SINGLE-LENS EXTENDED DEPTH-OF-FIELD IMAGING SYSTEMS

ABSTRACT

An extended depth of field (EDOF) imaging system (10) is disclosed that has a corresponding extended depth of focus (EDOF'). The imaging system has an optical system (20) consisting of a single lens element (22) and an objectwise aperture stop (AS) arrange substantially at a zero-coma axial position. The single lens element is configured so that the optical system has a select amount of spherical aberration (SA) in the range $0.2\lambda \leq SA \leq 2\lambda$, where λ is an imaging wavelength. The imaging system has an image sensor (30) for forming a digitized raw image (IM) of an object (OB). In applications, the raw image can be used directly. The imaging system also has an image processing unit (54) adapted to process the raw images to form contrast-enhanced images. The image processing includes forming an enhanced modulation transfer functions (MTF) using a gain function (G) applied to the "raw" MTF. Embodiments of the single lens element include at least one diffractive feature (23) to reduce chromatic aberration. Single lens elements with at least one aspheric surface (S1, S2 or S1 and S2) are also disclosed.

(FIG. 1)