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# RAY TRACING METHOD AS A WAY FOR FINDING AN INITIAL STRUCTURE OF THE FREE-FORM BASED AR SYSTEM

**Su Guanqiao** (ITMO University)
Supervisor – **PhD, Associate Prof. .– G.E. Romanova** (ITMO University)

**Introduction.** In recent years, the rapid advancement of head-display technology, particularly in augmented reality (AR), has led to increasing attention towards the development of free-form prism systems. Designing a free-form prism system is a complicated process, highly dependent on an initial layout and the surfaces' equations used. For designing such types of systems SMS-method and iterative optimization can be used. In the work we discuss using ray tracing to analyze the initial structure of the system, as a possible tool for searching the initial system.

**Main part.** AR systems based on free-form prism are very widely discussed through several decades [1]. Iterative and theoretical methods to construct the system are widely used [2,3,4]. Traditional and the fastest way of designing such a system is to choose by trial method initial structure in an optical design software, and then optimize it. If the quality is not high enough we can change initial structure and /or surface description (from spherical of conic surfaces to even asphere, biconic, extended polynomial or Chebyshev polynomial, etc).

The main issue is to choose the best description and optimization strategy. However it takes much time Moreover the result of optimization for the same surface description but for different starting points will be different.

The main goal of the work is to develop an algorithm that helps to generate the initial layout, that can be also developed up to the stage of fulfilling the first-order properties (size of the image for the given angular field) together with achieving moderate image quality.

On the first stage the ray tracing for a single mirror in Matlab was implemented. For the future stages we can provide a cycle inside Matlab code and add space constraints directly to the stage of searching the initial configuration.

**Conclusion.** The issues of generation of the starting point for the AR system based on free-form prism are discussed. The usage of the raytracing in Matlab are considered to help generate the starting point.

**References**:

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