# Vibration Control of MFC/Bicycle Handlebars Using Finite Element Model Approach


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**ABSTRACT**

The purpose of this thesis, is to study the vibration suppression technology of the bicycle handlebars. The research approach is to use Macro Fiber Composite (MFC) as the actuator. It is to use velocity feedback control and piezoelectric shunt to control the method. This study is divided into two sections: active control design and passive control design. In the active control design, the active piezoelectric constraining layer acts as an active energy pump utilized to accelerate the absorption of unwanted vibration energy. Velocity feedback control with the advantages of simplicity and reliability and linear quadratic regulator with the advantages of efficiency and robustness are proposed utilizing in control of vibration of cylindrical strut. In the passive control design uses piezoelectric shunt, the generally shunted model is specialized for two shunting circuits: the case of a resistor alone and that of a resistor and inductor. Use finite element method to derive the systematic mathematics model, derive the state space equation, utilize numerical simulation and experiment to probe into its control efficiency respectively, in order to study simple and steady and effective Composite bicycle handlebars vibration suppression technology. Bicycle handlebars is the curved surface structure, so suppress the vibration necessary piezoelectric component to be different the traditional piezoelectric ceramic , the vibration control method is comparatively complicated , need to consider the forms and load types of compound structure , look for best pasting the position and control circuit , Design the vibration control of cylindrical structure which includes MFC, According to vibration analysis and experiment measurement , set up the optimization vibration control of MFC/bicycle handlebars.



Keywords : Macro Fiber Composite, bicycle handlebars,Linear quadratic regulator, Piezoelectric shunt, Finite element method


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