

## KOKKUVÕTE

Autori eesmärk oli leida autotööstuse standardile AEC-Q100 vastav mikrokontroller Taltechis arendatavale iseAuto projektile. Sobiv mikrokontroller leitud, oli vaja see ära tellida ning õppida kasutama selle programmeerimise tarkvarasid. Tarkvara õppimise käigus oli autori eesmärk programmeerida ka autotööstuses laialdaselt kasutatav CAN protokoll kasutatav andmevahetus kontrollerisse.

Töö käigus õppis autor CAN protokollide töötamise põhimõtted ning selle protokollide iseärasused. Peale selle uuriti informatsiooni autotööstuse standardit kasutavate mikrokontrollerite kohta ning saadi parem ülevaade, kui kaugel tänapäeva tehnoloogia kontrollerite valdkonnas on. Töös on toodud võrdlus erinevate tootjate vahel, kes pakuvad AEC-Q100 standardit omavaid mikrokontrollereid, mis on spetsiaalselt mõeldud isesõitvate sõidukite süsteemi juhtimiseks. Tehtud on ka valik ühe tootja kasuks, kellelt mikrokontroller telliti.

Samuti on töös välja toodud põhjalik ülevaade tellitud mikrokontrolleri tarkvarade kasutamisest. Lisaks on välja toodud üksikasjalik õpetus, mis algab uue projekti tegemisega ning lõppeb mikrokontrollerisse koodi peale laadimisega. Selles töös on käsitletud juhtkontrolleri sisest koodi ning konfiguratsiooni. Kood, mis kontrollerisse programmeeriti põhineb kahe mikrokontrolleri plaadi vahelisel suhtlusel, kasutades varasemalt mainitud CAN protokollide. Lisaks on ka koodi kirjeldus ning peamised funktsioonid töös lahti seletatud. Seletatud on ka programmi testimisel esinenud errorid ning kuidas autor need lahendas.

Autori arvates annab tehtud töö hea ülevaate kontrollerist ning selle programmeerimise tarkvaradest. Lugeja, kes pole valitud mikrokontrolleri tarkvaradega kokku puutunud, peaks saama tööst algteadmised, kuidas programmeerida SPC5 seeria mikrokontrollereid.

Tulevikus kui mikrokontroller peaks iseAutos kasutust leidma, tuleb kindlasti leida lisainfot teiste andmeside protokollide programmeerimisest, kuna selles töös on toodud välja ainult CAN protokollide andmevahetus. Lisaks peaks tulevikus ka rohkem süvitsi konfigureerima CAN protokollide sätteid ning uue koodi kirjutama, kui hakatakse looma mahukamaid elektroonikamoodulite süsteeme.

## CONCLUSION

The purpose of this work was to find a microcontroller for a Taltech iseAuto project. It was important that microcontroller had a AEC-Q100 automation standard. When suitable microcontroller was found was necessary to order it and to understand its programming software. While learning the microcontroller programming software author also programmed CAN-bus data exchange what is widely used in automation industry.

During this work author learned about CAN protocol operating principles. Besides that author also learned about latest automation microcontrollers and how developed is current technology in microcontrollers field. Author also made a comparison about different manufacturers who are producing microcontrollers that have AEC-Q100 automation standard. AEC-Q100 standard is specially meant to control the system of self-driving vehicle. Furthermore a decision is made in the favor of one manufacturer whose microcontroller was ordered.

A thorough overview is written about how to use ordered microcontroller software. Also a tutorial was made for programming software, that starts with making a new project and ends with program being installed inside the controller. This work mainly focuses on master controller configuration and the code that was uploaded inside it. The program that was uploaded in this thesis was about CAN data exchange between master and slave controller that controls BLDC motor. Author has written an explanation of how uploaded code works and what functions it uses. All the errors that appeared during programming are all explained with solutions.

Author believes that his work will give a good overview about the controller and its programming softwares. Person who reads this thesis and who has never worked with this controller family should understand the basics of how to program SPC5 family microcontrollers.

More information about other data exchange protocols should be searched, if this controller is going to be used in iseAuto project because this thesis is focusing only on CAN protocol. Also the program that was made in this document was based on simple motor controller and master controller communication. Projects that have more complicated electronics systems must have their own code written and CAN settings configured differently.