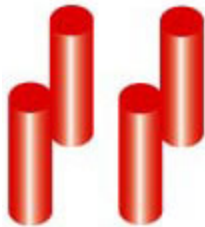
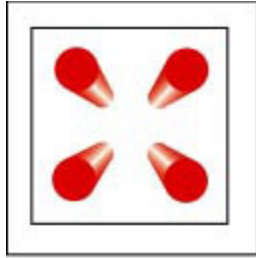
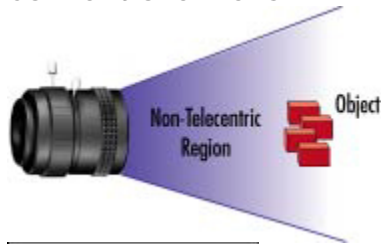


Using Telecentric Lenses

By Sam Sadoulet and Jeff Harvey

Perspective errors, also called parallax, are part of everyday human experience. In fact, parallax is what allows the brain to interpret the 3-D world. We expect closer objects to appear relatively larger than those placed farther away. This phenomenon is also present in conventional imaging systems in which the magnification of an object changes with its distance from the lens. Telecentric lenses optically correct for this occurrence so that objects remain the same perceived size independent of their distance, over a range defined by the lens.

Conventional Lens:



Conventional Lens

Advantages:

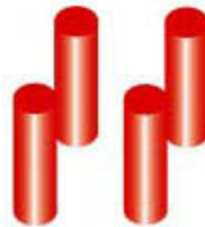
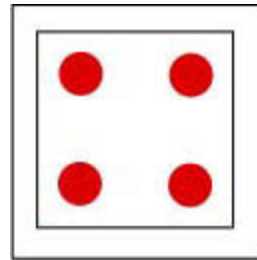
- Lower Cost
- Greater General Availability
- Greater Flexibility

Disadvantages:

- Change of Magnification with Change in Distance
- Perspective Error

Applications:

Telecentric Lens:



Telecentric Lens

Advantages:

- Constant Magnification with Change in Distance
- No Perspective Error

Disadvantages:

- Higher Cost
- Larger Lens Diameters
- Larger Weight

Applications:

- Metrology
- CCD Based Measurement

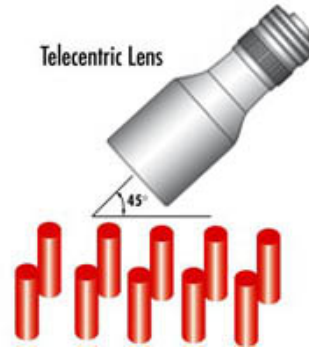
- Imaging Large Objects

- Microlithography

Alignment of Jumper Pins

With the field of computer technology growing exponentially, and with trends moving towards smaller and smaller components, the order of precision needed in aligning computer components becomes even more critical. A traditional lens' perspective errors become more noticeable when dealing with such minute detail.

In image A above, we see a conventional lens viewing the jumper pins of a typical computer circuit board at a 45° angle. As clearly shown, the lens begins to introduce perspective errors and the angled pins begin to slant toward the center of the field of view. An observer analyzing the distances between these pins for alignment purposes would generate incorrect calculations. Perspective error in this example is 3%, but can be much higher for other applications.



The second image (B) shows the same pins through a telecentric lens. In this captured image, the angled pins show their accurate distances and perspective errors are eliminated. With the use of a telecentric lens, correct and consistent distances can be determined and a higher degree of accuracy achieved. The reasoning behind this stems from a constant magnification that occurs as the distance from the lens changes. This constant magnification allows the user to maintain the correct perspective over a change in height or a change in slope.

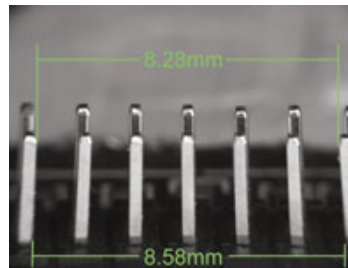


Image A: Conventional Lens

If you would like to see other topics covered or more detailed information, let us know. We invite you to discuss any suggestions or specific application requirements with our engineering department at techsup@edmundoptics.com or 800-363-1992.

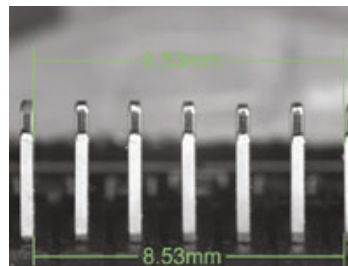


Image B: Telecentric Lens



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