics of the channel models in a simple and intuitive manner.

Conteúdo da GUI

Requirements

- Plot of the channel response in time;
- plots of the parametrical and empirical autocorrelation of the channel;
- plots of the parametrical and empirical Doppler spectrum of the channel;
- selection of the models and adjustment of the parameters at the screen;
- display of the channel statistics on screen.

Tab 1: Channel gain in time



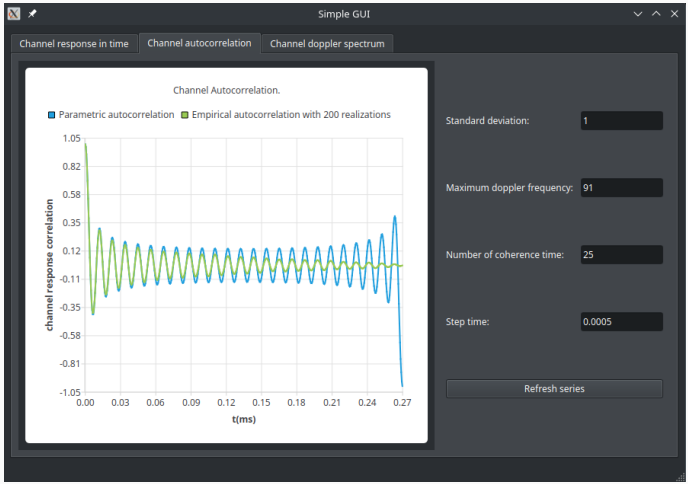
Inputs

Channel model, parameters and update of the plot through the button ”refresh series”.

Outputs

Channel statistics and plot of the channel gain (dB) versus time (ms).

Tab 2: Channel autocorrelation



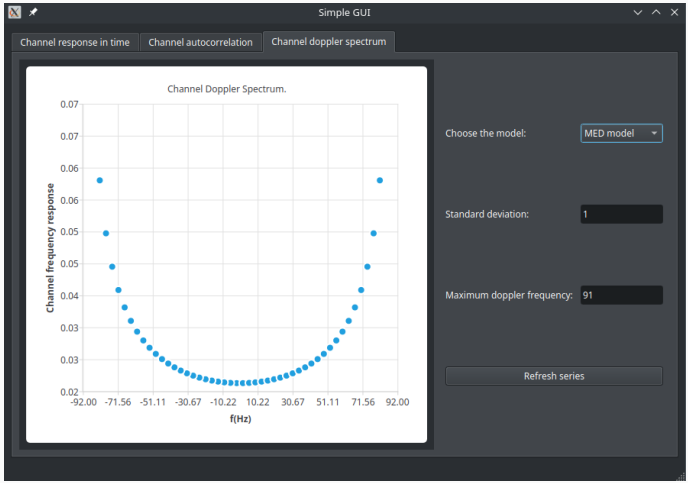
Inputs

Necessary parameters for the parametrical autocorrelation. Number of realizations for the empirical autocorrelation.

Outputs

Plot of the parametrical, empirical and theoretical autocorrelation of the channel.

Tab 3: Doppler spectrum



Inputs

Channel model, standard deviation and maximum Doppler frequency.

Outputs

Plot of the Doppler spectrum of the channel.

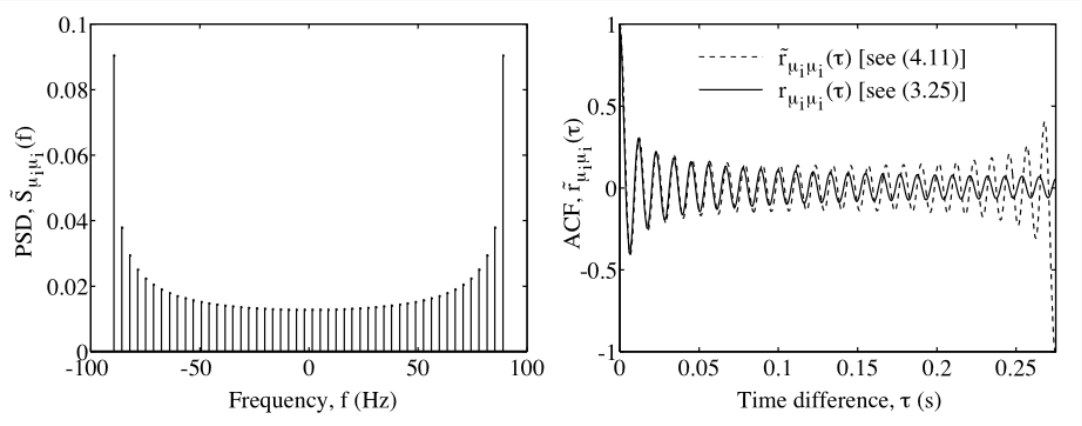
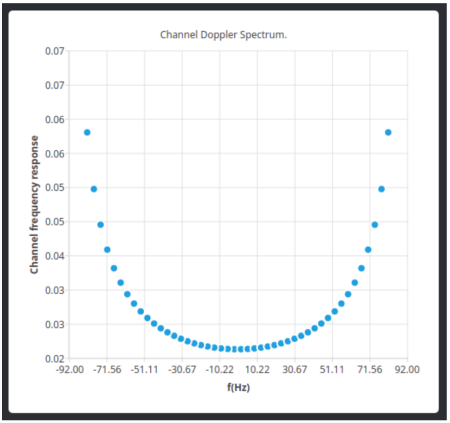


Figure 1: Doppler spectrum and channel autocorrelation for MED model with $N_i = 25$, $f_{max} = 91$Hz and $\sigma_0^2 = 1$. Font: Patzold, 2012, p.153.



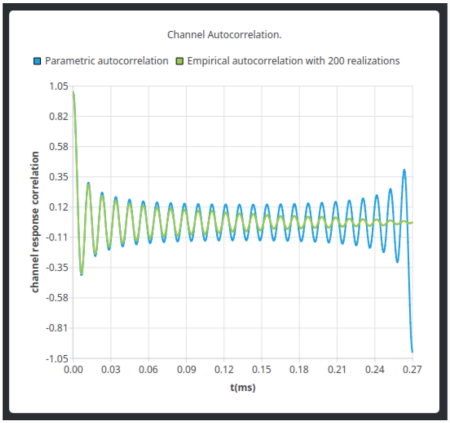


Figure 2: Doppler spectrum and channel autocorrelation for MED model with $N_i = 25$, $f_{max} = 91$Hz and $\sigma_0^2 = 1$. Executed in the GUI.

Conclusion

In this class, it was developed a GUI for simulation and observation of the behavior of mobile radio channels, following the models studied and implemented in AICT I. The graphs follow what was shown in the theoretical foundation.