Title:
Beampattern Modelling in Wireless Ad hoc Networks

Supervisor:
Salman Durrani

Project Description & Aims:
There is increasing interest in the application of beamforming antennas in emerging wireless ad hoc networks. As complexity of considering exact beam patterns in performance evaluation of wireless ad hoc networks is very high, simplified beampatterns have been proposed in order to facilitate calculation of analytical results. The beampattern modelling techniques available in literature include exact beampattern model [1], Spagnolini model [2] and flat-topped or keyhole model [3]. This project will focus on beampattern modelling for uniform linear arrays (ULA) and uniform circular arrays (UCA) using the above methods.

The aims of the project are:-
1. Write the Matlab code to generate and compare the beampatterns for ULA and UCA using the above 3 models.
2. Write the Matlab code to compute the model parameters associated with the flat-topped and Spagnolini models respectively.
3. Compute and examine the variation of the array interference factor (AIF) which is defined in [4] to characterise the effect of beamforming in wireless ad hoc networks.
4. Generate the beampatterns when mutual coupling between antenna elements is taken into account (optional advanced investigation).

Assessment:
The project will require a short literature review, as well as some background reading to become familiar with ULA, UCA and the beampattern modelling techniques to be used. The student will write the Matlab code to implement the beampattern modelling techniques, followed by comparison of the properties of the simulated beampatterns.

The project will include the following components, with the (approximate!) associated time commitments:

Literature survey (10 hours)
Familiarisation with Matlab (10 hours)
Background reading on ULA and UCA and beampattern modelling methods (15 hours)
Matlab simulations and analysis (25 hours)
Preparation of report and presentation (20 hours)

Proposed project assessment:
Presentation (15%)
Matlab Coding (30%)
Report (55%)

References