KOKKUVÕTE

Lõputöö eesmärgiks oli välja töötada lahendus Taltech iseAuto v2.0 roolivõimendi elektrimootori asendamiseks harjavaba elektrimootoriga. Töö läbiviimiseks oli kasutada sõiduki roolilatt.

Elektrimootori asenduse planeerimiseks teostati roolilati tehnilise lahenduse analüüs, vaadeldi võimalusi elektrimootori asendamiseks ning teostati vajalikud mõõtmised. Analüüsi tulemusena selgus, et mootor oli võimalik asendada valides turult sobiv harjavaba elektrimootor ning projekteerides sellele uus korpus. Lisaks oli vaja projekteerida sidur elektrimootori võlli ning roolilati võlli vahele. Kuna harjavaba elektrimootori juhtimine erines oluliselt varem kasutusel olevast mootorist, siis tuli projekteerida ka uus elektroonika lahendus mootori juhtimiseks.

Mehaanika lahenduse väljatöötamisel valiti turult sobiv harjavaba elektrimootor ning projekteeriti sellele ilmastikukindel korpus koos võllide siduriga. Elektrimootori sobitamiseks roolilatile oli vajalik kolme spetsiaalse detaili projekteerimine. Töö käigus koostati nende 3D mudelid SolidWorks tarkvaras koos joonistega ning pakuti välja võimalik valmistamise tehnoloogia.

Elektroonika lahenduse raames koostati elektroonikaskeem ning trükkplaadi disain *Altium Designer* tarkvaras. Elektroonikaskeemi aluseks võeti VESC nimelise mootorikontrolleri elektroonikaskeem. Elektroonikaskeemi kohendati auto elektrisüsteemis kasutamiseks. Viimase osana valiti elektroonikakomponendid ning koostati trükkplaadi disain.

Üldiselt said töö eesmärgid teostatud - projekteeriti mehaanika ja elektroonika lahendused roolivõimendi elektrimootori asendamiseks. Projekteeritud süsteemi praktiline katsetamine ei olnud võimalik turgu tabanud elektroonikakomponentide puudujäägi tõttu - disainitud trükkplaati ei saanud tähtajaks toota. Lisaks ei mahtunud lõputöösse lahenduse autotööstuse standardite vastavuse tagamine. Näiteks STM32 mikrokontrolleri asendamine SPC5 mikrokontrolleriga ning täpsem turvalisuse analüüs.

SUMMARY

The goal of this work was to develop a solution to replace the brushed electric motor of Taltech iseAuto v2.0's power steering system with a brushless electric motor. It was possible to examine the existing steering rack of the vehicle to achieve this.

The existing solution was examined and analyzed to plan the replacement. Different solutions for replacement were considered and the necessary measurements were carried out. As a result of the analysis, it was concluded that the electric motor could be replaced by choosing a brushless electric motor from the market and designing a new weatherproof housing for it. In addition, it was necessary to design a coupler between the chosen electric motor's shaft and the steering rack's shaft. Brushless electric motors are controlled differently from brushed motors; thus, it was necessary to develop a new electronics solution to control the motor.

As a part of the mechanical solution, new brushless electric motor was chosen, and a weatherproof housing was developed along with the mentioned coupler. To fit the parts together, three specially made details were needed. 3D models and necessary drawings were made in SolidWorks software, and the manufacturing technology was suggested.

To Control the motor electronically, an electronic schematics and PCB design were constructed in Altium Designer software. The electronics schematics of a motor controller named VESC was used as a base. The schematics was adjusted to fit with the car's electric system. Finally electronic components were chosen, and the PCB was designed.

In general, the goals were achieved – the replacement solution for mechanics and electronics was developed. Due to shortage of electronic components, it was not possible to test the designed system in practice. The PCB could not be manufactured in time. In addition, the author would have wanted to make the entire solution more compliant with automotive standards but was unable to fit it into this work. For example, the used STM32 microcontroller could have been replaced with a SPC5 microcontroller and more safety analysis could have been carried out.