Abstract

The importance of the brake-by-wire (BBW) system emerged from the fact that it replaces all the conventional hydraulic braking system components with electronic signals between sensors, control modules and electrically driven braking actuators. This conversion has enormously contributed to the braking system performance in terms of responsiveness, compatibility with other vehicle subsystems and an adaptive behavior in different driving circumstances.

The aim of this research is investigating the sliding mode control strategy to BBW. To achieve this aim, BBW system is modeled and validated experimentally. The sliding mode control strategy is applied to the model and validated experimentally. Moreover, this research focuses on compensating the effect of worn pads on braking performance.

All modeling tasks are performed using SIMULINK software package. The experimental work is carried out using a specially developed test rig. The test rig consists of an electric motor connected to a shaft via coupling. The shaft has two flywheels as the load to brake. An Electro mechanical brake-by-wire actuator (EMBBW) is used for system braking. The rig is equipped with sensory system to grasp the system performance. The control strategy is encapsulated in a microcontroller.

The experimental work shows that the developed system model gives matched results with the practical work. This test points to a valid system modeling. The applying sliding mode control to the model shows a good performance in braking operation with acceptable error. The applying of the sliding mode control to the test rig shows a good performance with acceptable deviations. In addition the experiments show that the control strategy is able to compensate the effect of the wear on the braking pads and keep tracking the braking form.