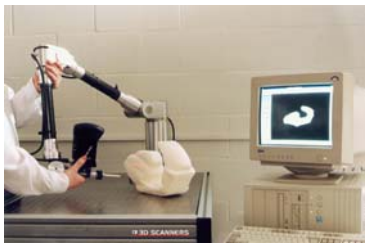
OMC Technical Brief – Light Stripe

A light stripe system uses a two dimensional CCD sensor and a light stripe generator to produce several hundred 3-D measurements of an object surface in around 1/25th of a second



What does it do?

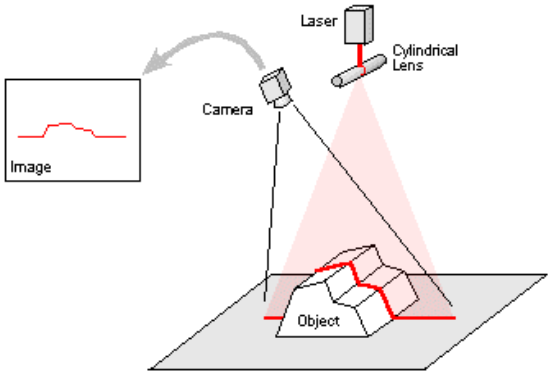
Light stripe systems use a plane of projected light that is viewed by a camera positioned at an angle such that the camera can view the stripe as it illuminates surfaces over some predetermined range. By calibrating the instrument using known distances to a calibration object it is possible to measure several hundred distances to unknown object surfaces in the time it takes for a CCD camera to capture an image.

Typical objects measured:

- size and shape of logs prior to sawing
- surface texture and shape of roads
- whole and partial body scans
- reverse engineering of industrial components
- reproduction of rare objects
- joint tracking and seam tracking for welding systems
- object presence and positioning
- web and multimedia presentations

How does light stripe triangulation work?

The image formed of the light stripe will be deformed by the surface that the light hits. The deformation will depend on the distance each point on the surface is away from the instrument. By calibrating the instrument, and using a look up table of calibration points or parameters, the distance to any point within the range can be determined. The maximum number of distance measurements will be equal to the number of pixels that the sensor has in either the horizontal or vertical direction (typically 580x750). Images can be collected at the rate of around 25 - 60 per second. If the object or the sensor is moved in a known manner each configuration can yield a new set of 3-D co-ordinates. A data rate of the order of 60 x 750 measured points per second is possible. This implies that the images can be processed to find the light stripe, compute its sub-pixel location, and estimate the 3-D co-ordinates of each point in real time. As a result special purpose hardware is often used.



Configuration of stripe system

The same characteristics of single point optical triangulation schemes apply to the light stripe system, for example: non-linearity over large ranges, approximate linearity over small ranges, requirement for light source and camera stability, problems of uneven surface texture or colour, occlusion and speckle. In addition because the stripe is projected onto a surface which may generate occlusions and have sharp edges or varying degrees of surface roughness, features along the stripe can also influence the accuracy and reliability of the device.

What are the benefits of this system?

- direct production of 3-D data at a reasonably high data rate
- freeform scanning when attached to a motion control system (eg CMM arm)
- range of designs to cater for very short to medium range applications

What are the limitations of this system?

- calibration may be required prior to use
- occlusion due to the optical triangulation characteristic
- multiple reflections from specular surfaces can cause erroneous measurements
- data needs to be processed to become meaningful

For further information contact: enquiries@optical-metrology-centre.com www.optical-metrology-centre.com