

화상 감시를 위한 직선수차보정 광각 렌즈

Rectilinear Wide-angle Lens for Video Surveillance

권경일, 최성물*, 김건희**, 양순철**, 이영훈***

호남대학교 광전자공학과/(주)나노포토닉스

*호남대학교 전자공학과

**한국기초과학지원연구원 연구장비개발부

***한남대학교 광·전자물리학과

kweon@honam.ac.kr

We have designed and fabricated a catadioptric wide-angle lens with a rectilinear projection scheme. An integral equation describing a mirror profile is obtained based on the principle of specular reflections and a pinhole camera model¹. The mirror has been designed to have a 40 mm working distance and 160° field of view(FOV). A rectilinear projection scheme has been adopted so that a straight line still appears straight after the reflection. The designed mirror profile is fitted to an aspheric lens formula and Code V has been used to design a dedicated refractive lens to be used along with the mirror. The lens is optimized for a VGA-grade 1/4 inch color CCD camera. The FOV of the designed catadioptric lens is as wide as 155° , and still image distortion is not severe. The experimental results will be presented during the session.

1. Gyeong-il Kweon, Kwang Taek Kim, Geon-hee Kim, and Hyo-sik Kim, "Folded catadioptric panoramic lens with an equidistance projection scheme", *Applied Optics*, 44 (14), 2759-2767 (2005).

Surface	Radius	Thickness	Glass	Semi-Aperture
Object	infinity	infinity		
1	50.00	3.00	BK7_SCHOTT	49.94
2	47.00	40.00		46.96
3	7.79	-42.50	MIRROR	22.49
Stop	infinity	-0.40		0.59
5	3.20	-1.50	BACD10_HOYA	1.55
6	29.05	-0.31		0.93
7	-9.34	-1.90	BACD16_HOYA	1.05
8	4.77	-0.35		1.35
9	3.20	-1.80	BACD16_HOYA	2.12
10	3.48	-0.43		1.85
11	-12.13	-2.50	BACD10_HOYA	1.97
12	7.15	-0.60		1.97
13	3.20	-1.00	FD4_HOYA	2.37
14	infinity	-0.20		2.28
15	-9.26	-2.60	BACD16_HOYA	2.50
16	6.13	-3.58		2.70
17	infinity	-1.50	BK7_SCHOTT	2.17
18	infinity	-0.43		2.05
Image	infinity	0.00		2.02

Table 1: Surface data

Symbol	Variable	Value
c	vertex curvature	1.284183E-01
k	conic constant	-3.828093E+00
A	4th order mod. term	-1.169940E-06
B	6th order mod. term	-8.072104E-09
C	8th order mod. term	2.708283E-11
D	10th order mod. term	-3.426718E-14
E	12th order mod. term	1.586557E-17

Table 2: Aspheric coefficients of the mirror.

Acknowledgement

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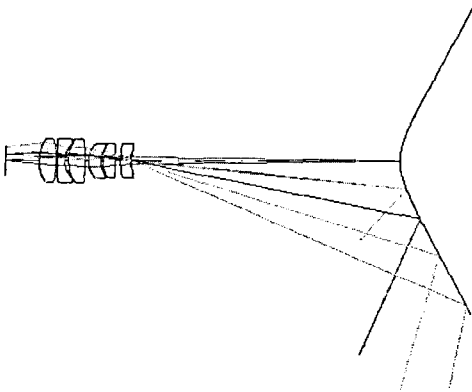


Fig. 1: Layout of the catadioptric wide-angle lens.

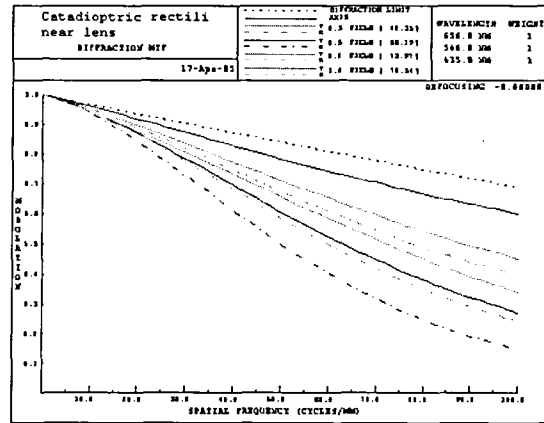


Fig. 2: MTF plot.

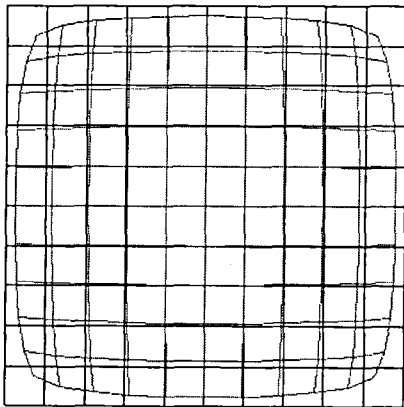


Fig. 3: The distortion grid plot.

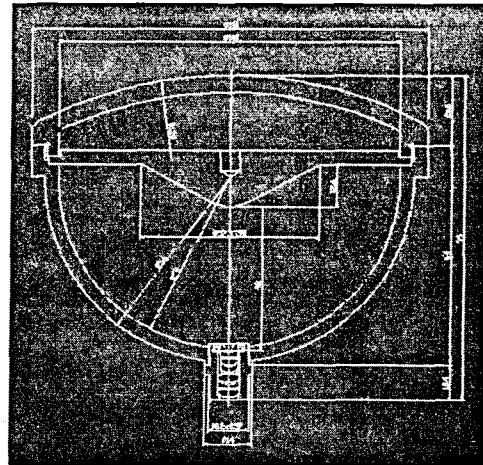


Fig. 4: Autocad drawing of the lens.