ABSTRAK

The development of electric vehicles faces efficiency challenges across various operational conditions. Two common powertrain types, Hub-Drive and Mid-Drive BLDC motors, possess inherent weaknesses: Hub-Drives are efficient for urban use but struggle on inclines or with heavy loads, whereas Mid-Drives excel in torque but are less efficient in single-gear city usage. This research aims to overcome these limitations by designing and building an Automated Manual Transmission (AMT) system integrated with a Mid-Drive BLDC motor on an E-C70 motorcycle platform. The methodology involved redesigning the gearbox ratio to achieve a balance between torque and speed, and developing an AMT control module based on an ESP32-V4 microcontroller that actuates servo motors for clutch and gear shifting operations. Comparative testing was conducted on three configurations: the existing system (direct drive), a manual custom gearbox, and the custom gearbox with the AMT module. The results show that the custom gearbox ratio successfully increased the maximum speed from 47.28 km/h to 81.20 km/h in 4th gear. Furthermore, the configuration with the AMT module consistently delivered the longest travel distance in all load scenarios. Power consumption analysis proved that the AMT module successfully improved energy efficiency by ±5.9%, evidenced by the decrease in average power consumption from 23.7 Wh/km to 22.3 Wh/km. This study concludes that the implementation of the AMT system successfully creates a more efficient and adaptive electric vehicle powertrain for diverse driving conditions.

***Keywords:* Automatic and Manual Transmission, Electric Vehicle, Fuzzy Logic, Transmission System.**