Abstract

Optical lens systems for shortwave infrared radiation

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Topic relevance. Shortwave infrared lenses are widespread in the military, medical and industrial fields. They are used for spectral analysis and quality control of products, in foggy weather and at night. The main feature of shortwave infrared lenses is that optical elements designed for the visible spectrum can be used to manufacture them. This feature sets them apart from other devices that operate in the longer wavelengths of the infrared range and make them more profitable to produce.
Existing approaches to the design of optical shortwave infrared lens systems are based on the use of 3rd- and 5th-order aberration theory or optimization of existing optical systems. The disadvantage of the first approach is the limited resolution of finite-order aberrations, while the second one needs to use the original optical system with the satisfactory image quality.
Therefore, it is important to develop a simple and effective method of designing optical systems for short-wave infrared lenses.
Research goal: demonstrating the possibility of parametric synthesis of optical systems of short-wave infrared lenses.
Research objectives:
1. To analyze the known methods of global optimization and to choose the most effective for its further use in the process of parametric synthesis of optical systems of short-wave infrared lenses.
2. To develop a method for designing optical systems of short-wave infrared lenses.
3. Perform an experimental verification of the proposed method by calculating optical systems of short-wave infrared lenses and compare them with analogs.
Object of research: the process of designing optical systems for short-wave infrared lenses.
Subject of research: method of automated calculation of optical systems of short-wave infrared lenses.
Keywords: *optical system, shortwave infrared lens, lens, global optimization, differential evolution, adaptive Cauchy differential evolution, parametric synthesis*