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## Linear model identification of beetle-mimicking flapping wing micro-air vehicle in hovering flight (Conference Paper)

Khan, Q.<sup>a</sup>, Akmeliawati, R.<sup>a</sup> [✉](#), Phan, H.V.<sup>b</sup>, Park, H.C.<sup>b</sup> [✉](#)<sup>a</sup>Intelligent Mechatronics System Research Unit, Department of Mechatronics Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia<sup>b</sup>Department of Advanced Technology Fusion, Konkuk University, Seoul, South Korea

### Abstract

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This paper presents a linear time invariant model identification for beetle mimicking flapping wing micro air vehicle (FWMAV) in hovering mode. The identification is facilitated by assuming the wings of the beetle rectangular in shape and the body is considered cylindrical. The main thrust is provided by flapping the wings of the FWMAV whereas the trailing-edges-change mechanism was kept off. The measurable aerodynamic forces and moment's measured data are utilized in the states' reconstruction. The state reconstruction was carried out via the discrete time integration of linear and angular acceleration. Having reconstructed the states, the standard least mean square estimation (LMSE) based estimation approach is used to estimate the system's stability and control derivatives. The results of the estimation are validated with the experimental data, and show the success of the estimation approach. © 2016 IEEE.

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