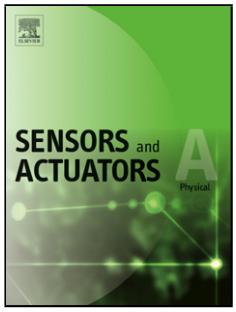

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Temperature and Strain Feedback Control for Shape Memory Alloy Actuated Composite Plate

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Highlights

- Different techniques can be employed to control the deflection of a shape memory alloy actuated composite plate such as the resistance or temperature of the SMA actuator and position or strain of the composite plate. The research work presented here investigated the effects of input measurements to the feedback control system in order to determine the optimal feedback variable. Two types of variables were investigated which were temperature of the SMA actuator and strain of the composite plate. Thermocouple and strain gauge were used successfully to obtain measurements and provide input to the feedback system. However, from the results presented it was found that the strain feedback system produced better performance with low overshoot and without steady state error compared to the temperature feedback system. In addition to that the strain feedback system was more energy efficient, as the power required to produce the composite plate's deflection was at least 40% lower compared to the temperature feedback system. The morphing composite plate-like wing with strain feedback can be used to produce continuous deflection as it has been proven to be effective in tracking continuous step input. In order to further reduce power consumption, a locking mechanism may be integrated to hold the structure in place. For the application of variable deflection control of smart composite plate it is recommended to utilize strain feedback control using input from the strain measurement of the composite's surface. For aerospace applications, the change of strain along the wing varies from the root to the tip, thus further study on the effects of sensor location on the performance of the system will be beneficial to produce an optimized smart composite design.