

**VIRTUAL SMART STRUCTURES AND DYNAMICS LAB**

**EXPERIMENT 4**

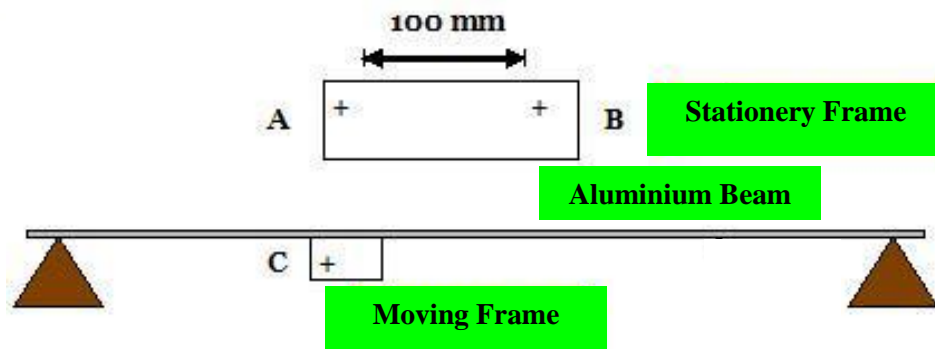
**PHOTOGRAMMETRY FOR DISPLACEMENT MEASUREMENT**

**OBJECTIVES**

This experiment aims to use the photogrammetry technique to determine structural deflections. Photogrammetry technique relies on image processing to measure real-life movements.

**EXPERIMENTAL METHODOLOGY**

This experimental setup is shown in Fig. 1. It consists of a simply supported aluminium beam which acts as the structure undergoing deflections. A stationary reference frame with two marks A and B 100 mm apart is fixed above the beam. The reference attached to structure is at the mid point of the beam and marked as C. The beam is loaded at regular intervals of one hour throughout the day with varying loads, resulting in varying deflections. Simultaneously the photographs of the deflected positions of each loading can be taken online using the camera link in the main page of the experiment (<http://ssdl.iitd.ac.in/vssdl/exp4.html>).



**Fig. 1** Experimental set up

The photographs can be analysed for deflections using MS paint, MS word, ADOBE Photoshop or MATLAB. The pixel count of the normal drawn from C to AB can be used to determine the vertical deflections of C in mm, using the principle of proportioning and making use of the fact that the real distance between points A and B is 100 mm.

If using MATLAB, following command can be used

```
I = imread('filename');
```

```
Imshow(I)
```

The concept can be extended to structural dynamics problems also by taking pictures at a very small interval, say one hundredth of a second, and analyzing them using the computer.

## REFERENCES

Jauregui, D. V., White, K. R., Woodward, C. B., Leitch, K. R. (2003), "Noncontact Photogrammetric Measurement of Vertical Bridge Deflection", Journal of Bridge Engineering, ASCE, Vol. 8, No. 4, pp. 212-222.

