Guidelines for Student Reports

MAXIMAL SURFACE DISTORTION COMPUTATION IN PARABOLIC REFLECTOR BY MEANS OF AN INTERVAL BASED PARTICLE SWARM OPTIMIZATION

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Abstract

Large reflector antennas are still nowadays widely used in terrestrial and satellite applications where the generation of narrow and highly-directive beam patterns is needed. Although reflector antennas are more bulkier than phased arrays and they have limited reconfiguration capabilities due to the low number of control points, they still are profitable solutions because of the affordable costs as well as their robustness and resilience also in harsh environments. On the other hand, surface distortions on the reflectors surface can effect the radiated pattern, that can be significantly different from the nominal (optimal) one.
In order to analyze the effect of random deformations on the parabolas an innovative methodology exploiting the Interval Arithmetic (IA) has been recently proposed. As a result, an average interval power pattern is computed by means of closed-form relationships considering an interval root mean square surface deformation. Moreover, integrating those equations in an optimization loop it is possible to determine the maximal values of deformation allowing that the radiated pattern satisfies given operating constrains.

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This report is submitted in partial fulfillment of the degree of the course "ACM".
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