David Sommitz
Independent Design Problem
Requirements Review

General

The goal of this project is to design a zoom lens mounting system. A pre-existing optical design will be used. However, the lenses will be custom and therefore must be specified. See the following website for the entire lens patent: (http://www.kenrockwell.com/nikon/18-55-ii/patent-7277232.pdf) The zoom lens barrel will need to be mounted to a specific mount type. The method for allowing zoom will need to be clearly specified and discussed.

Key Requirements

Based on Lens Design

- EFL range- 18.5mm to 53.4mm
- F/#: 4.6 to 8.1
- Full FOV: 14.9° to 38.3°

Arbitrary

- Operational Temperature: 20°+/- 15°
- Shock Loading: 20G
- Volume of production: 1
- Schedule: Flexible
- Lens Spacing: ±100µm
- Lens Decenter: ±50µm
- Lens Tilt: ±20arcmin
- Intermediate Tolerances: spatial tolerances apply to intermediate zoom positions
- Mount Type: C

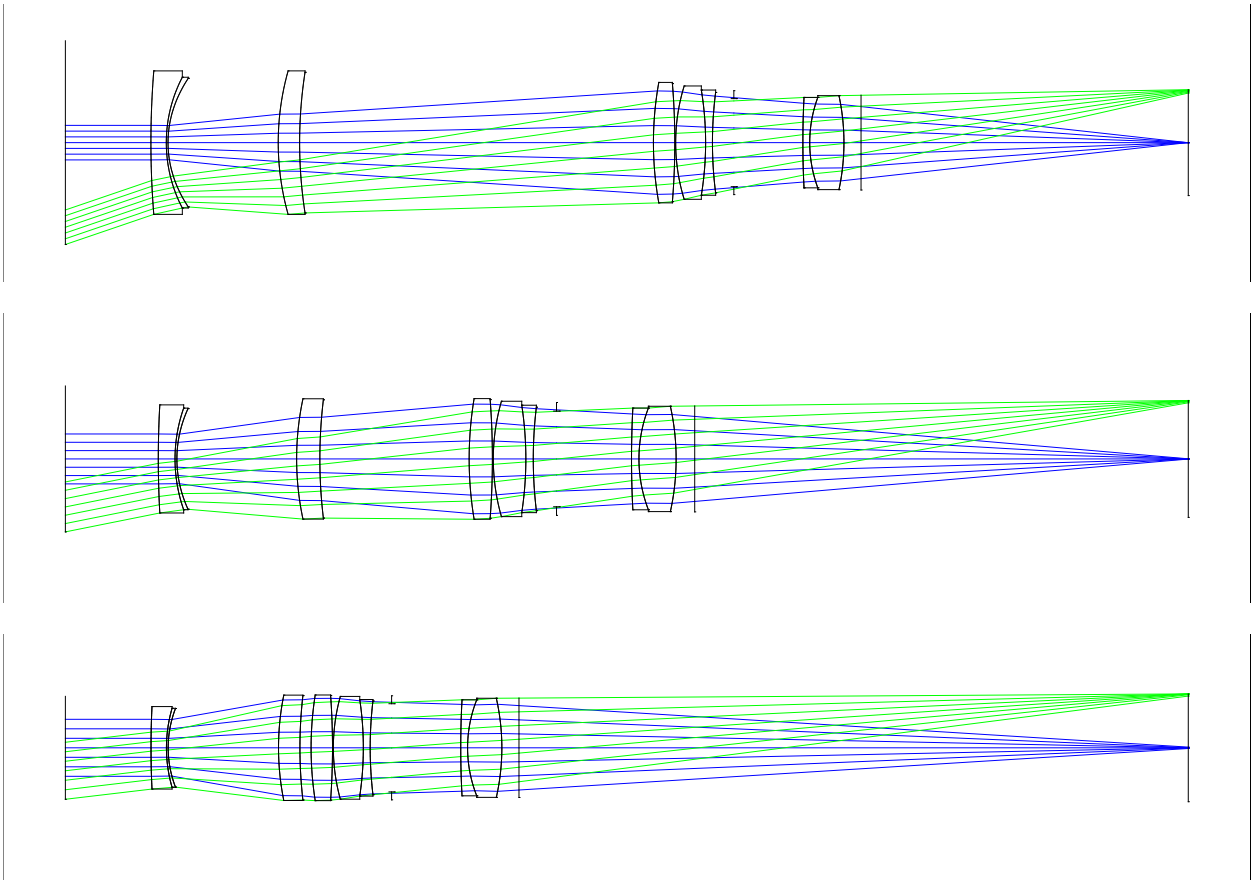
Problem Features:

Glass Type- the lens design does not specify what kind of glass to use- ideal glasses must be fitted. *This will not be addressed.*

Surface 3 Asphere- The third surface (last element of the first group) is the only surface that is aspheric. Conic constants are given up to the tenth order, but the last orders may be unnecessary (?). Determine whether using Forbes polynomials would be more suitable for specification. *This will not be addressed.*

Cam Design- Since the movement of the lenses is nonlinear, a cam will be used to facilitate this movement. It will need to maintain tolerances during movement. The path of both groups of lenses must be determined relative to one another.

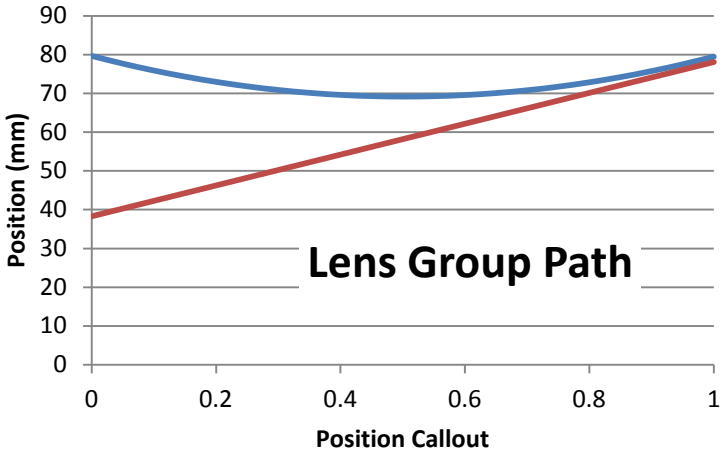
Zoom Configurations



Lens Group Path

Group 1 (Spacing 1, D5): Quadratic from x=0 to x=1: Position(x)=$41.412x^2$-41.588x+79.621

Group 2 (Spacing 2; D15): Linear from x=0 to x=1: Position(x)=39.8x+38.3



Lens Prescription

Surf:Type		Comment	Radius	Thickness	Glass	Semi-Diameter		Conic
OBJ	Standard		Infinity	Infinity		Infinity		0.000
1	Standard		Infinity	10.000		6.000		0.000
2	Standard		104.620	1.800	1.77,49.6	4.808		0.000
3	Standard		16.500	0.200	1.55,38.7	4.606		0.000
4	Standard		12.539	12.885		4.583		-0.479
5	Standard		30.943	2.500	1.81,22.8	6.143		0.000
6	Standard	D5	53.571	1.303		6.088		0.000
7	Standard		39.679	2.500	1.64,55.4	6.159		0.000
8	Standard		-84.183	0.100		6.102		0.000
9	Standard		22.469	3.500	1.52,64.1	5.990		0.000
10	Standard		-37.953	0.800	1.80,46.6	5.630		0.000
11	Standard		46.568	2.500		5.464		0.000
STO	Standard		Infinity	8.072		5.140	U	0.000
13	Standard		104.913	0.800	1.83,37.2	5.598		0.000
14	Standard		15.211	4.000	1.52,64.1	5.592		0.000
15	Standard		-26.189	2.000		5.777		0.000
16	Standard	D15	Infinity	78.142		5.794		0.000
IMA	Standard		Infinity	-		6.284		0.000