"IDENTIFICATION OF IMPACT FORCES ON CHASSIS OF VEHICLE DUE TO ROAD IRREGULARITIES"

A Project Report
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ABSTRACT

When dealing with the mechanics of deformable bodies, the variation of the applied force is one of the most important factors to be considered. The mechanical force acting on a body cannot be measured directly. If a body is loaded quasi-statically and if the body deforms linear-elastically, the deformation at any point of the body is proportional to the applied force. Therefore, the variation of the force can be measured indirectly by measuring the variation of the deformation. However, this principle cannot be applied when a body is subjected to an impulsive force. In this case, the propagation of stress waves inside the body cannot be neglected so that the variation of the deformation at any point of the body is no longer the same as the variation of the applied force. Therefore, impact force is much more difficult to measure than quasi-static force. There is no instrument to measure the impact force directly. In order to overcome this difficulty, inverse analysis methods to estimate variations of impact force from measured responses of a body have been studied extensively during the last two decades.

The general inverse technique has been applied to the problem of impact force identification. The force identification problem can be stated as follows: 'Given the response of a structure, what impact force is required to produce this response?' Experimental measurement data was used to describe the acceleration response of an impacted cantilever beam. The inverse technique used these measurements to predict the impact force which resulted in the beam response. This theory then can be extended to predict the impact force on a vehicle chassis due to road irregularity.

Direct measurement of impact force is not possible. So they can only be identified indirectly. Inverse identification of the main internal excitations through operational acceleration measurements, combined with laboratory tests of FRF matrices, is the only possibility.

The results obtained by conducting experiment on the validation model (Cantilever beam) were found to be satisfactory. So this methodology can be extended for simply supported beam (vehicle chassis).