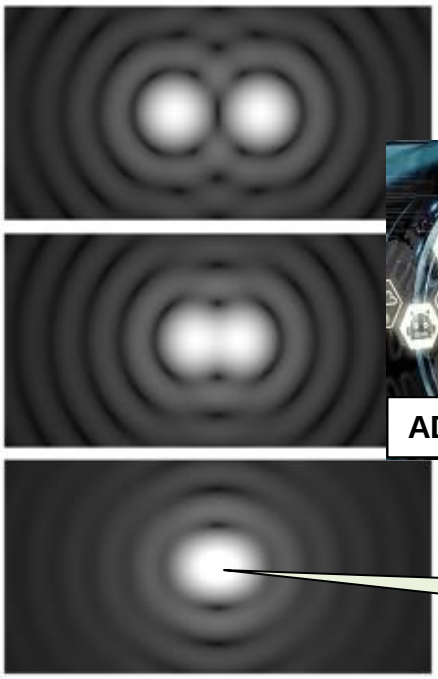
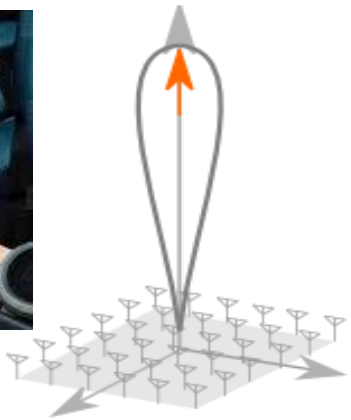
Research (What is it about?)	**Angular superresolution of antenna array signals**
UNN authors	*Ermolaev V., Flaksman A., Elokhin A., Kuptsov V.*
We find (The result)	New (root) variant of the superresolution method of minimum polynomial for determining the number and the angular coordinates of the signal sources acting on the antenna array has been proposed. This variant has been shown to have the ***maximum efficiency*** in comparison with all known superresolution methods but it needs linear equidistant antenna arrays.
Abstract	The ***superresolution*** methods allow one to determine the angular coordinates of the closely located sources with the accuracy which significantly ***exceeds*** the Rayleigh angular-resolution limit that is equal to the antenna-array ***beam width***. Among all of them the root *MUSIC* (*MU*ltiple *SI*gnal *C*lassification) method ensures a higher accuracy of estimating the angular coordinates. But it does not estimate the number of sources, which is assumed to be known or pre-estimated by another way. We propose the ***root variant*** of the superresolution method of ***minimum polynomial of the correlation matrix*** for estimating the number and angular coordinates of the closely located sources within the same calculation procedure. The method is based on estimating the degree and coefficients of the minimum polynomial of the sample correlation matrix of the input process in the array using the statistically grounded functional of the standard error and on constructing the matrix projector onto the noise subspace. The method ensures the direction finding of the sources by determining roots of the denominator of the reciprocal (pseudospectral) function and can be applied only for the ***linear equidistant*** antenna arrays. The cases of uncorrelated and correlated signal sources have been considered. The comparative simulation results for the cases of a short sample of the input process, when the number of samples is significantly smaller than the number of elements of the antenna array, and the strongly correlated sources have been presented. The proposed method has been shown to have the maximum efficiency compared with all known superresolution methods. It will be used in Advanced Driver-Assistance Systems – ***ADAS***.

Representative articles 2017-2018, quartiles	1. *Ermolaev V.T., Flaksman A.G., Elokhin A.V., Kuptsov V.V.* Minimal polynomial method for estimating parameters of signals received by an antenna array. Acoust. Phys. **64**(1). 83-90 (2018). 2. *Ermolaev V.T., Flaksman A.G., Elokhin A.V., Kuptsov V.V.* Angular superresolution of the antenna-array signals using the root method of minimum polynomial of the correlation matrix. Radiophys & Quant.Electron. **61**(3). 232-241 (2018).	Q3 Q4, Q4
	Q-index (Qi) for the result	**1.3**
	low yellow	

In collaboration	–

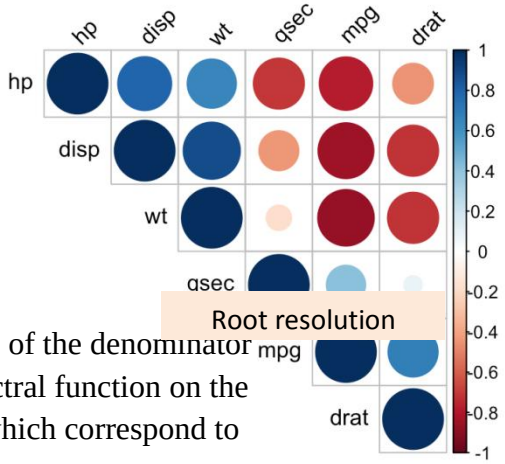


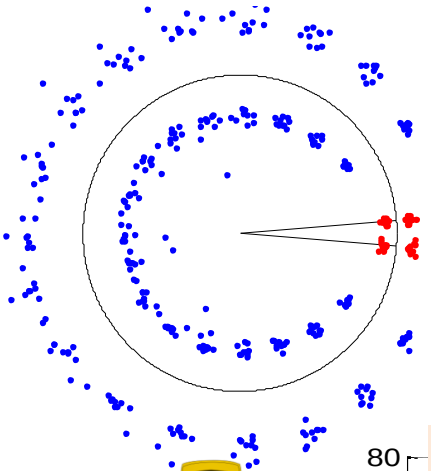
Classic (Rayleigh) angular-resolution: the ***sources merge*** when the vision angle between them is less than the array beam width.



But they can be resolved by ***superresolution*** methods.

Sample ***correlation matrix*** of the input process in the array.





Root resolution

Selection of roots of the denominator of the pseudospectral function on the complex plane, which correspond to ***resolved sources***.