

Paired diode-laser and L.E.D. for measuring the surface curvature 1. Motivation a. Observing the reflected images on the glass marble T.V. screen from the light bulbs on the ceiling, they are all distorted. I try to measure the surface curvature by an optical non-contact device. b. Try to evaluate the qualitative and quantitative application by the device. 2. Purpose a. By optical theory, using paired diode-laser and light-emitting-diode bulbs to make a portable convenient device to measure surface. b. To estimate the practical application and improvement in the future of the device. 3. Materials a. Acrylic frame 2 sets b. L.E.D. 56, copper wire 2, white plastic ring 2 c. Transparent cellophane(scale printed) d. Laser pen 2, mercury battery 6 e.



Protractor 1 f. Acrylic rack 1 4. Methods (1) Apparatus The 56 L.E.D. are all abutted one against another between 2 annular white plastic rings, they all emit centrally downward to produce a continuous light source. The two copper wire welded to each L.E.D. to make a electric circuit. Put the ring light source into the acrylic frame. Paired diode-laser pen on either side of the frame pointing to the examinee to standardize the object distance. Cellophane with reference circle printed on is adapted in front of the ring light source. Set the inner diameter of the lighting ring is 76 mm. The object distance is 85 mm. The total frontal thickness is 20 mm. The outer diameter of the lighting ring is 80 mm(FIG3)

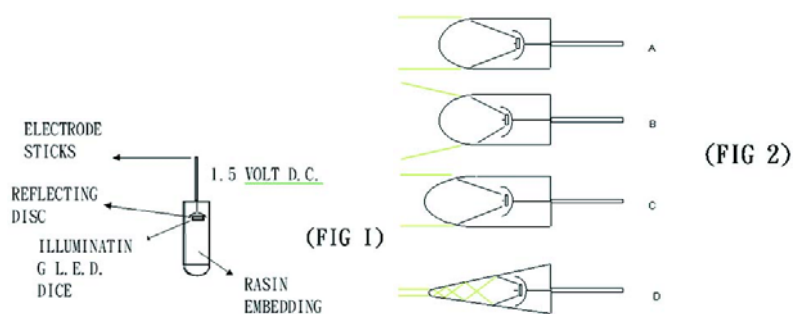
Split the protractor to two half pieces. Fix them on the either side of the light source. Put the laser pens into the acrylic racks. Make a claw behind the laser pens to keep the angle. (2) Experiment Practically measure three marbles in the different sizes. (thirty times in total.) Get the averages. Change the distance of the light source and the marble. Observe the changes of the data. 5. Discussion Light-emitting-diode is from semi-conductive material, & emit monochromatic beam. At present, the maximal illumination intensity is over 5 candle lights. L.E.D. is, small space-

Distance	average (radius)
100mm	
Marble 1	7.9mm
Marble 2	12.3mm
Marble 3	17.2mm

Distance	average (radius)
100mm	22.4mm
120mm	21.4mm
140mm	20.4mm
160mm	20.3mm

occupying, low temperature performance(The optimal illuminating strength is around 25℃), easy optical plastic designing, longer life span, and low electricity consumption. The illuminating dice of the L.E.D. is put in front of a metal concave disc, by connected two electrode sticks. The beam is reflected by the disc and emit forward. If the dice is located on the focal point of the L.E.D. optical system(FIG 2A), it emits the parallel light beam; If the dice is located before the focal point of the L.E.D. optical system(FIG 2B), it emits diverging light beam; If the diameter of the anterior part of the L.E.D. has smaller diameter(FIG 2C) as a bullet, it also emits parallel light beam. Sometimes it has a total reflection inside. L.E.D. produces seldom thermal production to interfere the observer; the

illuminating in ten si ty is



adjustable. The virtual image is stereo, real time. The observation field can be tinned by the light color of the L.E.D., but the light yellow L.E.D. beam has least tinning. If we use engraved scale or circle in the observation pathway, and paired diode-laser to standardize the object distance, the accuracy rate should be much more improved, even be digitally analyzed.

6. Conclusion Evaluate a device to measure the curvature of a surface. By utilizing the L.E.D. for light source in an abutted ring-typed arrangement, to produce a continuous light source, emits ring-shaped light to examinee.

7. Reference

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