FINAL PROJECT

STUDY ON THE EFFECT OF DAMPER TO THE QUADCOPTER FRAME VIBRATION RESPONSE

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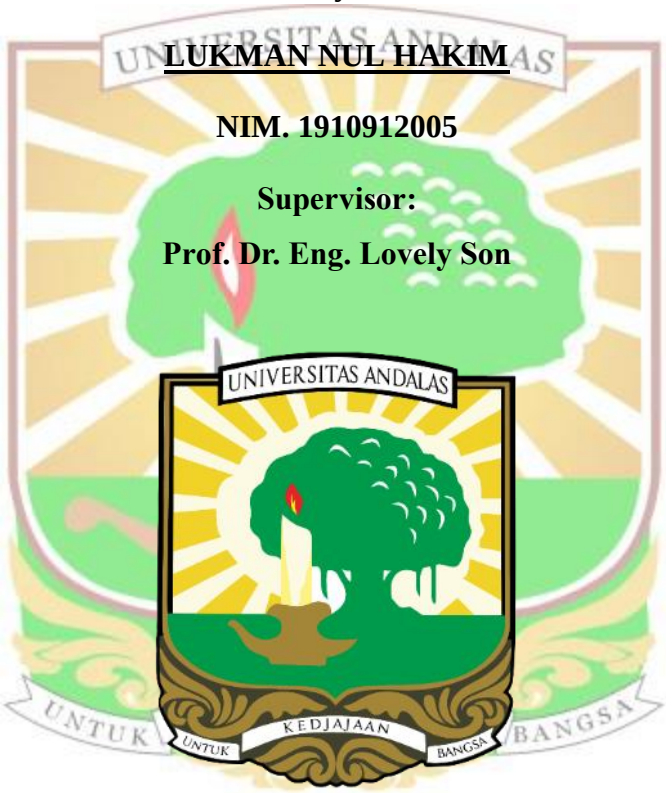

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ABSTRACT

The Andalas Flying Robot Generation (AFRG) team produced Sikumbang Api AFRG, an Unmanned Aerial Vehicle (UAV) type quadcopter equipped with the ability to scan QR codes, carry, and drop payloads. During flight tests, several issues occurred due to resonance in the quadcopter frame, disrupting its performance. The resonance phenomenon happens when the excitation frequency from the vibration source on the quadcopter, namely the motor-propeller, approaches or matches the quadcopter's natural frequency. One technique to avoid resonance is to add a damper to the quadcopter frame. The objective of this study is to determine the natural frequencies and vibration response of the quadcopter both without dampers and with dampers. Simulations using MSC Nastran/Patran software and experimental Modal Analysis (EMA) with impact test are utilized to obtain natural frequencies and vibration responses. The dampers used in this study are Neoprene rubber sheet, Thermoplastic polyurethane (TPU) and Sorbothane rubber sheet. The effectiveness of these dampers will be compared to determine which one provides better damping. From the research results, it was found that sorbothane provides good damping effects followed by Neoprene and then TPU. However, due to its soft material, vulnerability to damage, and high cost, Sorbothane is not recommended. As an alternative, neoprene was selected as the damping material for the quadcopter due to its ability to generate minimal vibration responses after sorbothane. The simulation and experimental results have errors due to the assumptions made in the simulation. However, the error values are below 10%, which is considered acceptable.

Keywords: Quadcopter, Modal Analysis, Resonance, Vibration respone, Damping.