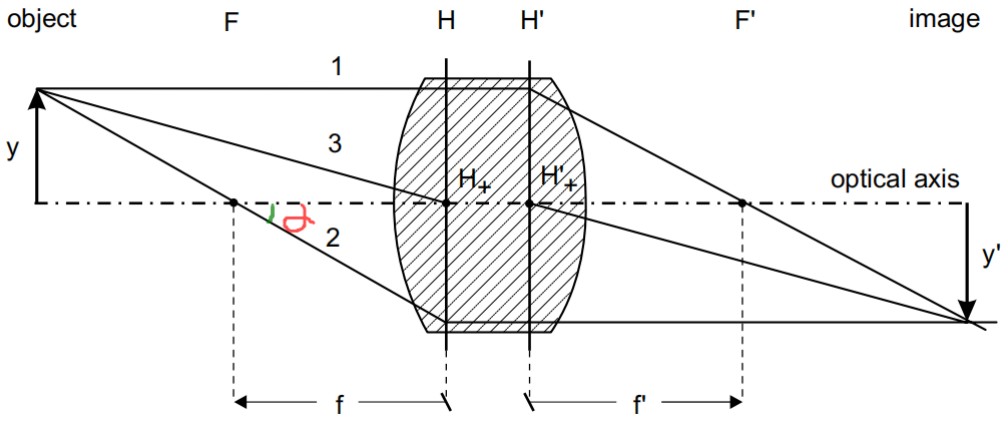
镜头相关作业

SZ170410221 朱方程

1. 简述影响视野大小的因素有哪些?

- Focal Length of the Lens.
- Working Distance.
- Sensor Size.



According to Gaussian optics, we have

$$\frac{y}{y'} = \frac{F-f}{f} = \frac{F}{f} - 1 \tag{1}$$

Assuming values of all the notations are positive.

Since y' is determined by the sensor size, F is proportional with working distance, f represents the focal length. It's easy to acknowledge the changing trend of FOV when the three factors vary.

Factors	Focal Length ↑	Working Distance ↑	Sensor Size ↑
Field of View	↓	↑	↑

2. 比较远心镜头与普通工业镜头的差异并对两者的拍摄效果进行对比。

Telecentric lens are used to perform a parallel projection in object space to eliminate the perspective distortions and remove occlusions of objects that occur because of the perspective distortions.

The biggest difference is theoretical, which is the **telecentric lens are able to perform parallel beam** while ordinary industrial lens cannot. Besides, there are other differences between them.

	Telecentric Lens	Ordinary Industrial Lens
Price	High	Low
Capability of Eradicating Distortion	Yes	No
FOV	Constant	Variant
Magnification	Constant	Variant
Size	Big	Small
Weight	Large	Small
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From the pictures shown above, the left one is shot by ordinary camera lens, the right one is shot by telecentric lens.

Because the incident light and imaging light of ordinary industrial lens are not parallel light, there is a visual error. **The inner wall of the circular hole** of the gear **can be seen easily**. The entire gear is convex along the center. The figures of the aperture and the outer edge are not what we desire. So it is brings impediment to read the edge and it often requires very sophisticated algorithm to correct the distortion.

The incident light of the telecentric lens is parallel beam. As can be seen in the right picture, when using a telecentric lens to capture gears, the inner edges of the circular holes and the edges of the outer gears have clear contours. The inner wall of the circular hole is invisible and there is no distortion needed to be corrected.