Triangulation Measurement Principle

The fundamentals of laser triangulation sensors

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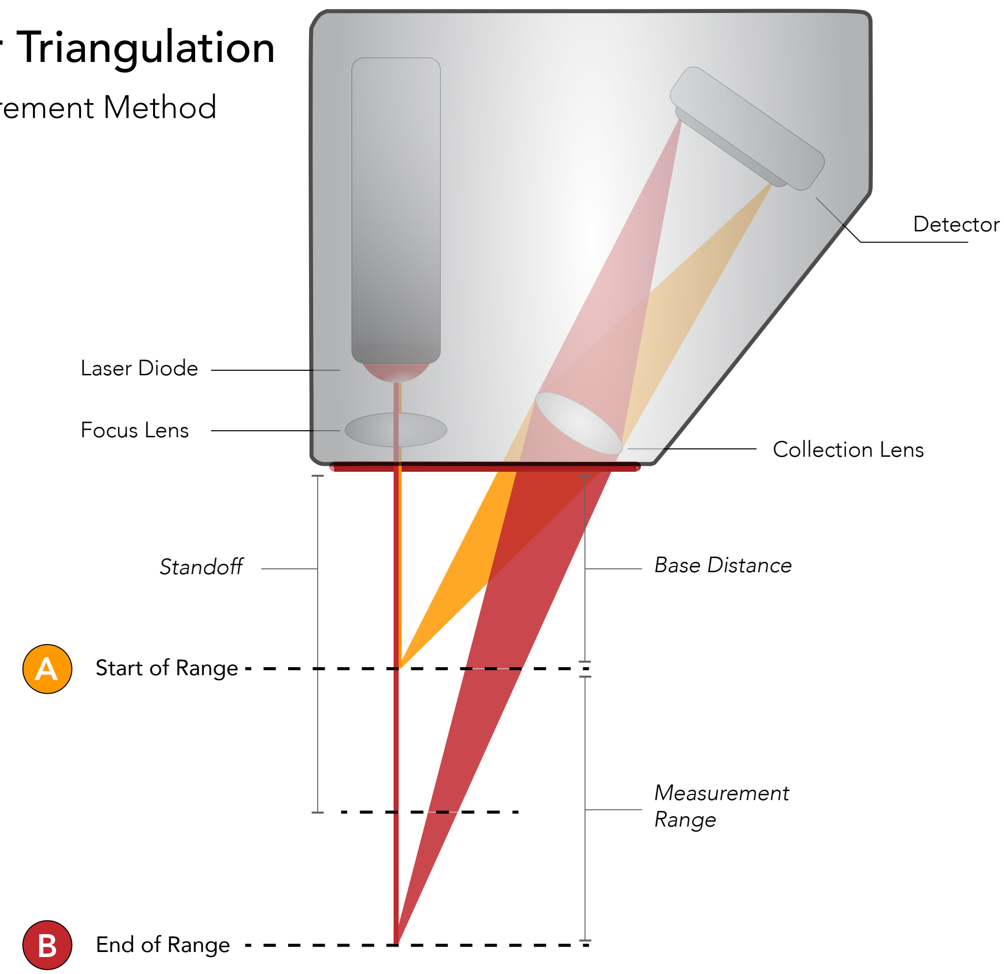
One method for accurately measuring the distance to targets is laser triangulation. The method is called triangulation because the sensor enclosure, the emitted laser and the reflected laser form a triangle. The laser beam is projected from the instrument and is diffusely reflected from a target surface to a collection lens. This lens is located a set distance adjacent to the laser emitter. The lens focuses an image of the spot on a linear array detector. The detector views the measurement range from an angle that varies depending on the particular model. The position of the spot image on the pixels of the detector is then processed, either through digital or analog signals, to determine the distance to the target.

Laser Triangulation

Measurement Method



Measurement Range

Measurement range, or sometimes referred to as span, is the working distance between measurement endpoints over which the sensor will reliably measure displacement

Base Distance

All laser triangulation sensors have a dead zone before the start of the measurement range, referred to as the base distance. It is important to note the laser sensor will not detect the target until the target is placed within the measurement range

Standoff Distance

The middle of the measurement range or the focal point. At the standoff distance, the laser spot size is the smallest

Linearity vs. Resolution

Linearity is the worst case accuracy throughout the measurement range. Resolution is the smallest change that the sensor can reliably detect. Given a cooperative target, your real-world accuracy will be between those two values but no worse than the linearity