Studia II stopnia
Automatyka i Robotyka

Specjalność:
Inteligentne systemy automatyki

Instytut Robotyki i Inteligencji Maszynowej

Opiekun: dr hab. inż. Stefan Brock, prof. PP
Stefan.Brock@put.poznan.pl

Co dają studia magisterskie?

Inżynier

- Ma podstawową wiedzę ogólną z zakresu dyscyplin naukowych tworzących podstawy teoretyczne oraz wybrane zagadnienia z zakresu wiedzy szczegółowej
- Potrafi wykorzystywać posiadaną wiedzę – formułować i rozwiązywać złożone i nietypowe problemy oraz wykonywać zadania w warunkach nie w pełni przewidywalnych
- Potrafi komunikować się z otoczeniem z użyciem specjalistycznej terminologii.

Magister inżynier

- Ma zaawansowaną wiedzę ogólną z zakresu dyscyplin naukowych tworzących podstawy teoretyczne, oraz wybrane zagadnienia z zakresu zaawansowanej wiedzy szczegółowej
- Potrafi wykorzystywać posiadaną wiedzę – formułować i rozwiązywać złożone i nietypowe problemy oraz innowacyjnie wykonywać zadania w nieprzewidywalnych warunkach;
- Potrafi formułować i testować hipotezy związane z prostymi problemami badawczymi
- Potrafi komunikować się na tematy specjalistyczne ze zróżnicowanymi kręgami odbiorców;
- Potrafi współdziałać z innymi osobami w ramach prac zespołowych, potrafi kierować pracą zespołu

WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia
Wikipedia store

Interaction

Help
About Wikipedia
Community portal
Recent changes
Contact page

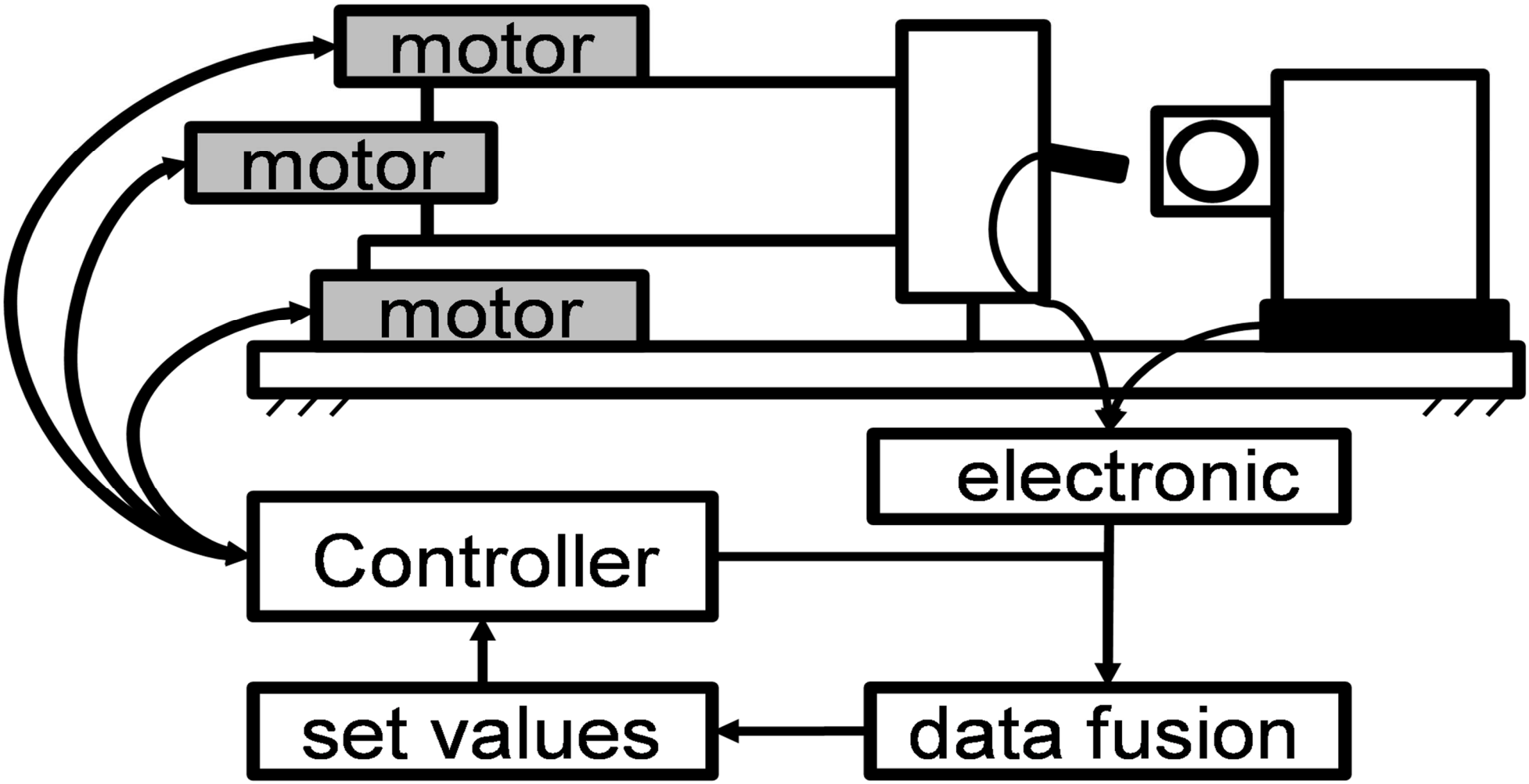
Intelligent control

From Wikipedia, the free encyclopedia

Intelligent control is a class of control techniques that use various artificial intelligence computing approaches like neural networks, Bayesian probability, fuzzy logic, machine learning, reinforcement learning, evolutionary computation and genetic algorithms.[1]

Contents [hide]

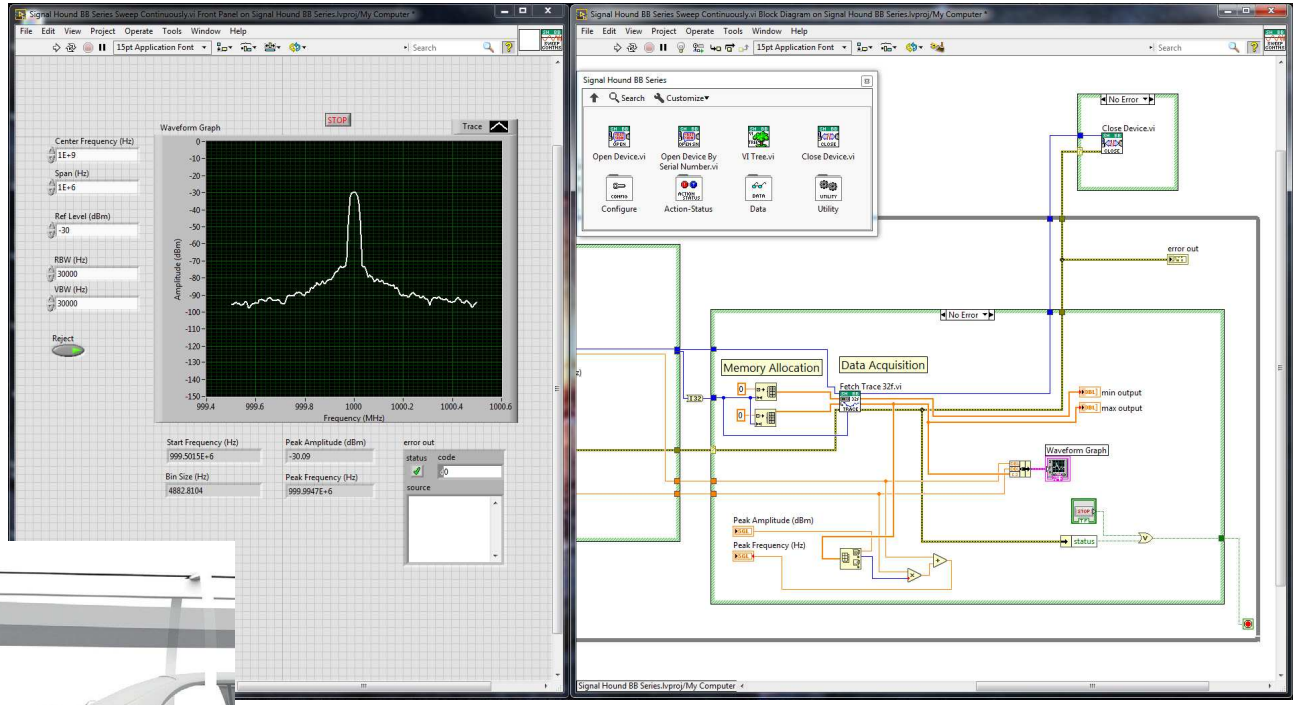
Sense - Think - Communicate - Act

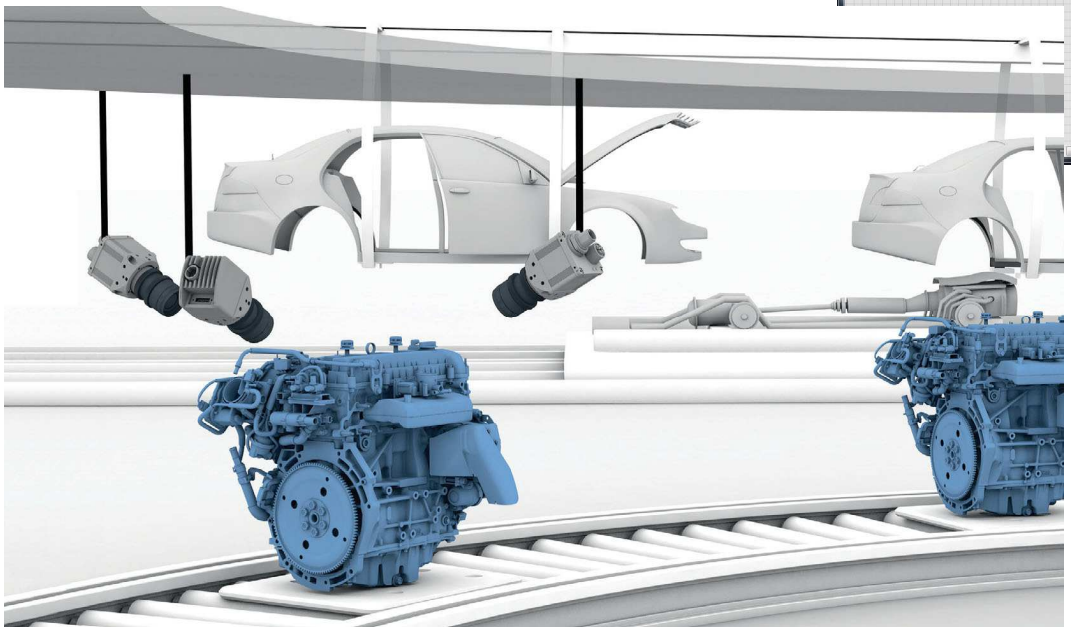


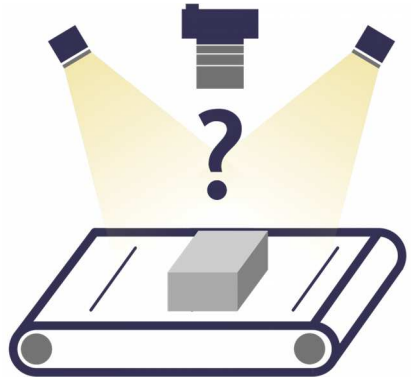
Sense

Inteligentne systemy pomiaru i sterowania (30W 30L)

Systemy wizyjne w automatyzacji (15W 15L)

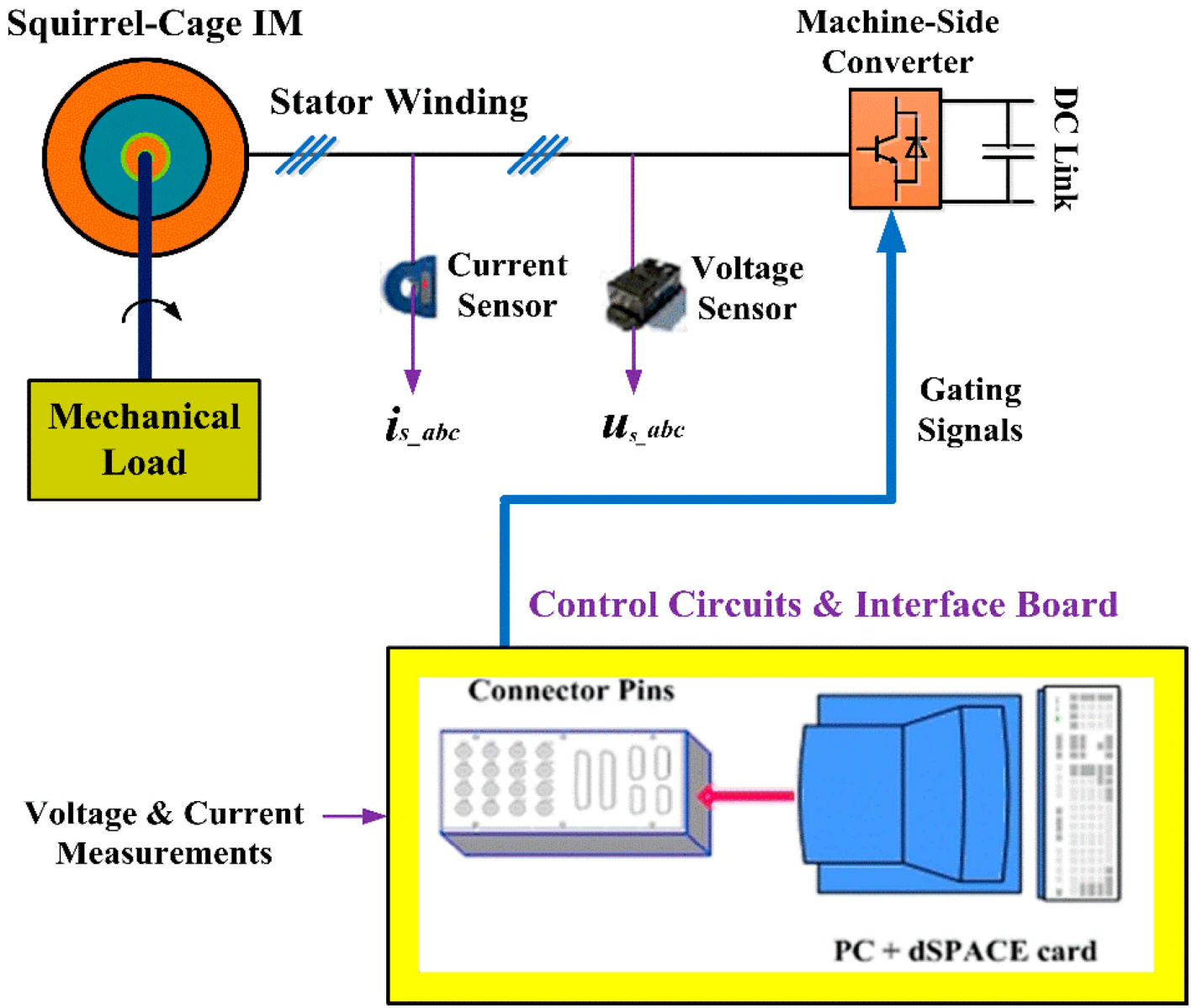






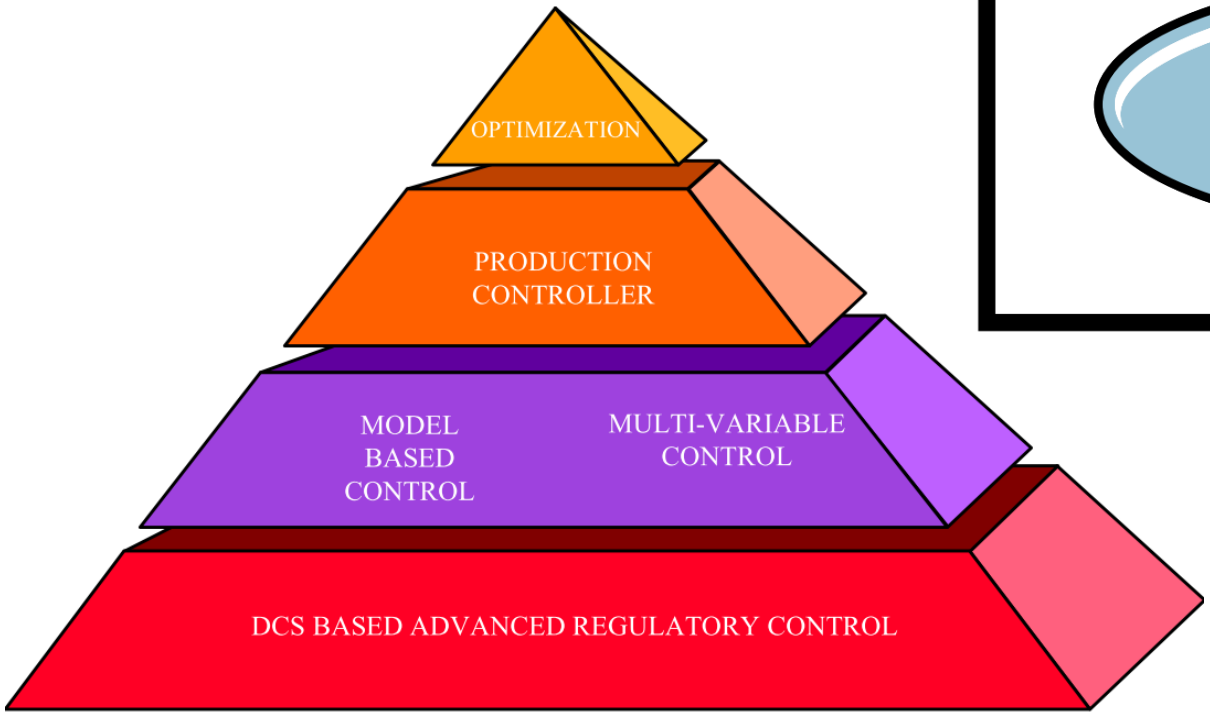
Sense

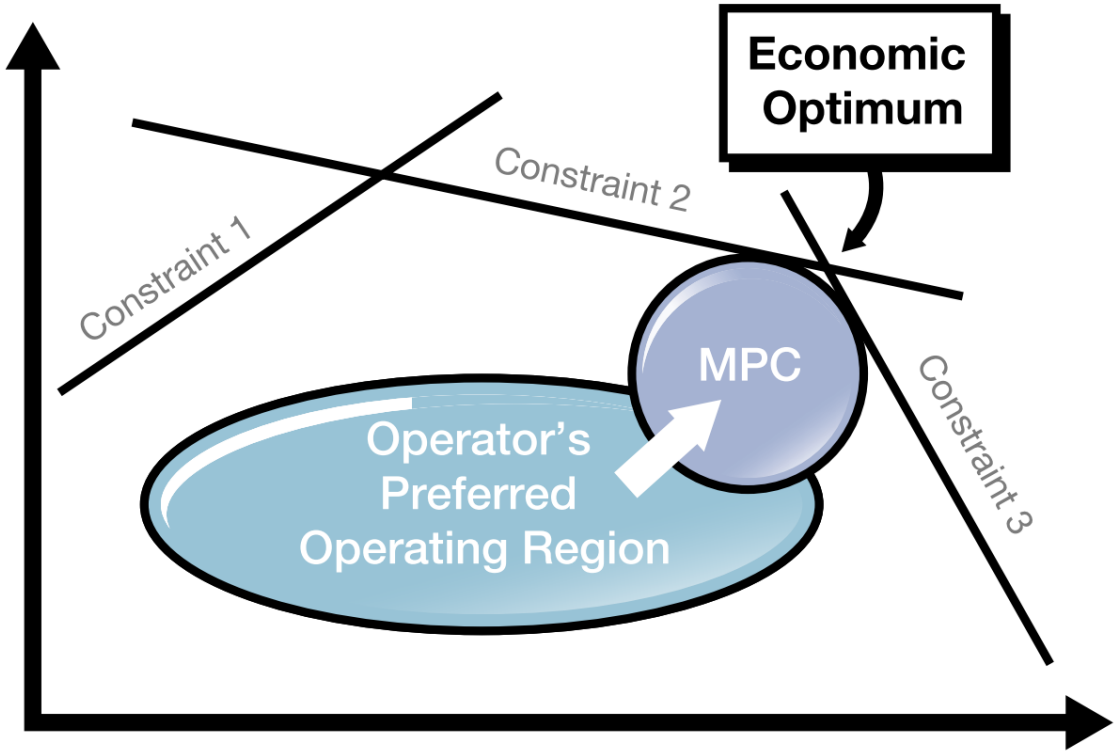
Systemy bezczujnikowe (30W 30 L)



Think

Metody obliczeniowe optymalizacji (30W 30C)

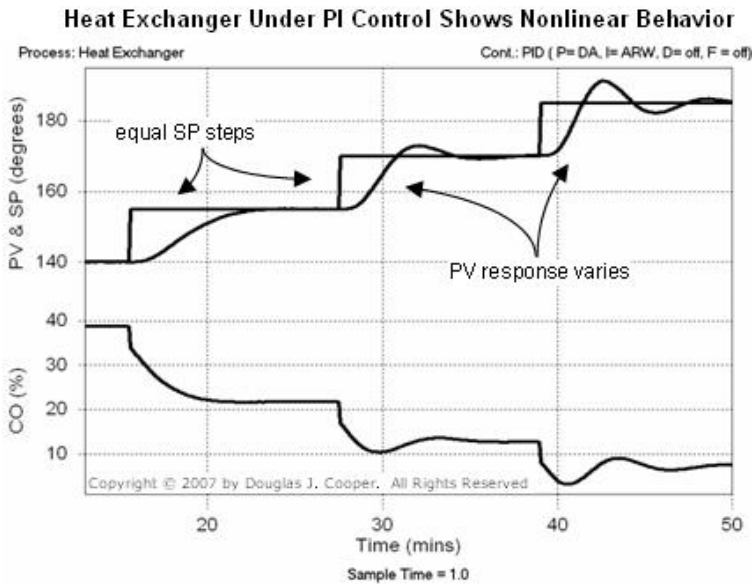


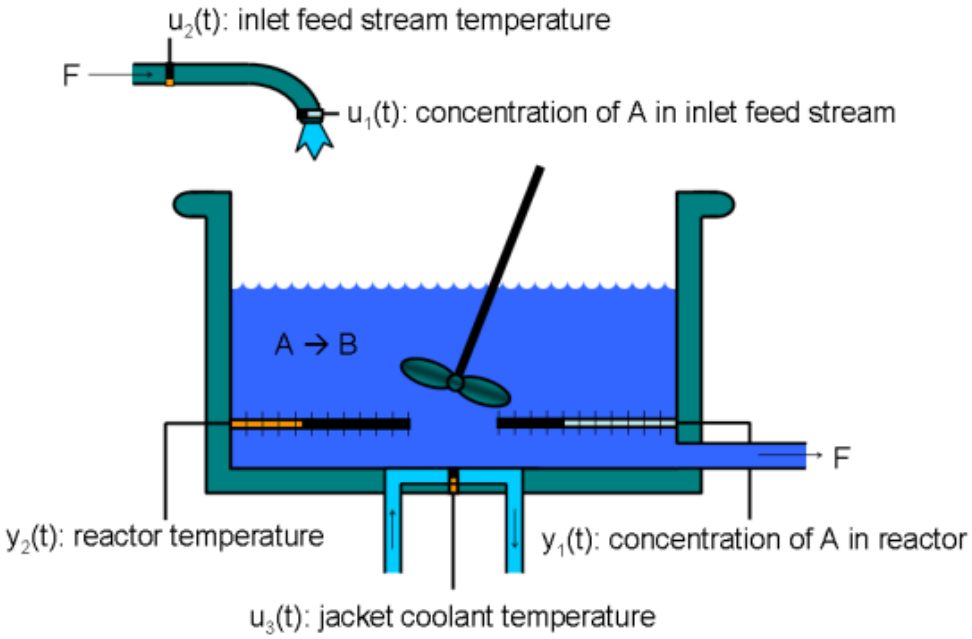


Think

Sterowanie procesami nieliniowymi (30W 30L)

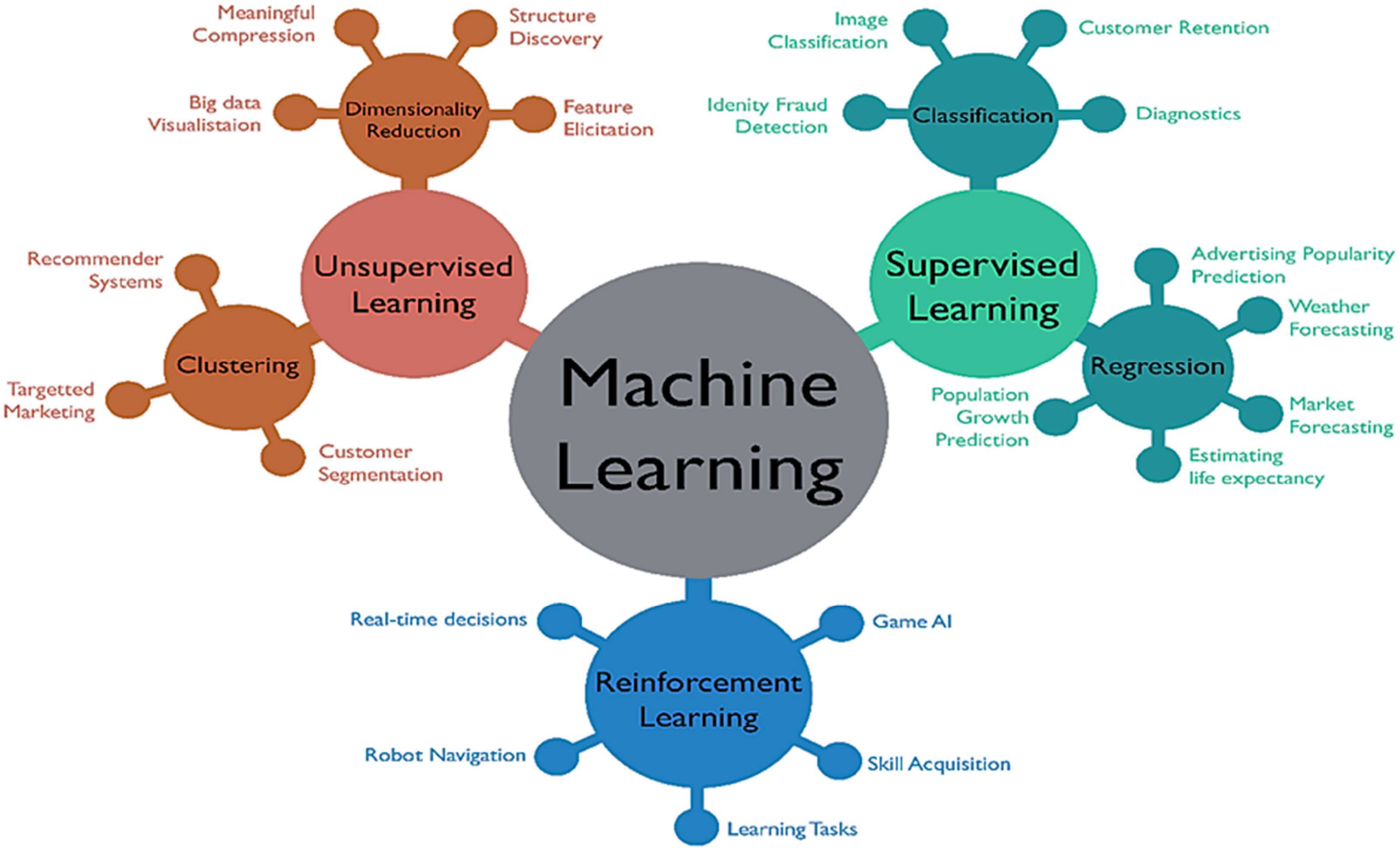
Zaawansowane metody identyfikacji systemów automatyki (30W 30L)





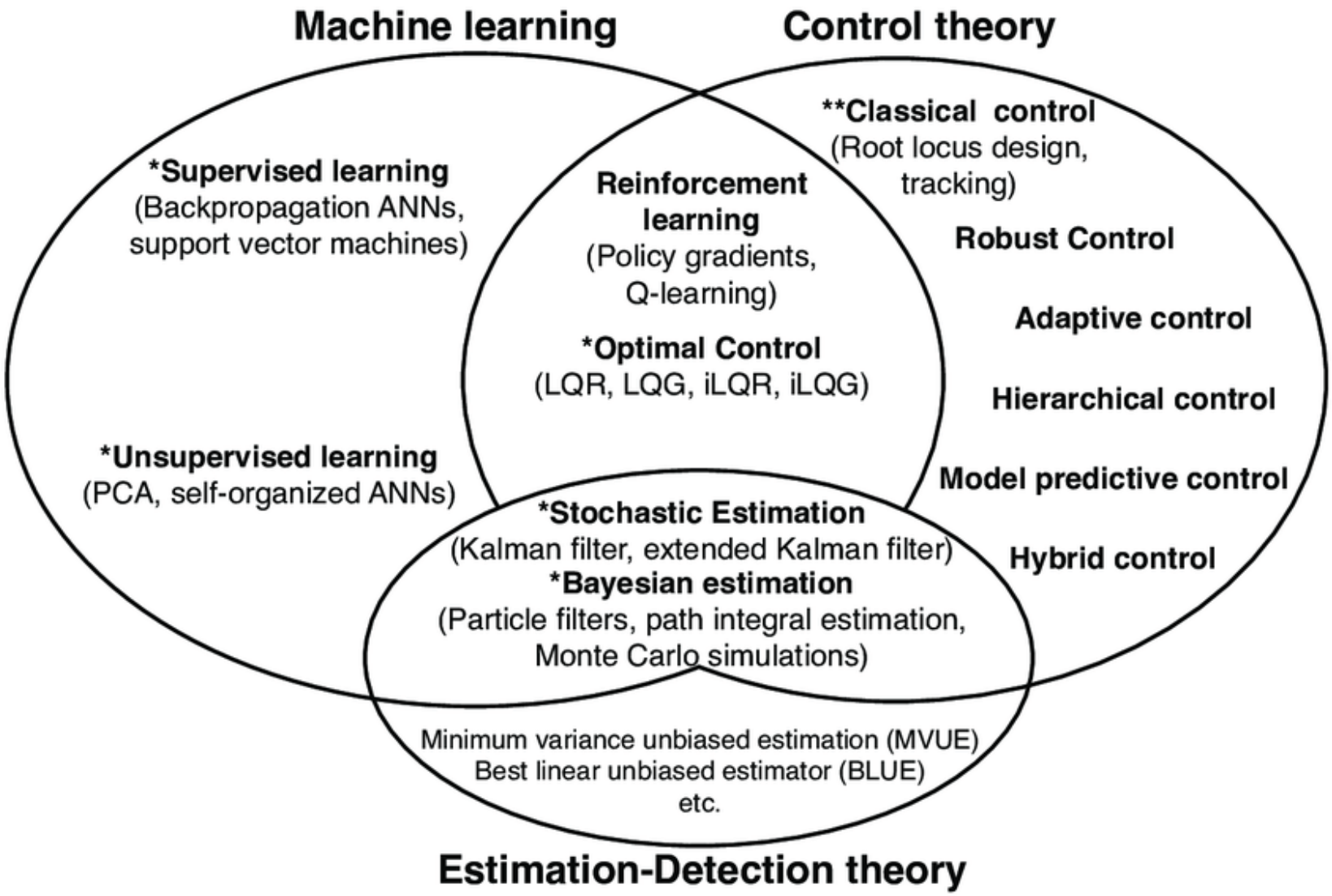
Think

Metody inteligencji maszynowej w automatyce (30W 30L)



Think

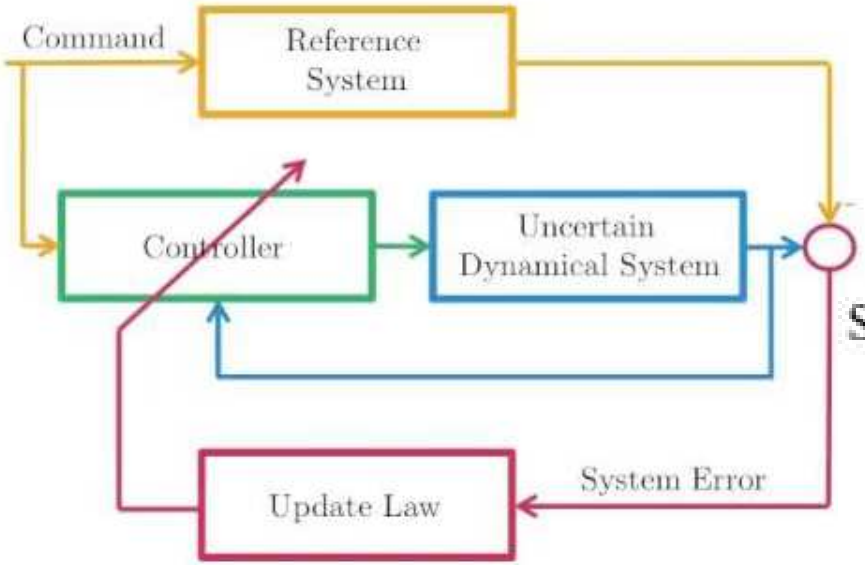
Metody inteligencji maszynowej w automatyce (30W 30L)

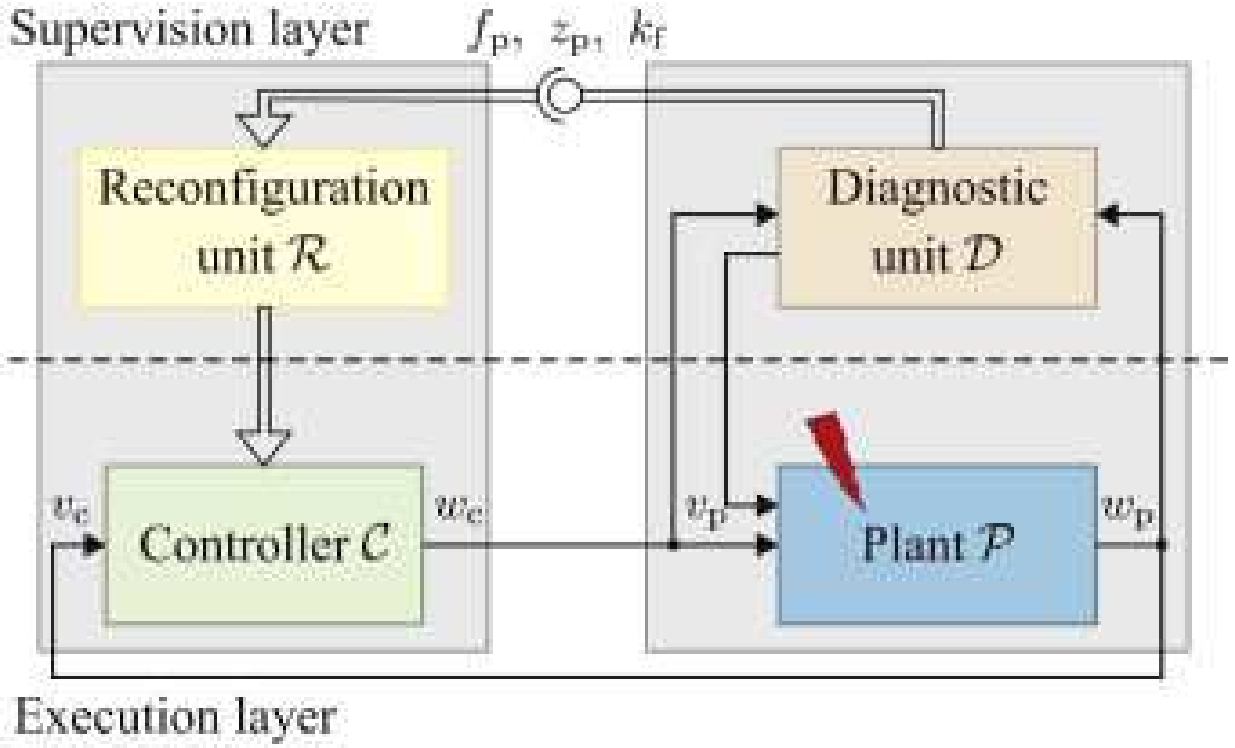


Think

Sterowanie adaptacyjne i odporne (30W 30L)

Systemy sterowania tolerujące uszkodzenia (15W 30L)





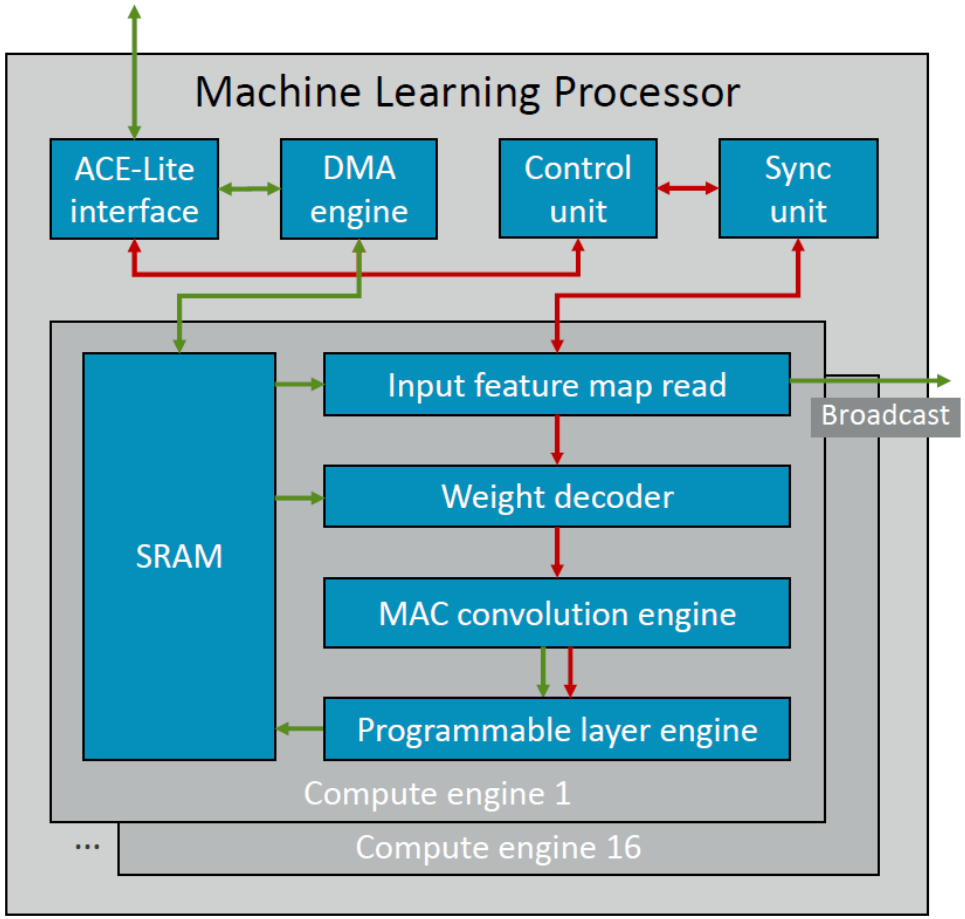
Think

Zaawansowane systemy diagnostyki i monitorowania (30W 30L)

Technologie inteligentnego sterowania (30W 30L)

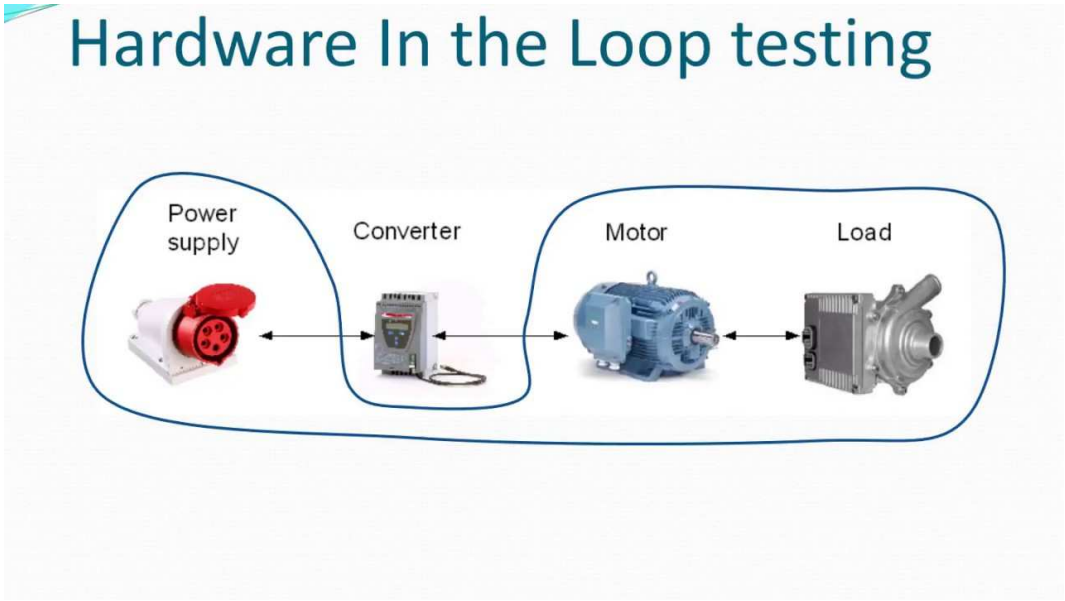
Arm's ML processor

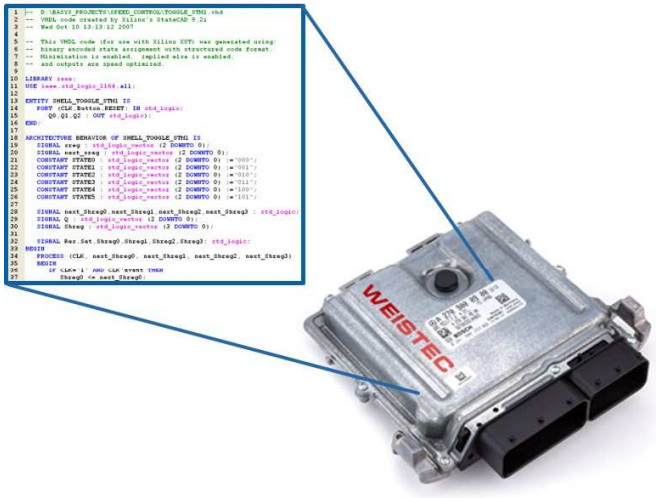
- A microcontroller and DMA engine manage overall network scheduling
- The compute engine processes major sections of the neural network
  - Stores weights
  - Stores and manipulates activation data
  - Handles convolution in 128-wide MAC units
  - Handles other layer operators via PLE
  - Pipelines data to and from SRAM
- Internal broadcast network manages SRAM population and synchronization

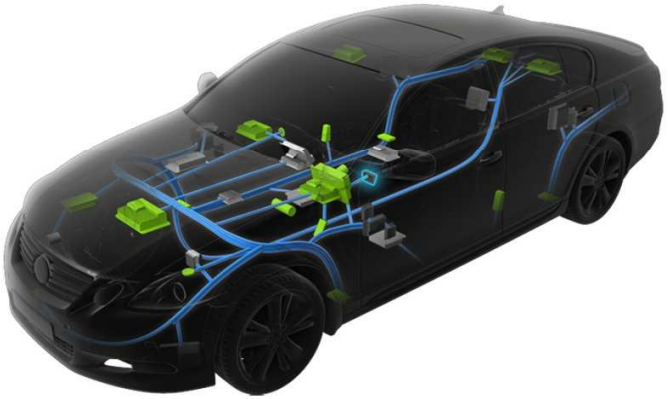


Think

Wirtualne prototypowanie w automatyzacji procesów (30W 30L)

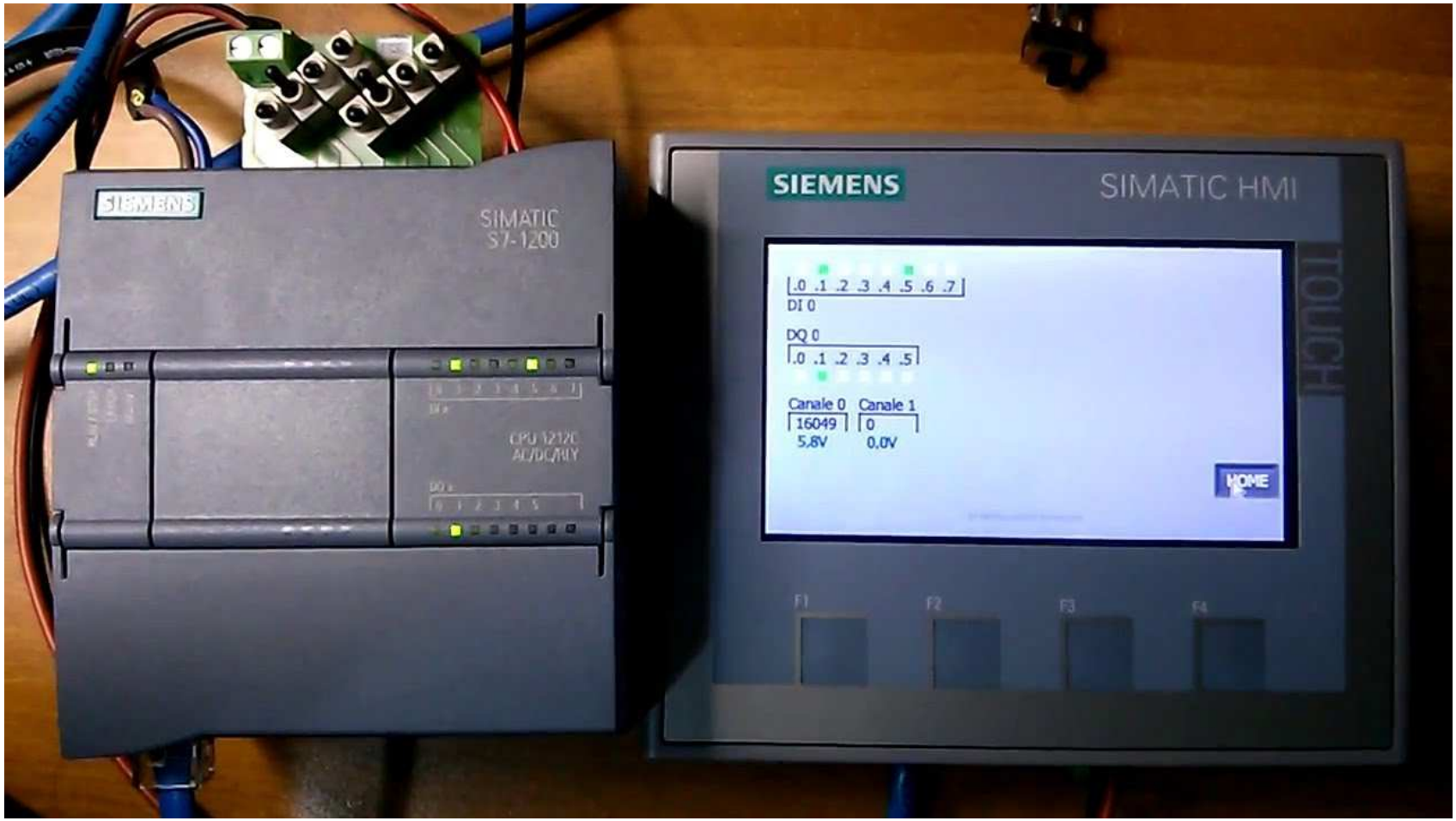






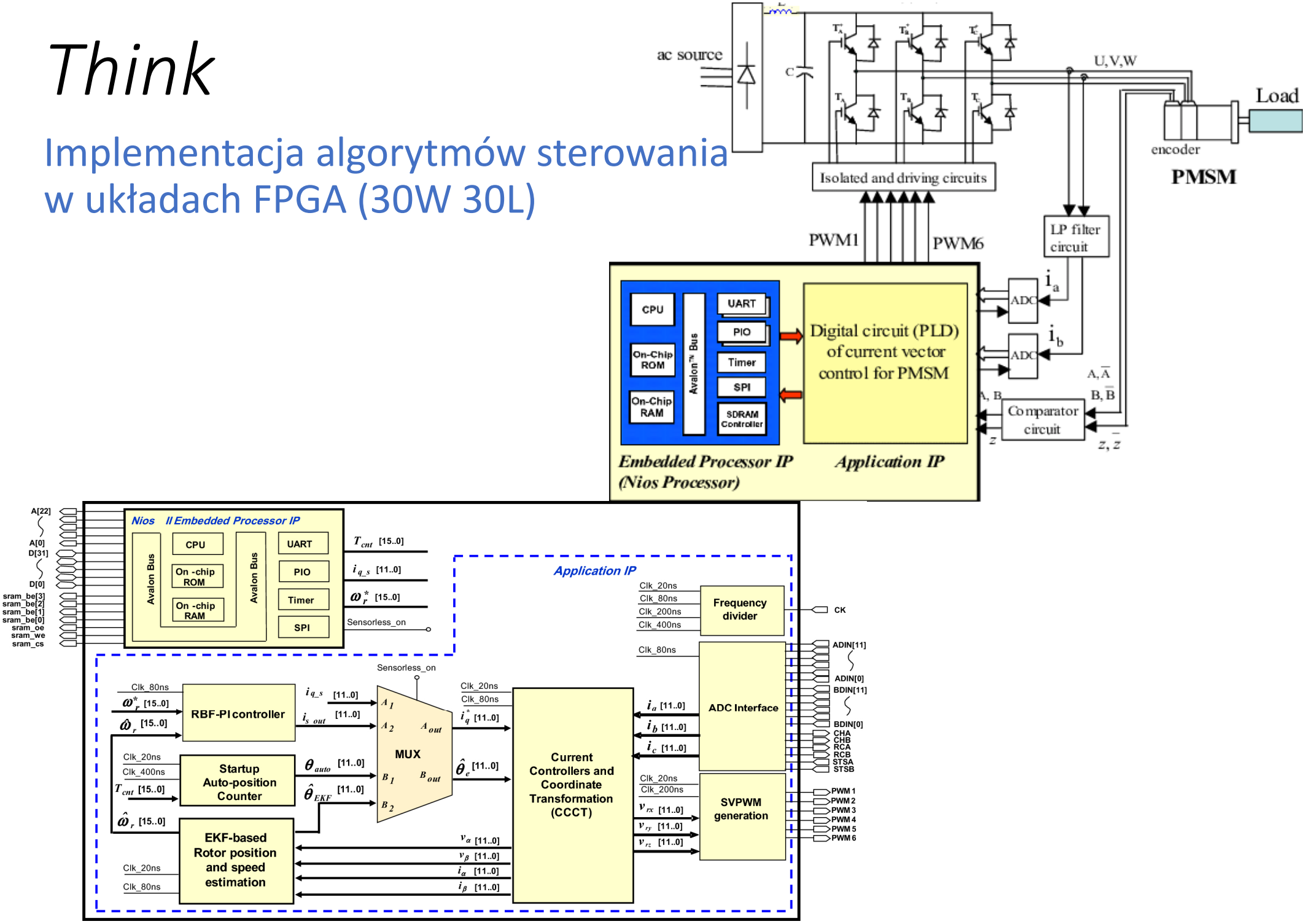
Think

Wybrane zastosowania sterowników programowalnych (15W 30L)



Think

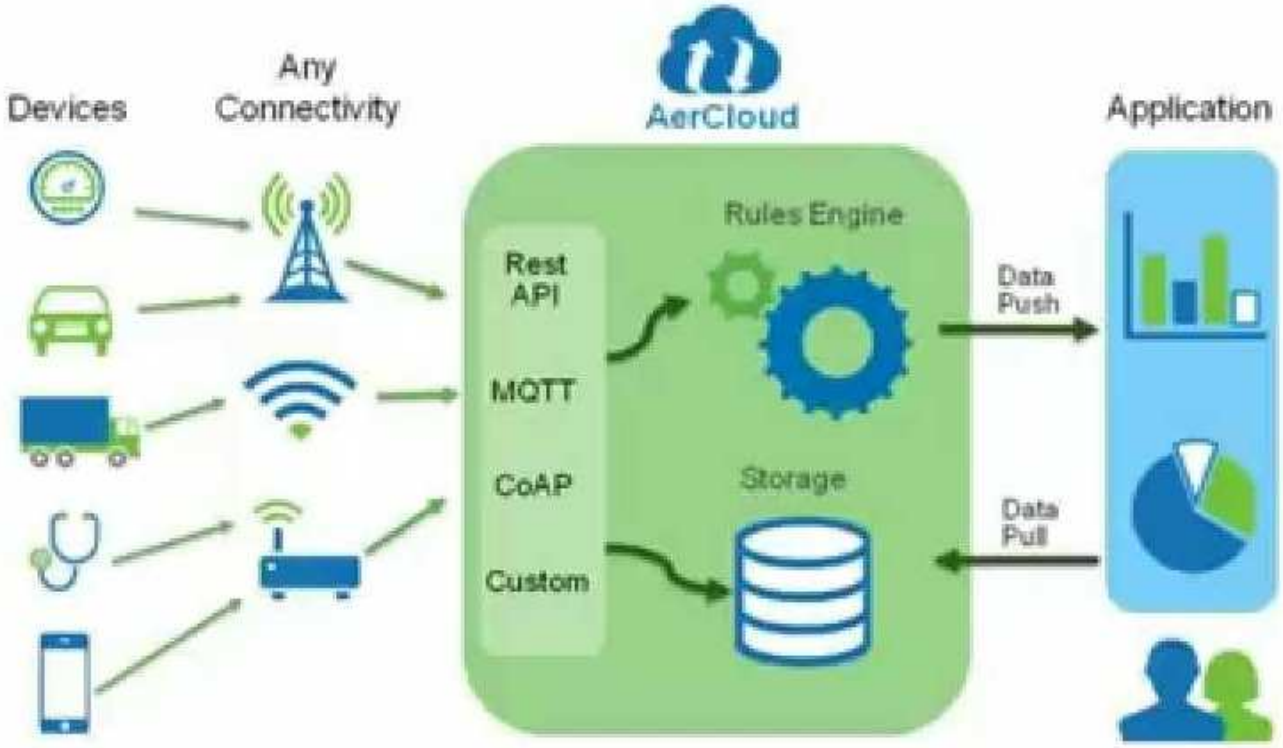
Implementacja algorytmów sterowania w układach FPGA (30W 30L)

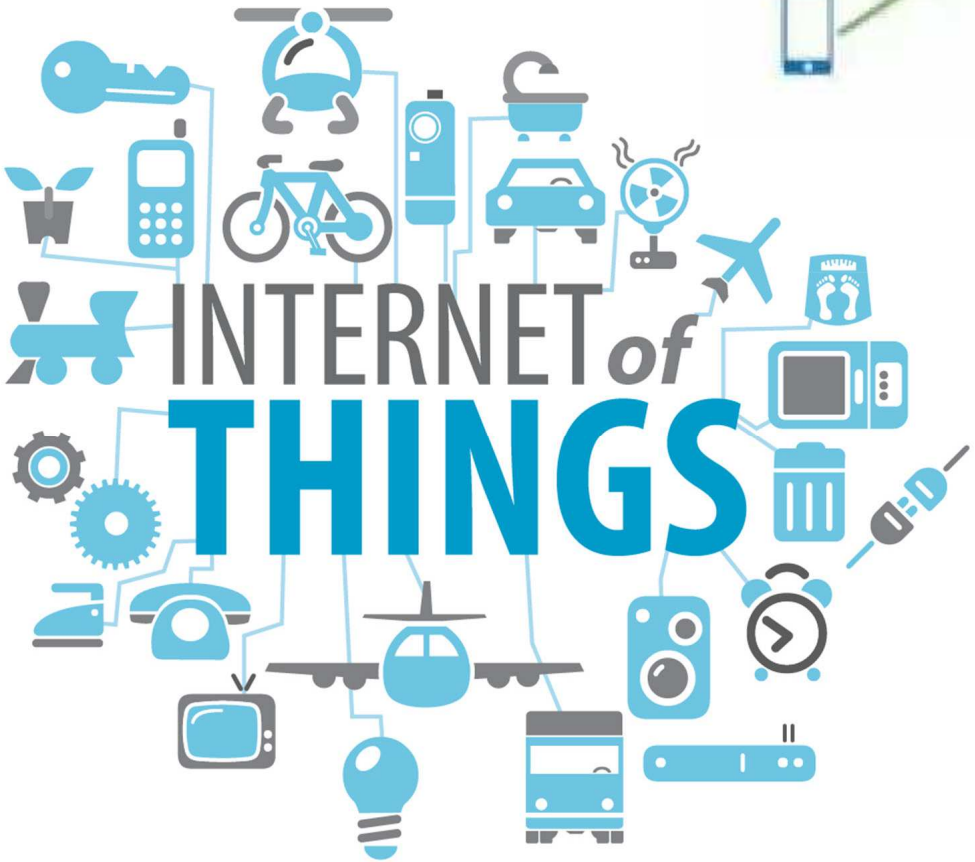


Communicate

Technologie mobilne i chmurowe (30W 30L)

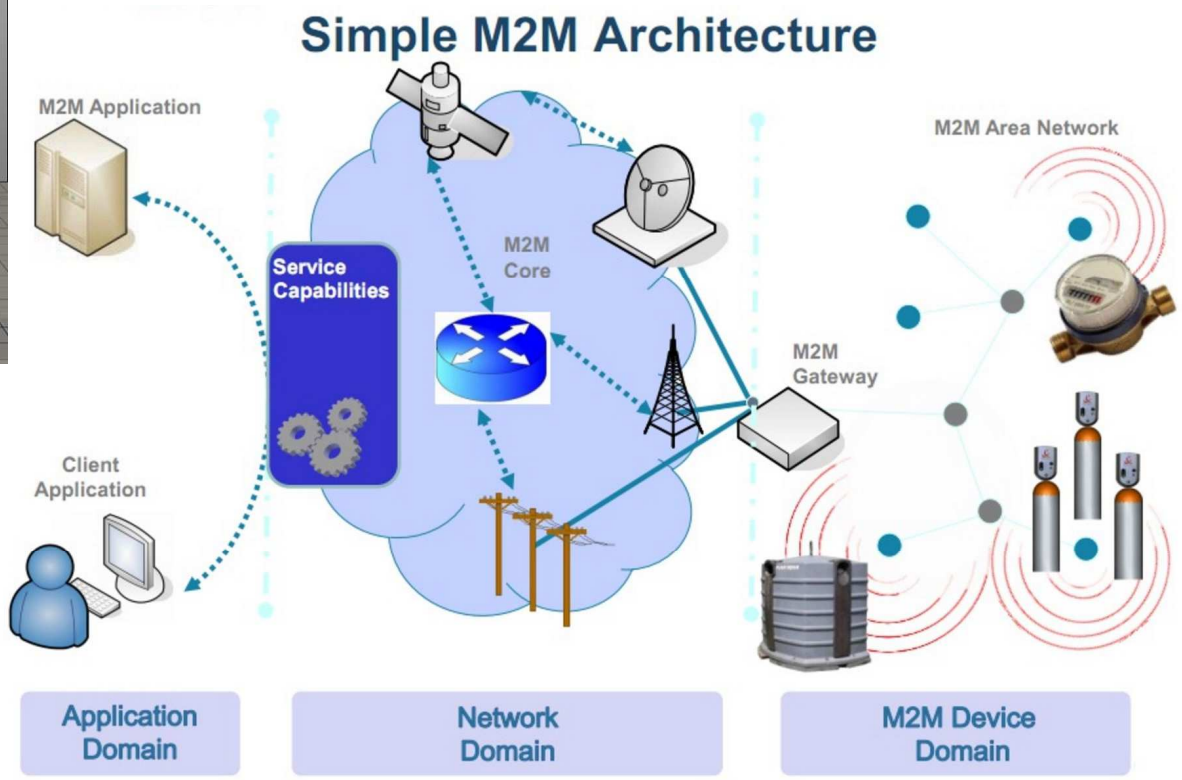
.





Communicate

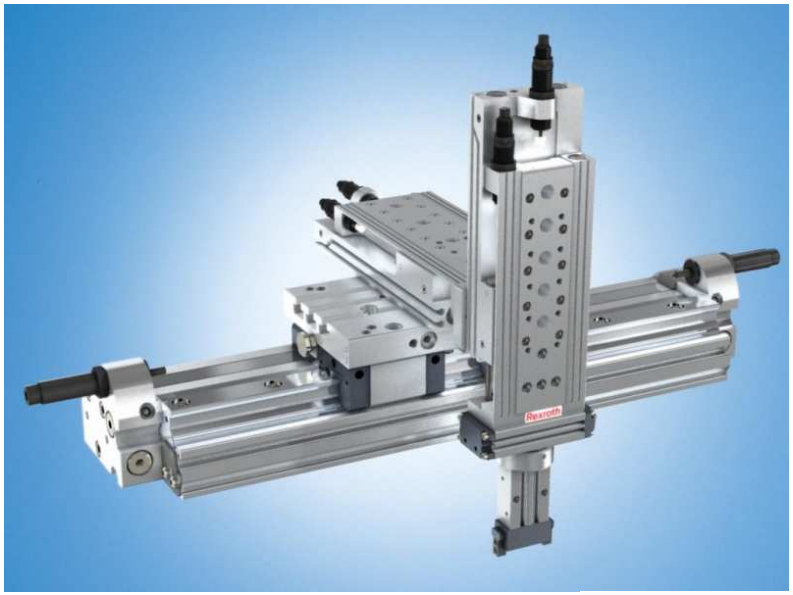
Projektowanie zaawansowanych interfejsów HMI i M2M (15W 30L)

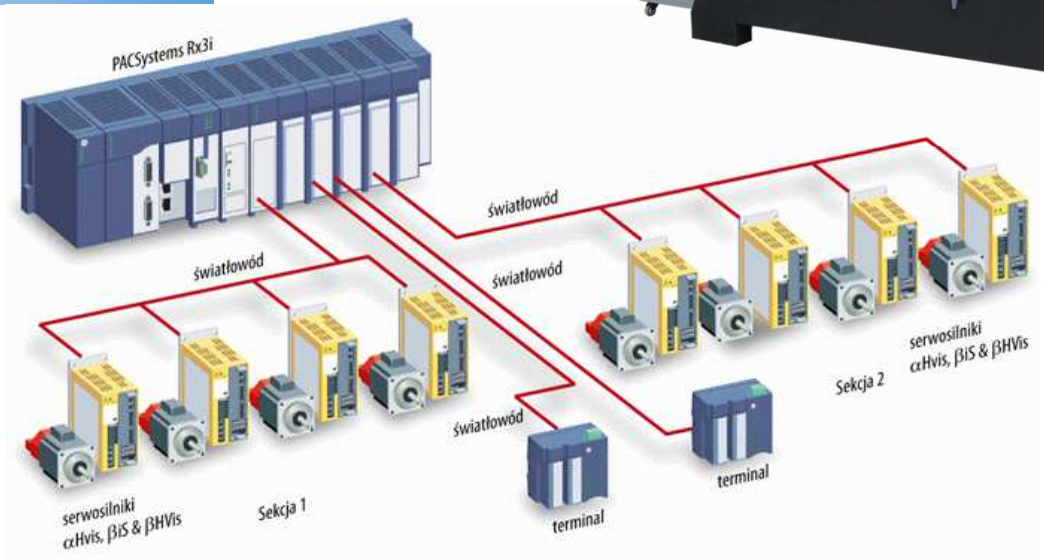


Act

Napędy w procesach, maszynach, urządzeniach i robotach (30W 30L)

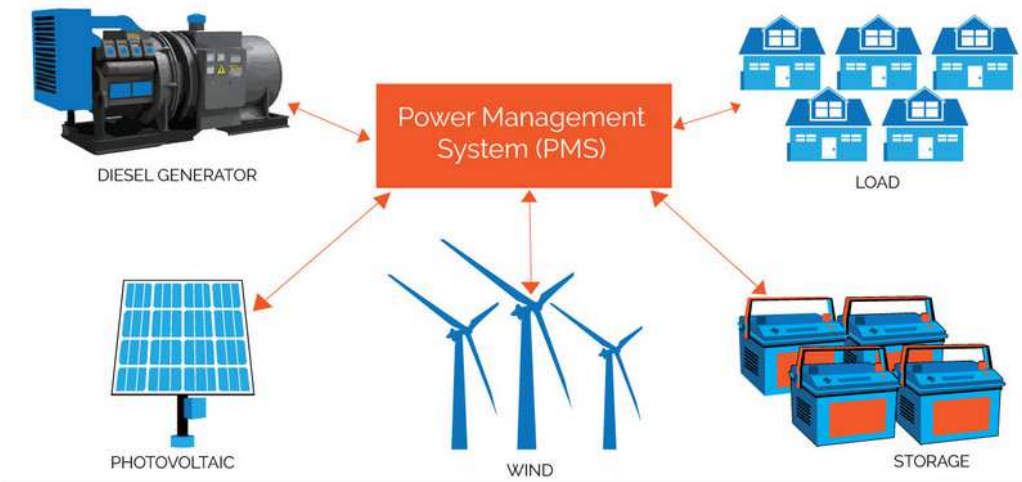
Precyzyjne sterowanie ruchem układów elektromechanicznych (15W 15W)

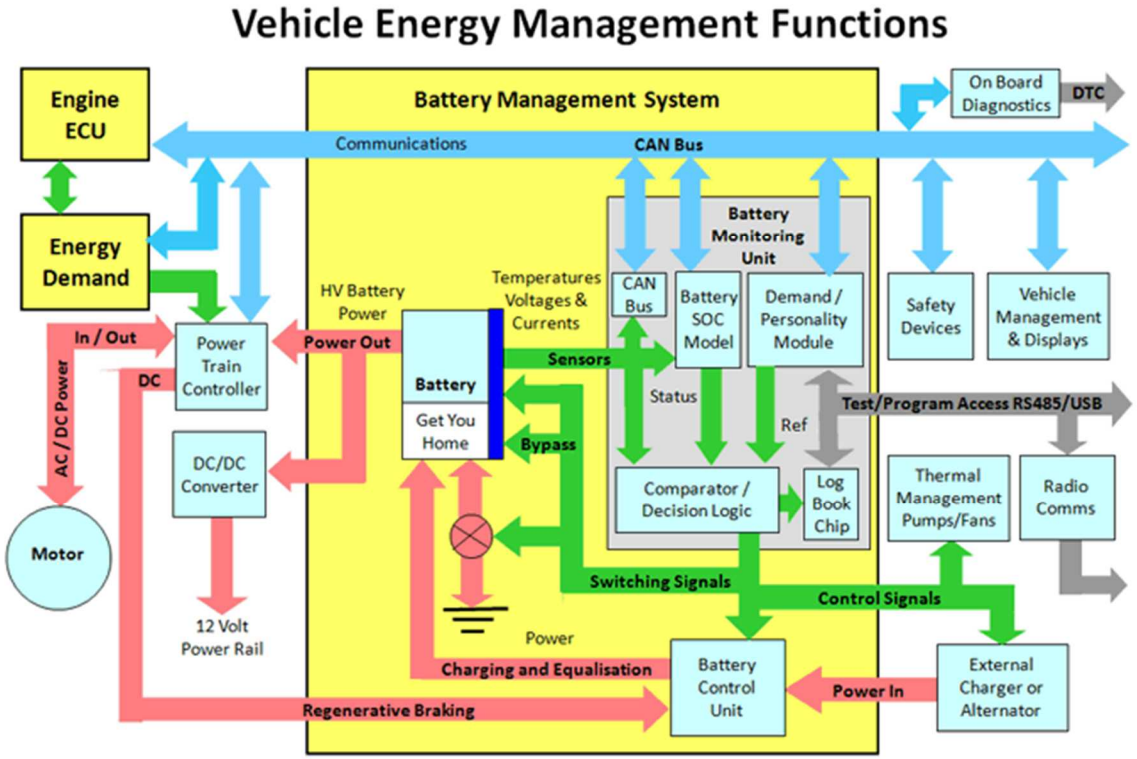




Act

Zarządzanie energią i sterowanie energooszczędne (15W 15W)

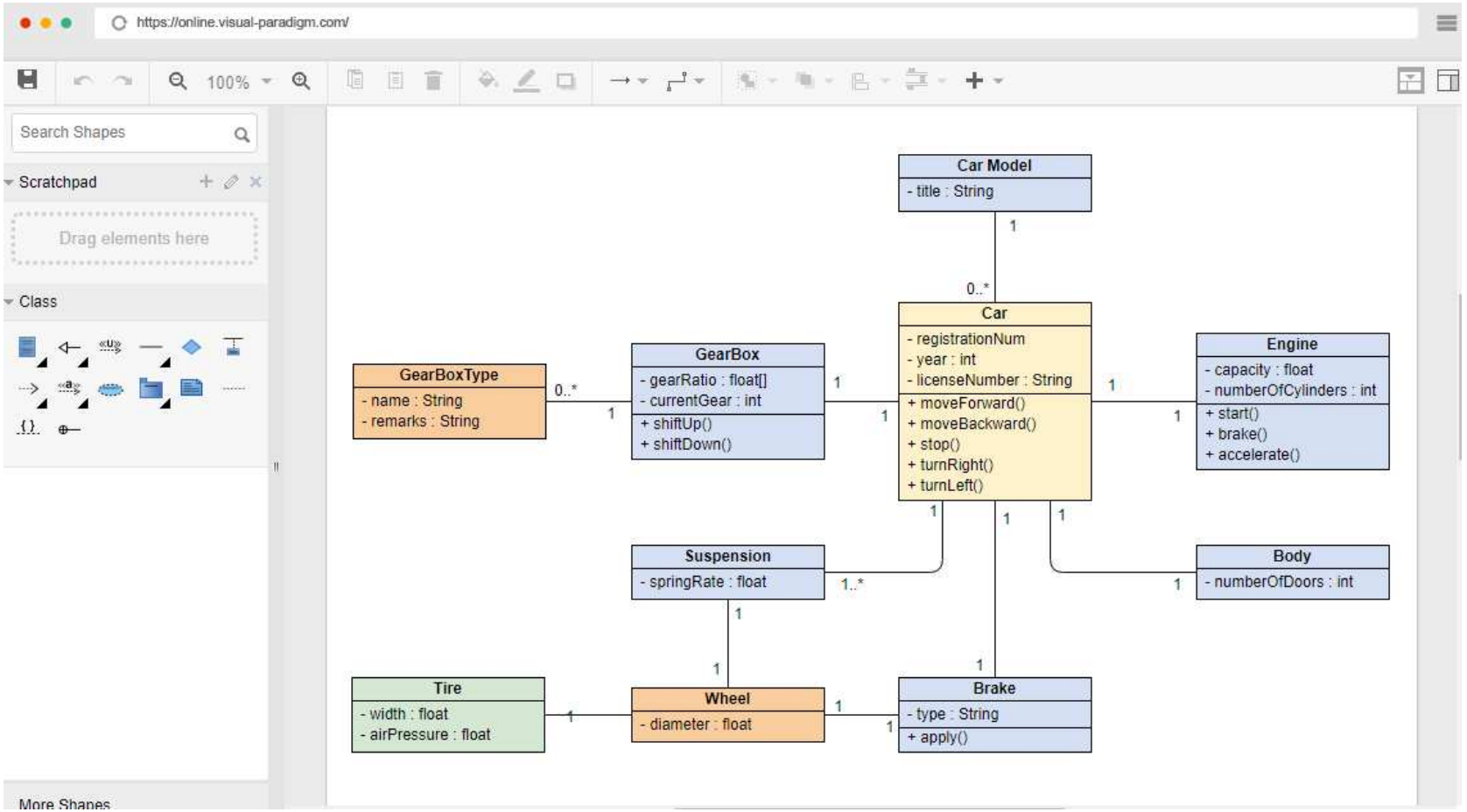




Przedmioty rozszerzające

Modelowanie systemów w języku UML (15W 15L)

Modelowanie procesów biznesowych (15W 15L)



Organizacja i prowadzenie badań naukowych

Pozyskiwanie finansowania na badania naukowe i działalność badawczo-rozwojową (15W 15P)

Pracownia badawczo-rozwojowa

Ochrona własności intelektualnej powstałej w wyniku prac B+R (15W 15P)

Narodowe Centrum Badań i Rozwoju

URZĄD PATENTOWY RZECZYPOSPOLITEJ POLSKIEJ

Sylwetka absolwenta

Absolwent kierunku Automatyka i Robotyka z tytułem zawodowym magistra inżyniera przygotowany jest do samodzielnego i twórczego rozwiązywania złożonych interdyscyplinarnych problemów. Potrafi:

- uruchomić i projektować systemy automatyki w różnych zastosowaniach,
- rozwiązywać problemy związane z automatyzacją procesów produkcyjnych,
- prowadzić prace badawcze z zakresu automatyki, diagnostyki i automatyzacji badań eksperymentalnych,

Absolwent jest przygotowany:

- do pracy w zakładach przemysłowych,
- do pracy w małych i średnich przedsiębiorstwach zatrudniających inżynierów z zakresu automatyki i informatyki przemysłowej,
- do działalności w działach rozwoju i w ośrodkach naukowo-badawczych
- do tworzenia własnych startupów bazujących na wiedzy
- do studiów III stopnia na wyższych uczelniach.

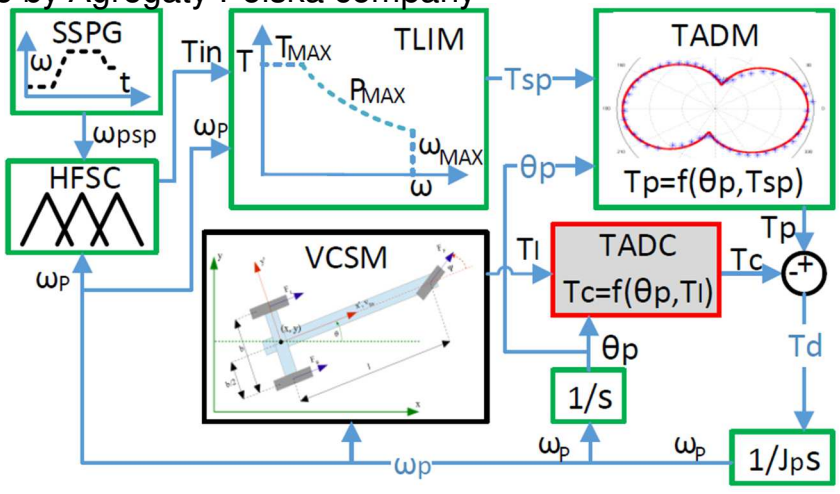
Kto za tym stoi?

Instytut Robotyki i Inteligencji Maszynowej

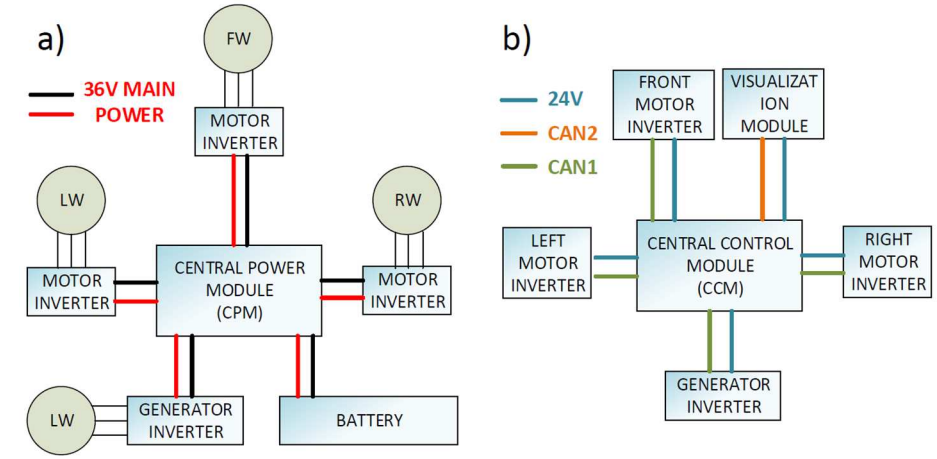
- Zakład Sterowania i Elektroniki Przemysłowej
- Zakład Automatyki i Optymalizacji
  - S. Brock
  - W. Giernacki
  - D. Horla
  - D. Janiszewski
  - D. Łuczak
  - T. Pajchrowski
  - K. Urbański
  - J. Ziętkiewicz

Drives and distributed control systems in electric vehicles

Example of the e-trike equipped with dedicated drives working in pedaling-by-wire (PBW) conception of control. Mechanics made by Agregaty Polska company

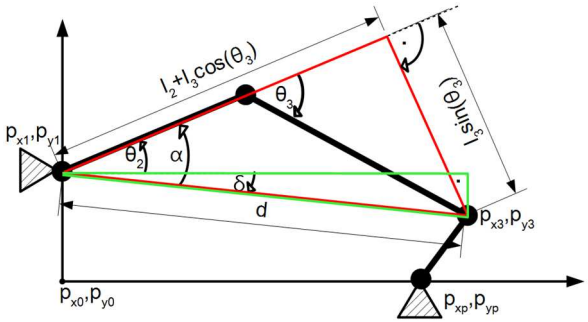


Proposal of electric vehicle control schema introducing reduction of dynamic torque (Td) ripples in PBW



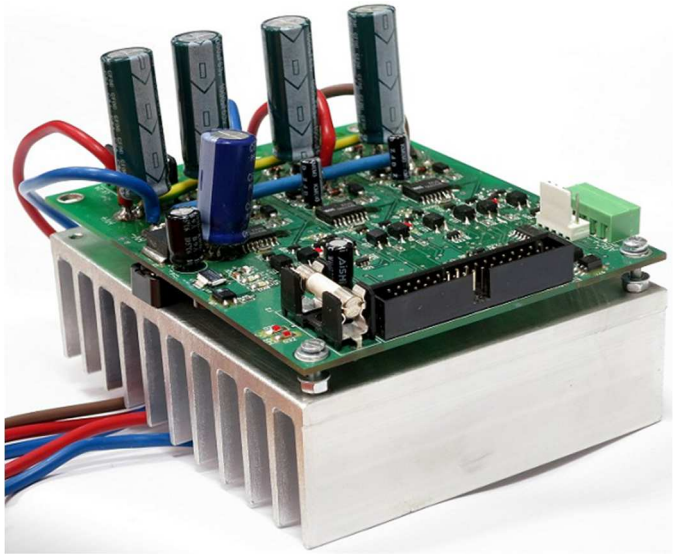
Schema of power distribution in e-trike (a) and its distributed control system (b)

The e-trike during technology show-case, presentation for media

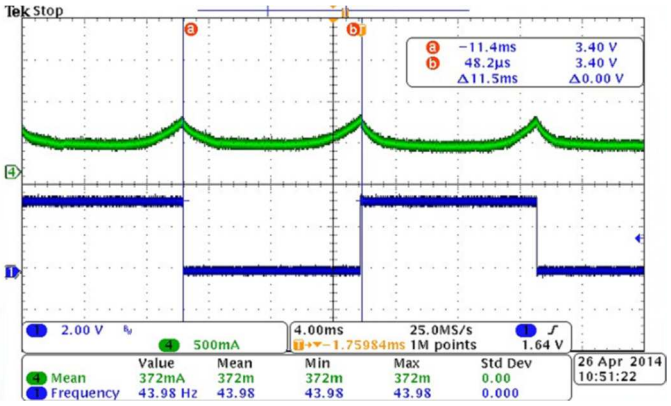


Kinematic structure of pedaling phenomena as the base for its model analytic solution

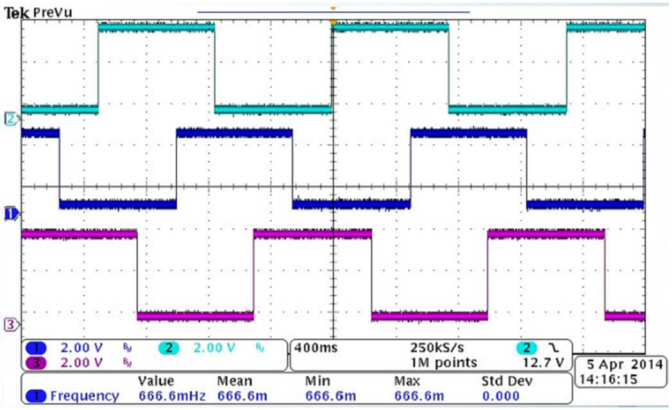
Power converters dedicated for distributed control in electric vehicles



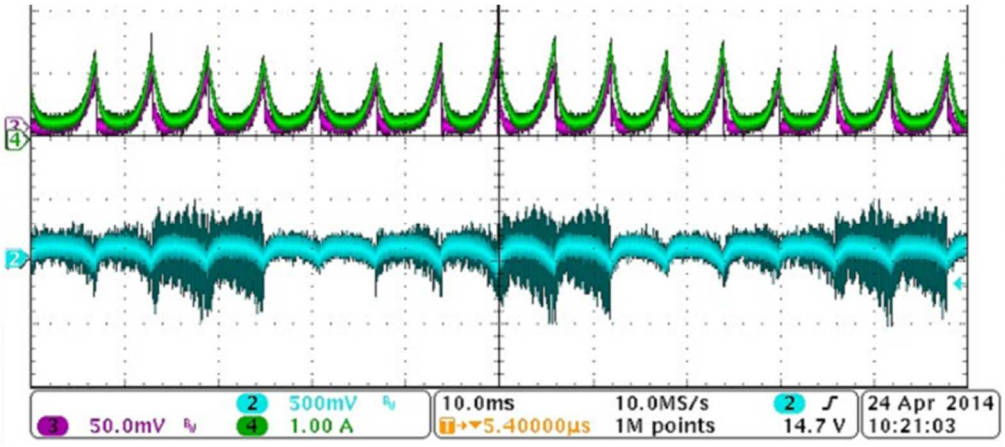
The picture of experimental power converter



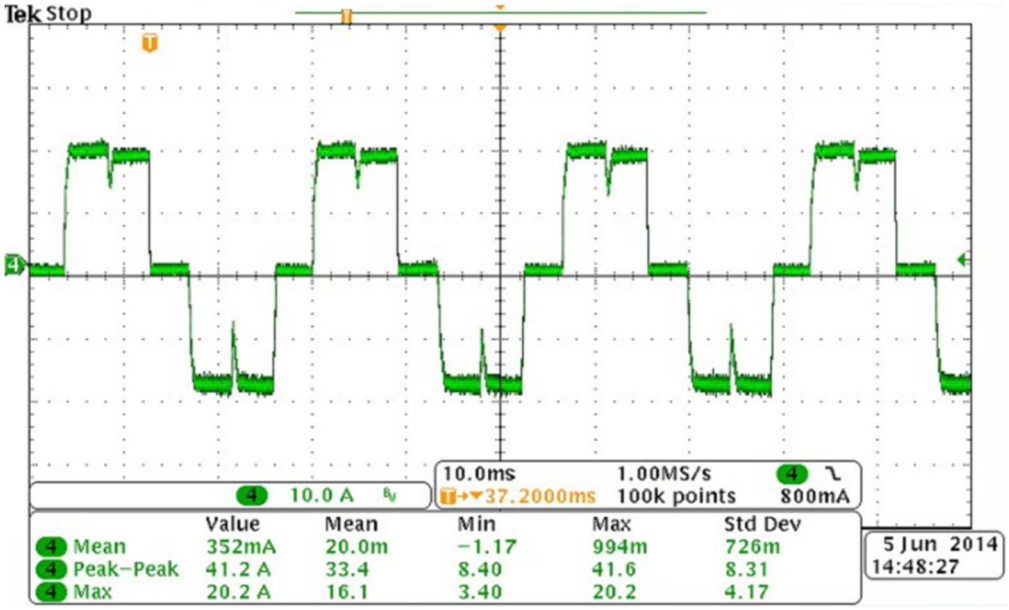
control loop signal delays compensation



high-quality of measured singals by using advanced filtering methods

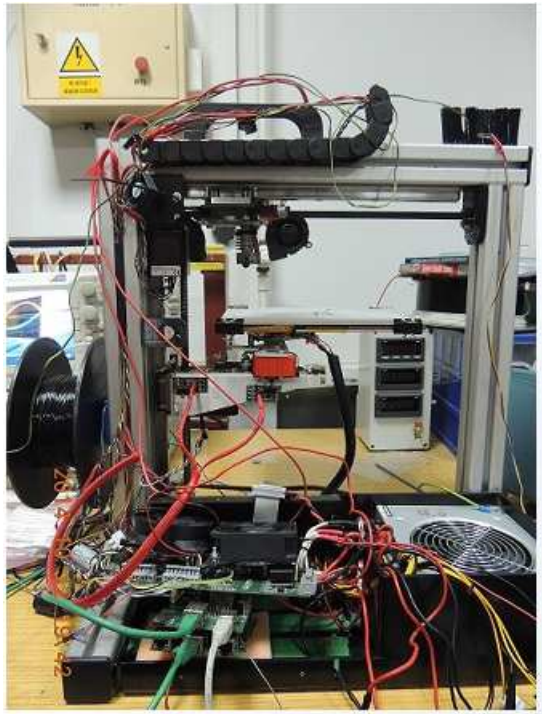


Unique solution of motor phase currents measurement with independent DC short-circuit prevention embedded in power converter

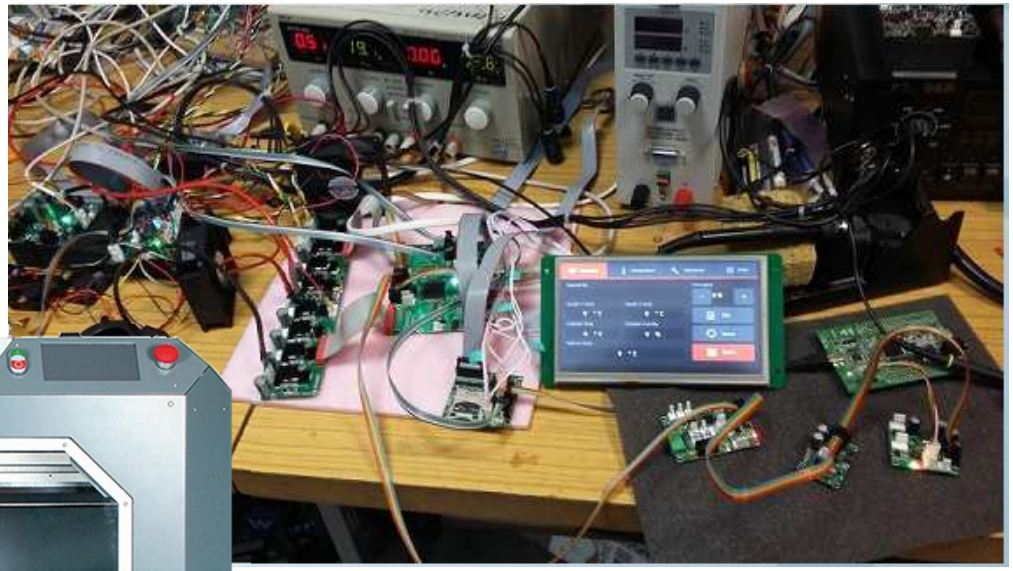


High current loads capability

Control systems for large-scale 3D printing

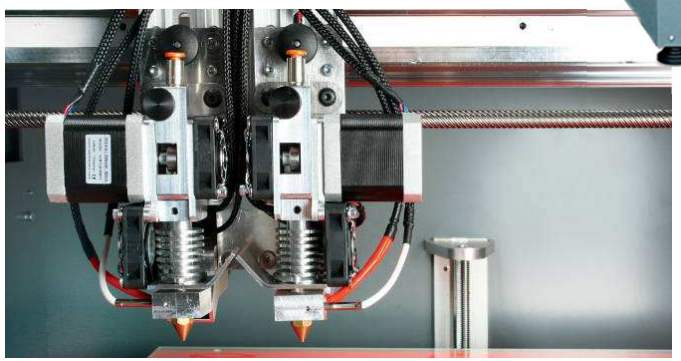


Preliminary, experimantal tests of control system with new drives and STM32F4 MCU made on compact printer



Laboratory test-runs of 3D printer distributed control system

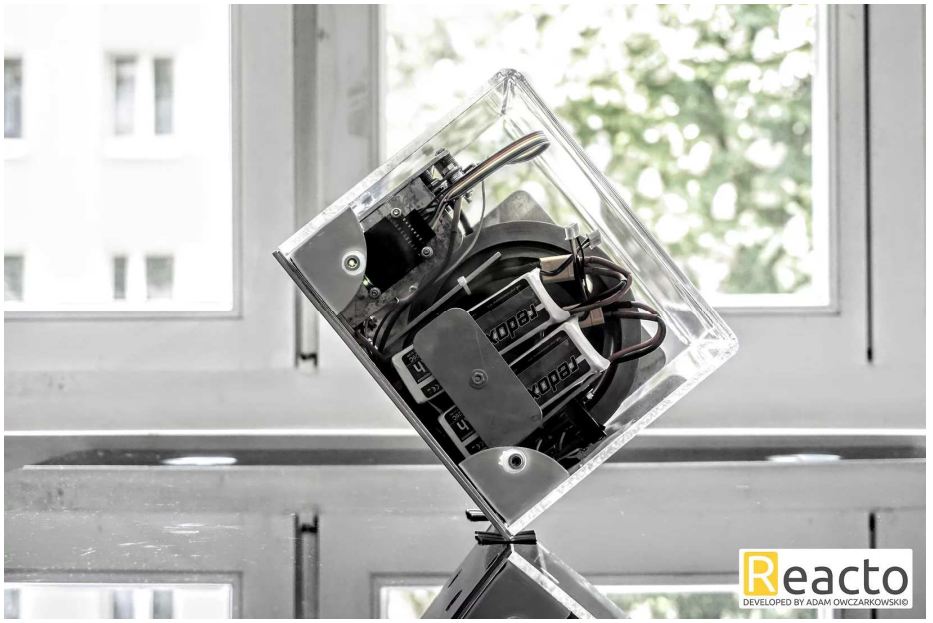
Large-scale 3D printer introduced by Omni3D company



Possibility of multiple printing head utilisation

HMI of the developed control system

Reacto


Reacto
DEVELOPED BY ADAM OWCZARKOWSKI©


Reacto
DEVELOPED BY ADAM OWCZARKOWSKI©


Reacto
DEVELOPED BY ADAM OWCZARKOWSKI©

IT server of critical information management – TechLink Bridge

The embedded – stable, secure and low-power server with use of multiple interfces (including DECT) and advanced logic of critical information propagation. Developed in cooperation with Emtel System company.

Photography of TLB server

System was implemented by Emtel System in many well-known companies such as:

ACP – Wloclawek

Imperial Tobacco – Radom

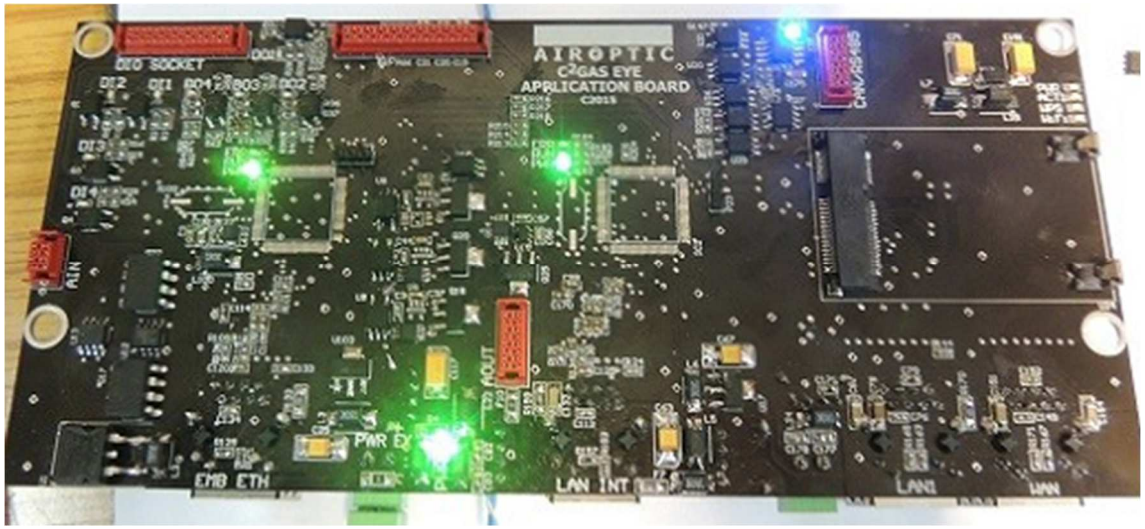
Nutricia – Krotoszyn

Swedspan – Bialystok

Polish Radio – Warsaw

Application board for Airoptic GasEye

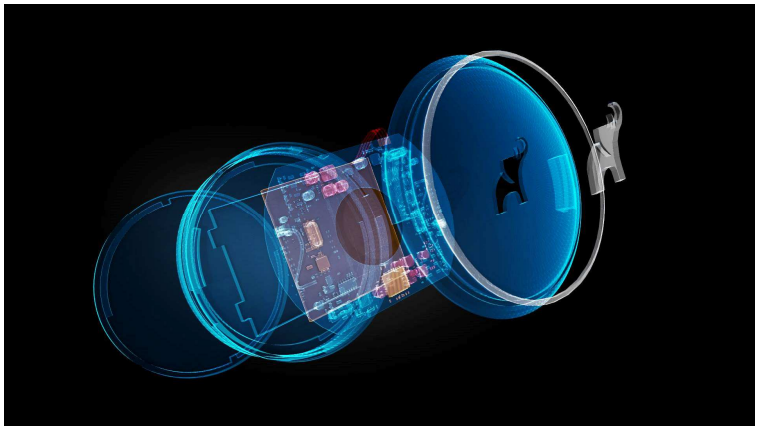
Airoptic GasEye – real-time gas concentration analyser based on quantum-cascade lasers technology.
Multiprocessor applicatin board developed for the Company with utilisation of high-end DSP algorithms and multiple user interfaces.



Experimental application board for GasEye

Photography of Airoptic GasEye device

ElephantDoor – an innovative burglar alarm

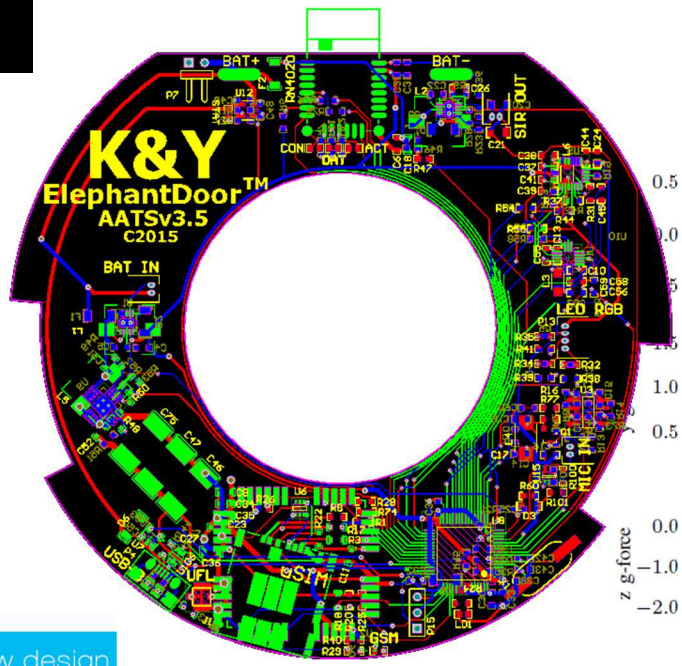


visualization of system deposition

The system logo

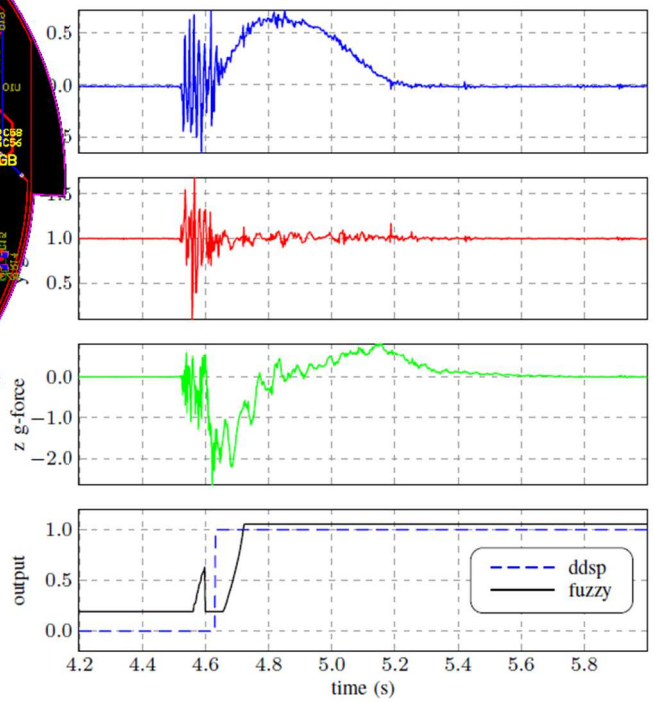
system components

ElephantDoor – the innovatiove burglar alarm based on artificial intelligence classifier and MEMS sourced signals. Fully wire-less system with loud sirene, li-pol battery selected MEMS sensors and bluetooth/GSM/WiFi interfaces.



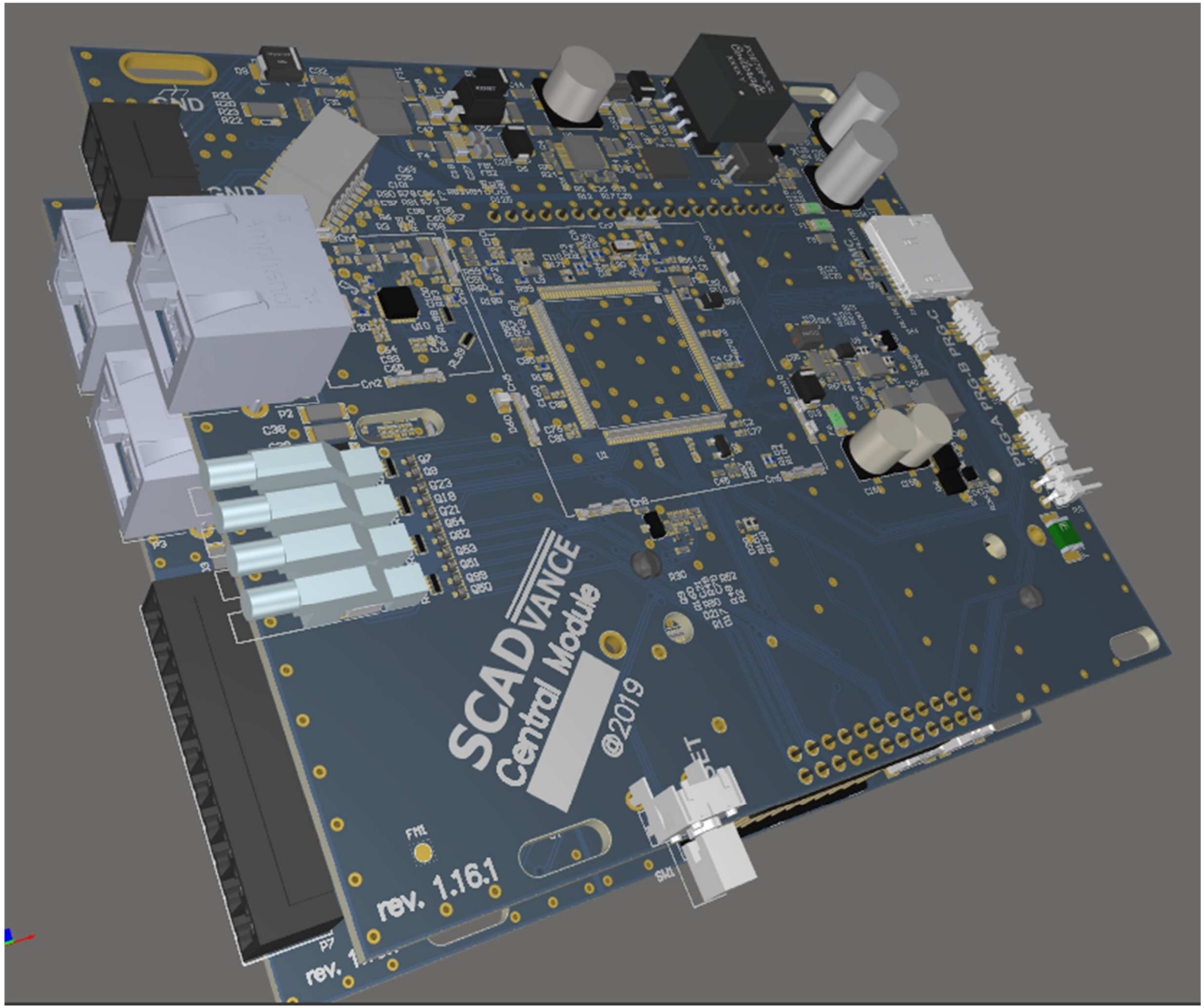
Prototyped PCB

High-quality design



Working results of advanced classification algorithms during experimental test-runs

Cyber-bezpieczeństwo w sieci przemysłowej (2019)

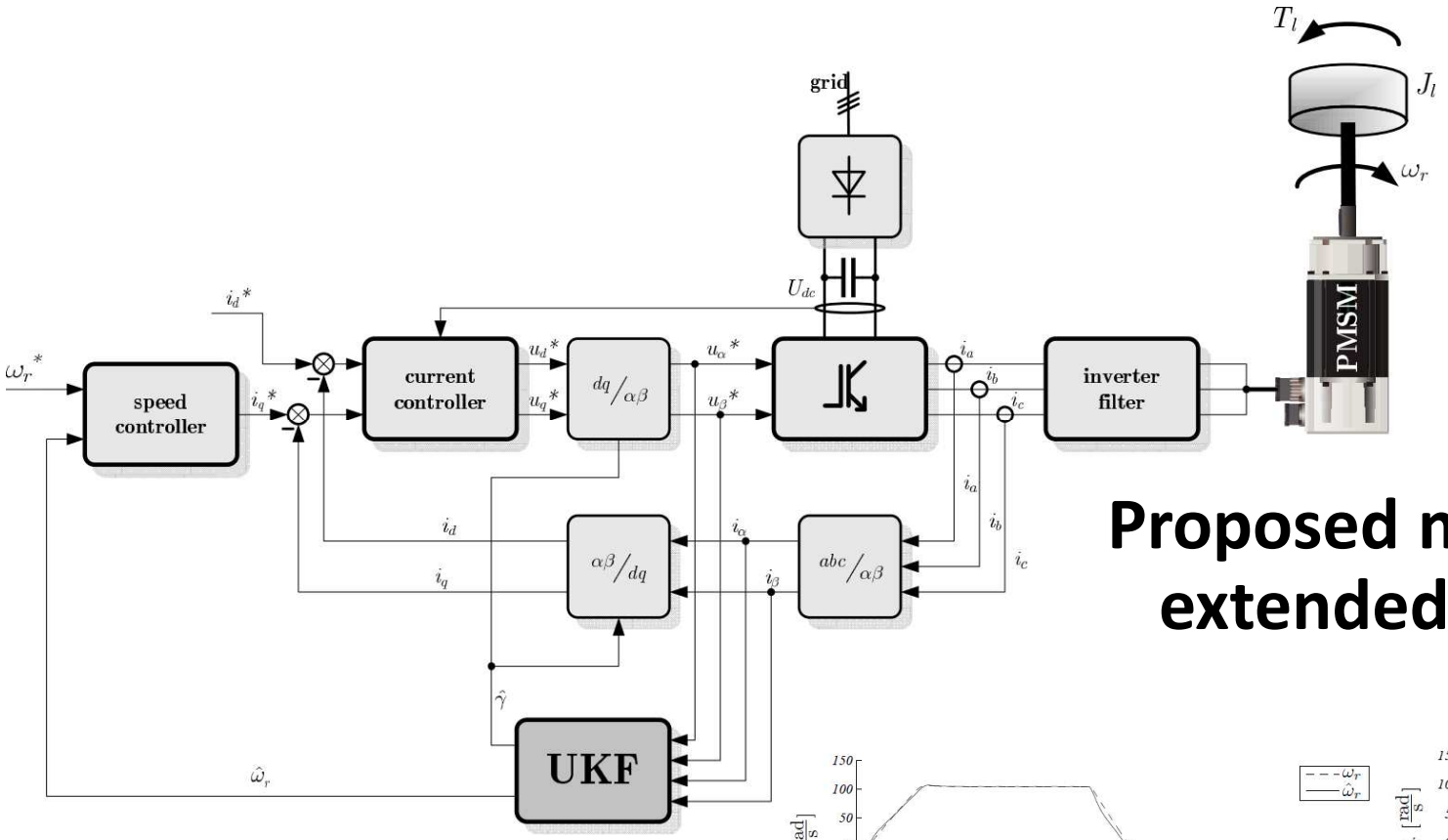


Control of direct drive with permanent magnet motors (2010 – 2020)

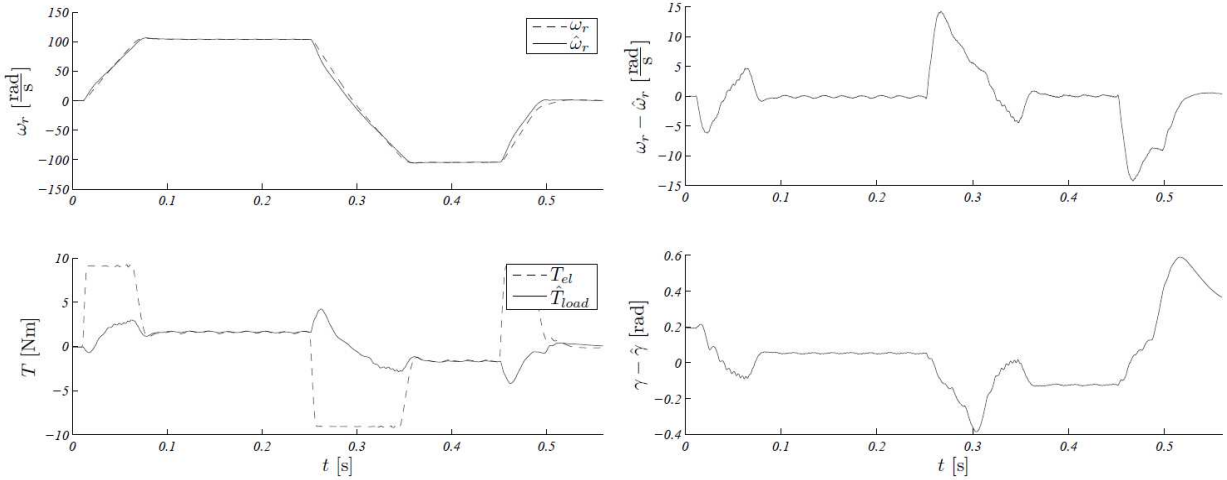
Problems:

- fast and robust current vector control
- speed calculation for very slow motion
- oscillation elimination in mechanical system
- torque ripple compensation
- minimalization of friction influence
- robust control for drive with changing inertia
- adaptive control for drive with changing inertia
- optimal reference trajectory generation

Sensorless control for permanent magnet synchronous motor



Proposed method: extended Kalman filter



INNOVATIVE ECONOMY
NATIONAL COHESION STRATEGY

Project Part-Financed by the European Union

European Regional Development Fund

New generation of energy-saving electric drives for pumps and cooling fans in mining industry

Instytut Chemii Przemysłowej

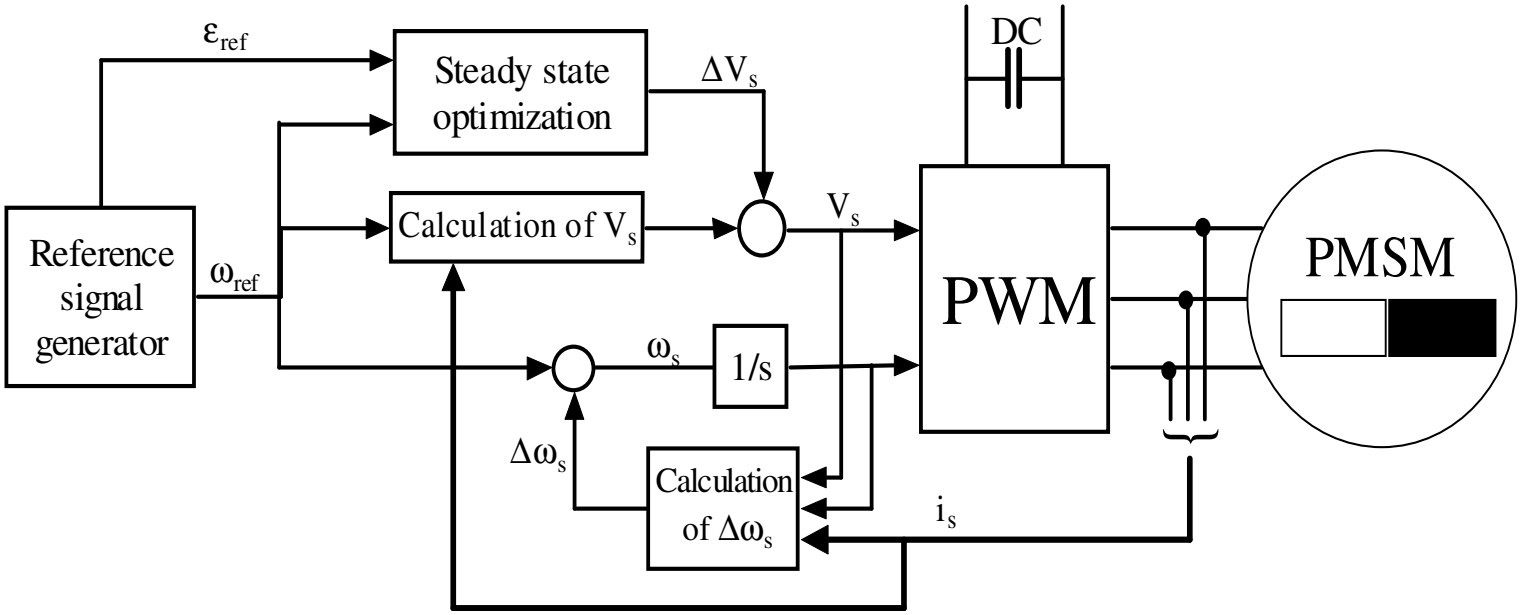
Instytut Tele – i Radiotechniczny

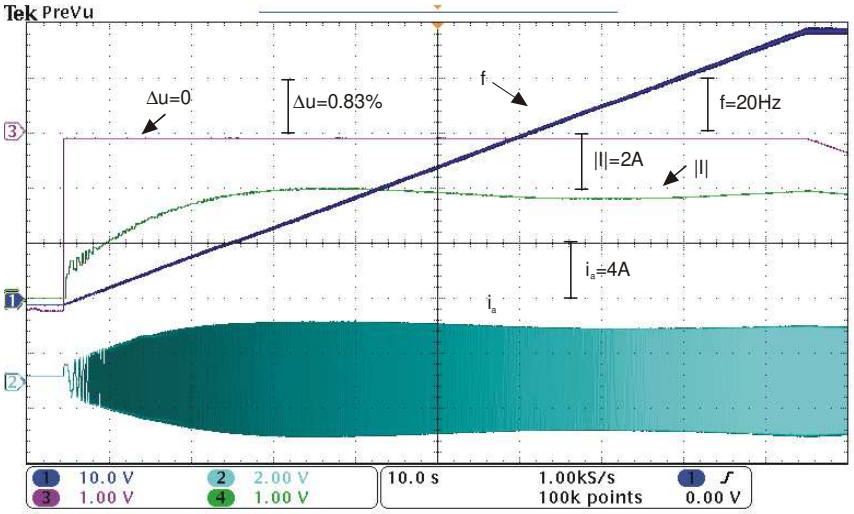
Politechnika Wrocławska

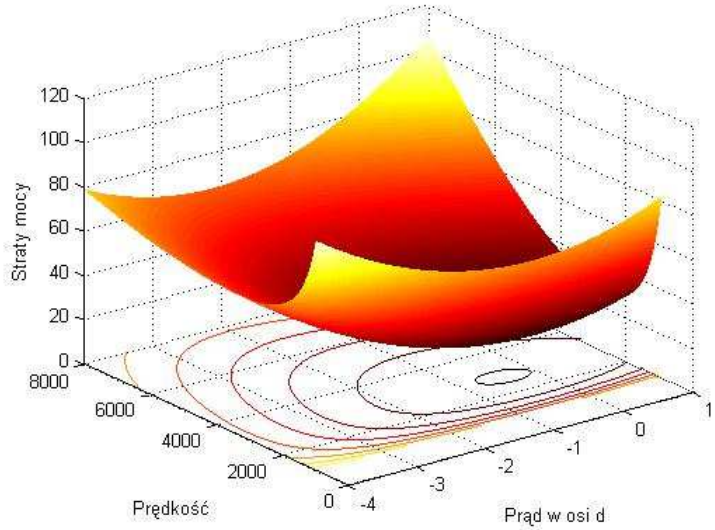
- **Poznan University of Technology**
- **Wroclaw University of Technology**
- **Tele and Radio Research Institute (Warsaw)**
- **Industrial Chemistry Research Institute (Warsaw)**

Control of motors with permanent magnets for pumps and fans.

V/f control method for a PMSM without dumping windings







Control of motors with permanent magnets for pumps and fans.

Tektronix DPO3014 with Power Measure

Analog Devices floating point DSP
ADSP-21369 (2 Mb SRAM,
400 MHz Clock, 2.4 GFLOPS)

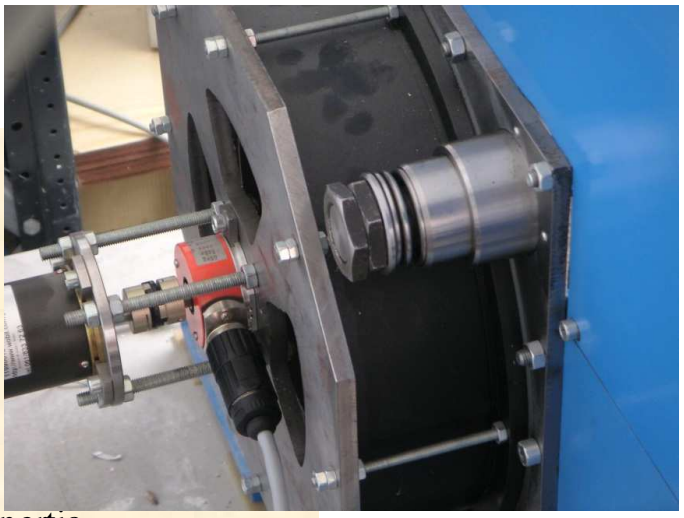
IGBT converter
750 V, 10 A

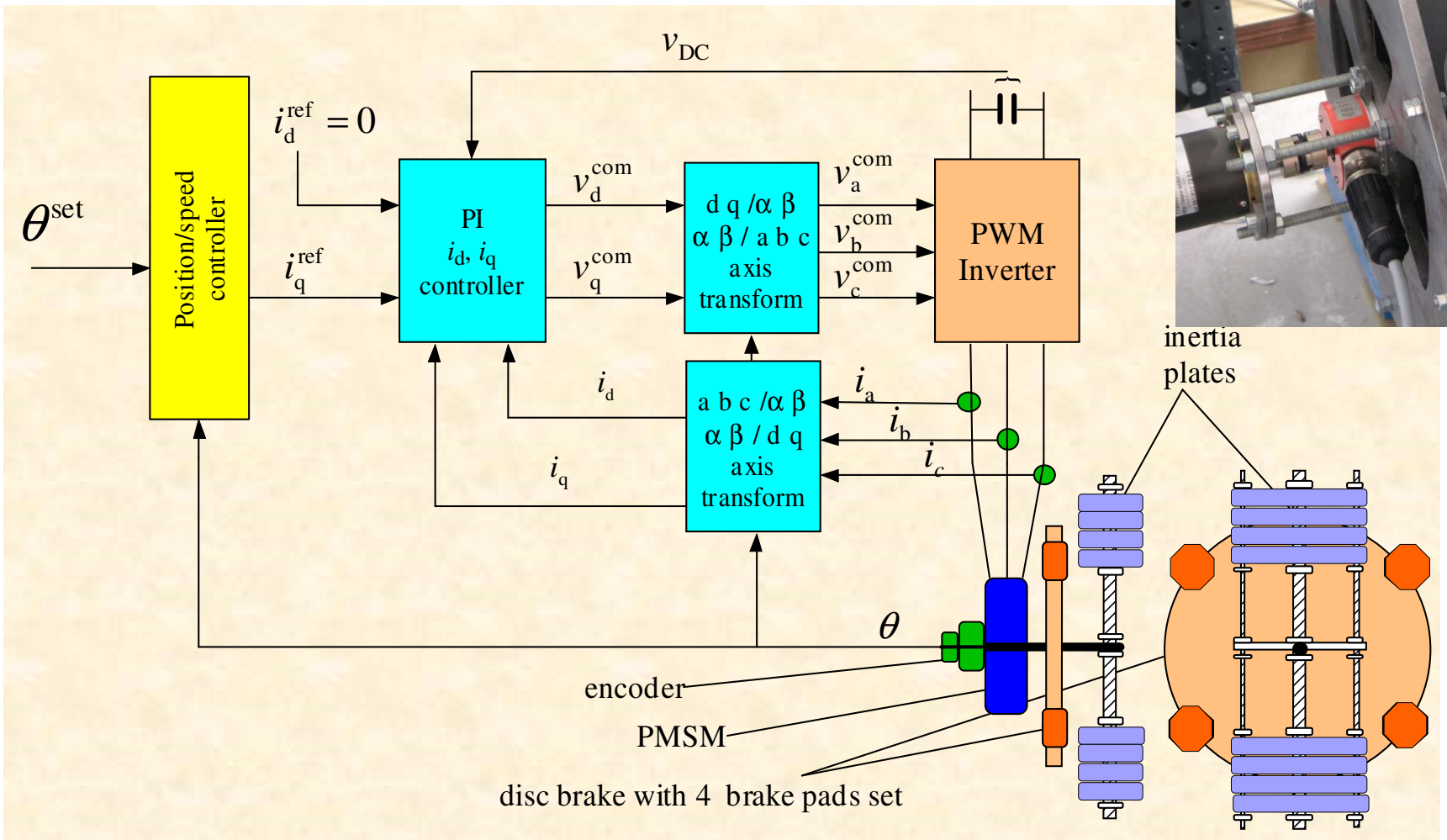
Control of motors with permanent magnets for pumps and fans.

Laboratory stand

Control of direct drive with permanent magnet motors

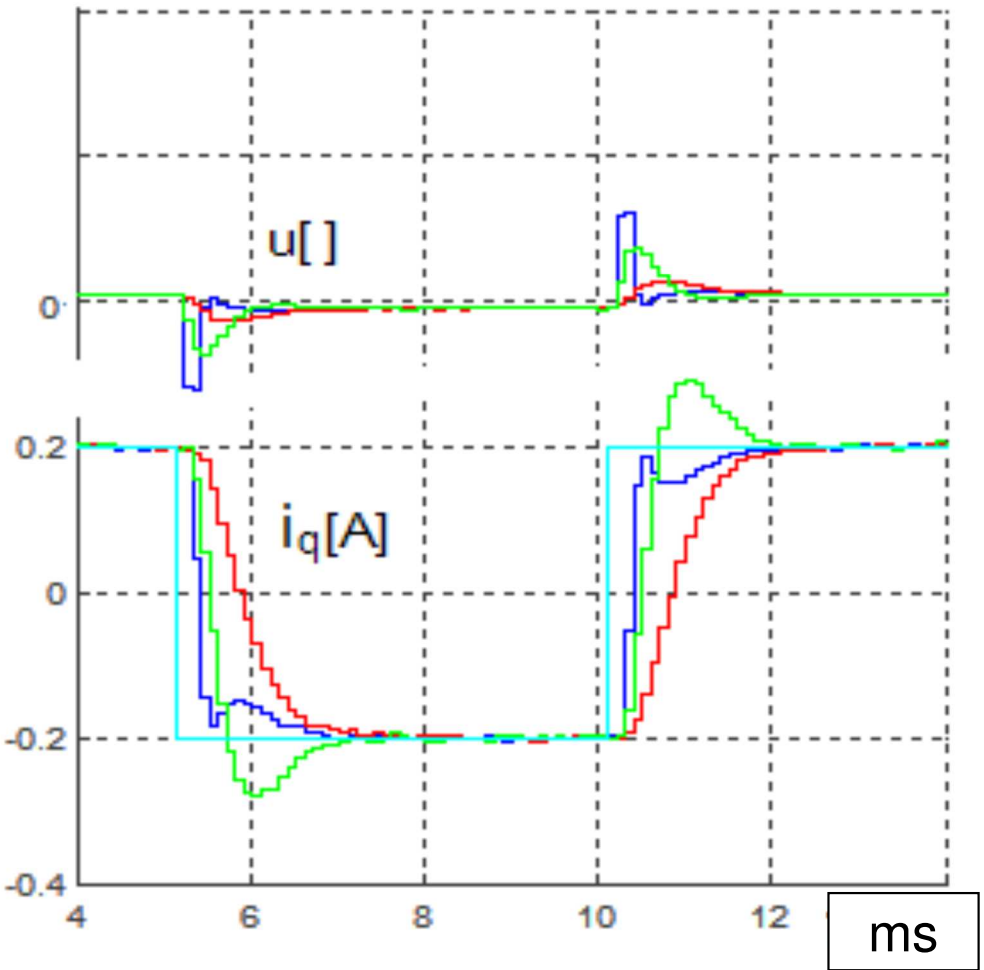
Direct-drive motors can improve the positioning precision since they lack the gearbox required in conventional electric drive systems.

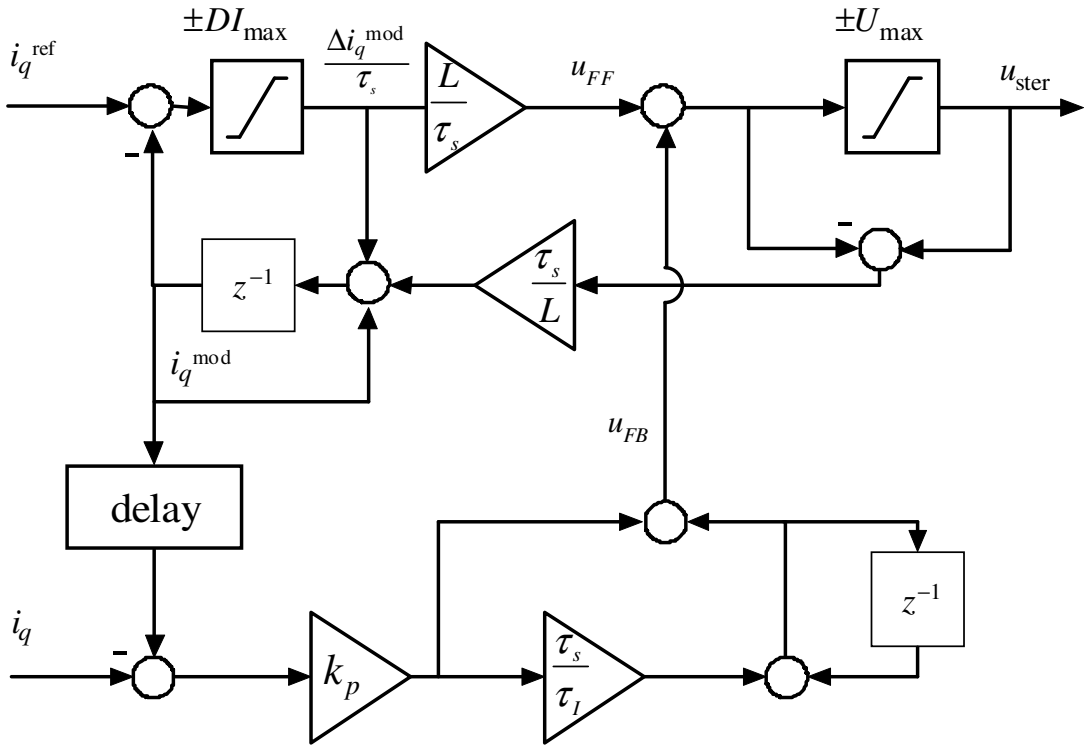




Fast and robust current vector control

- 2DOF PI controller

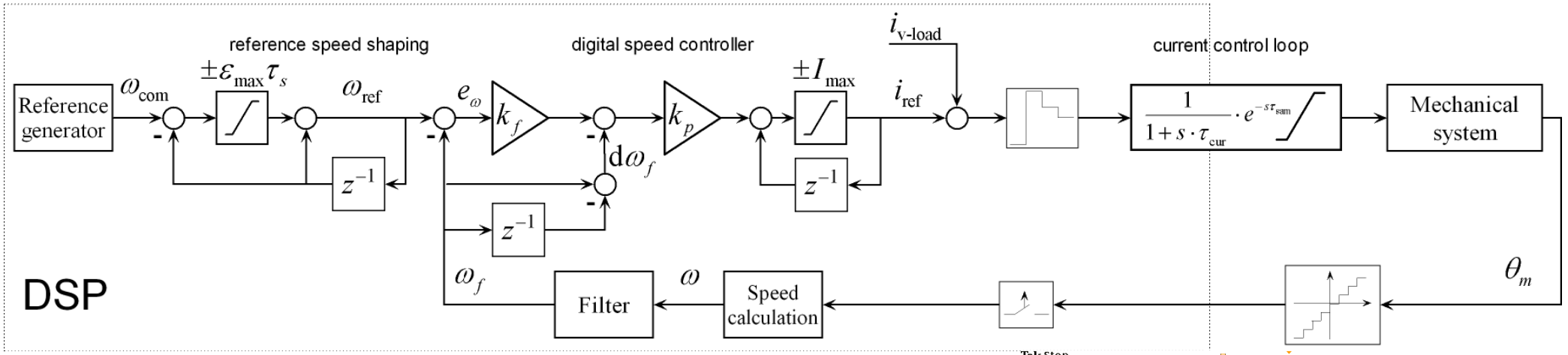


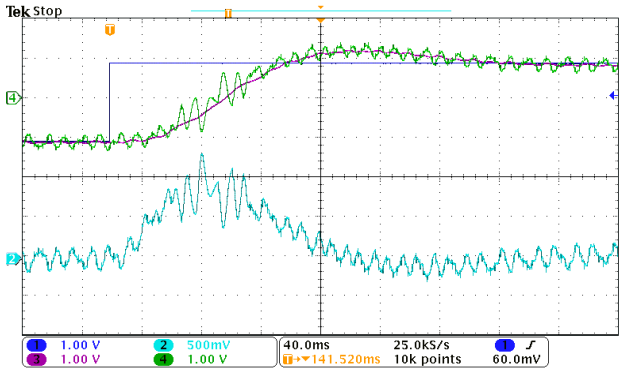


Speed calculation for very slow motion

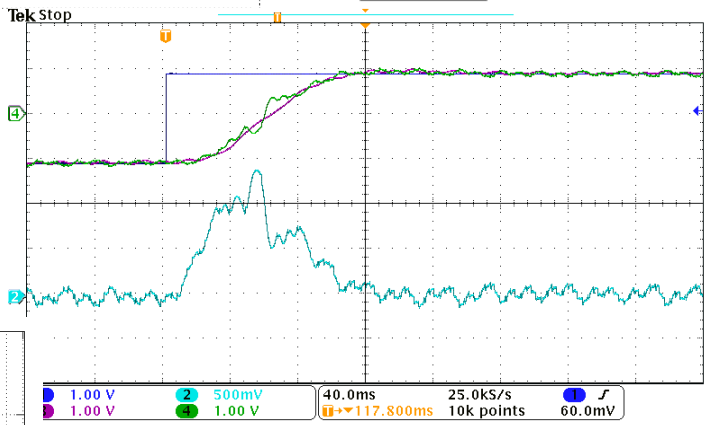
- Encoder resolution is 512.000 imp/rev.
- Sampling time is 100 µs
- Typical slow motion: 5 rev/min = 1/12 rev/s
- In sampling time there are only 4 impulses !!!
- The simple speed calculation error is 25% - unacceptable for control purpose
- The need special algorithm to increase speed resolution.

Oscillation elimination in mechanical system

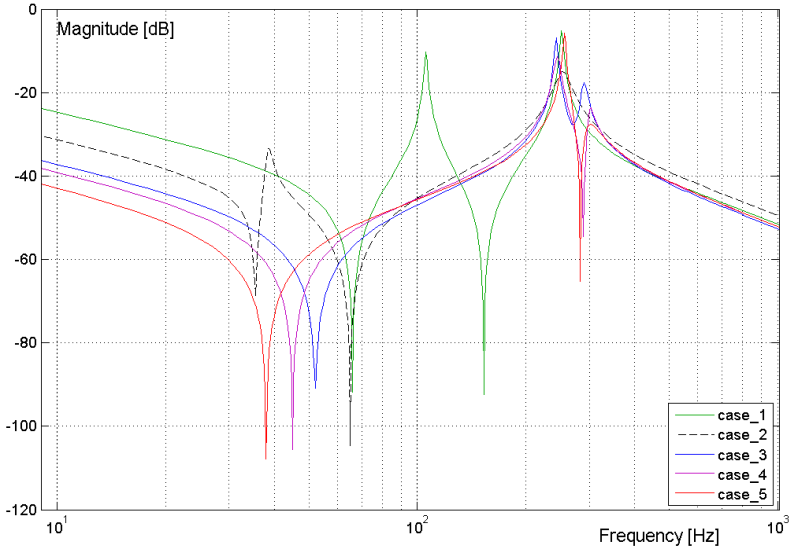




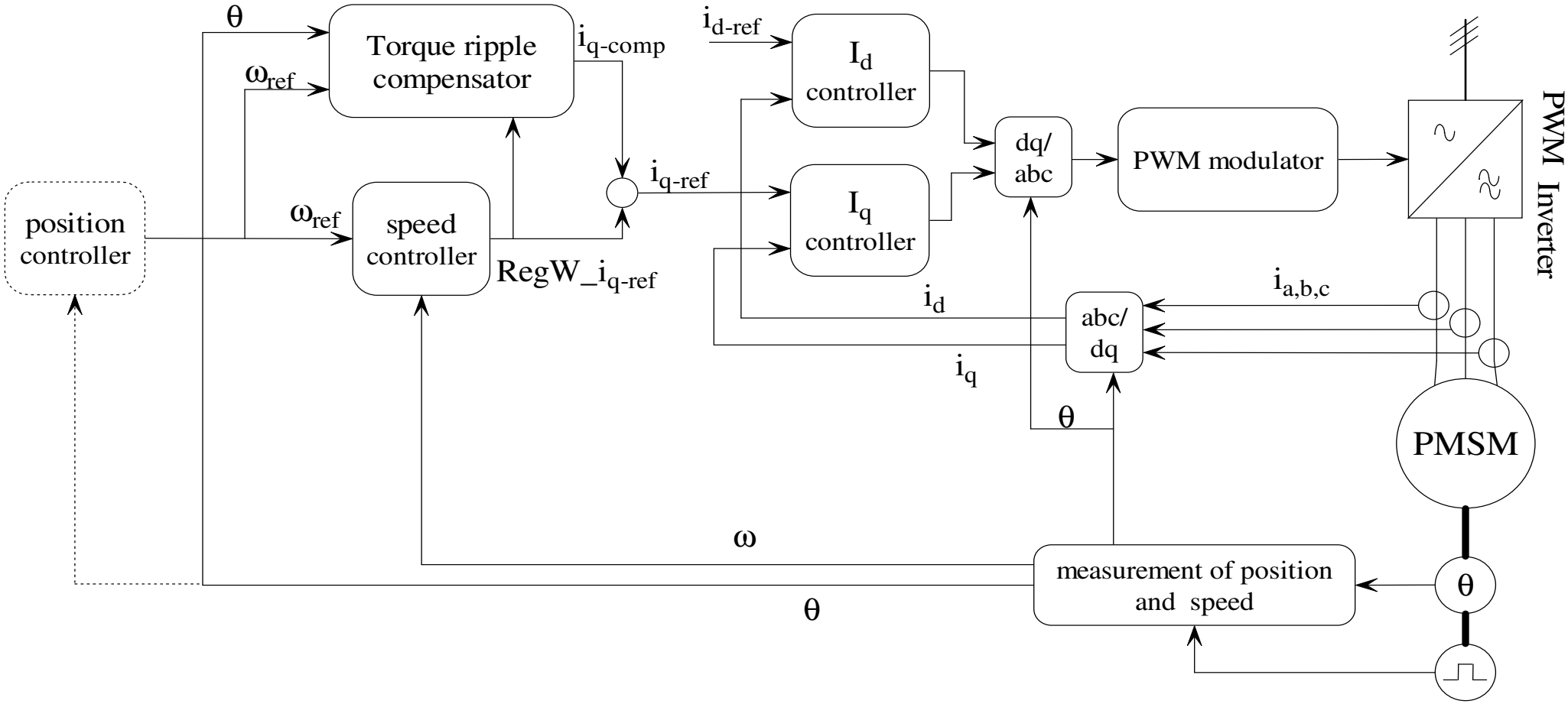
Chebyshev low pass filter



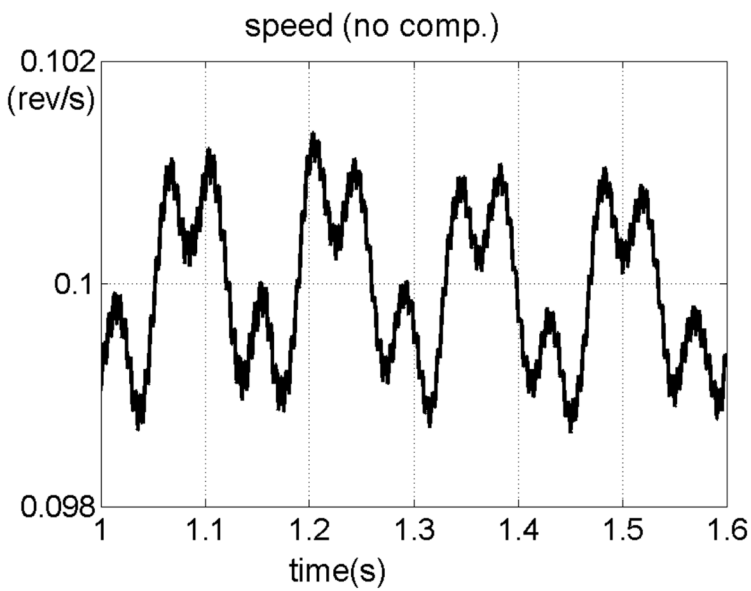
bi-quadratic filter

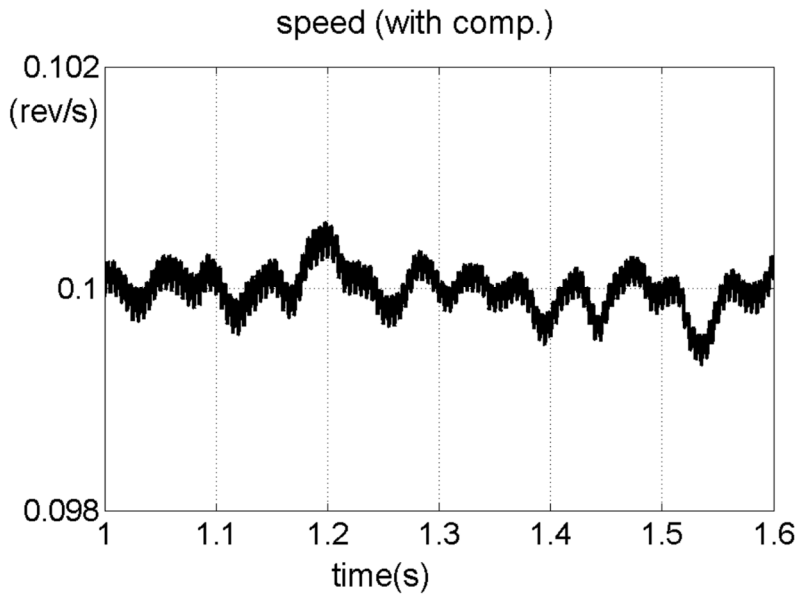


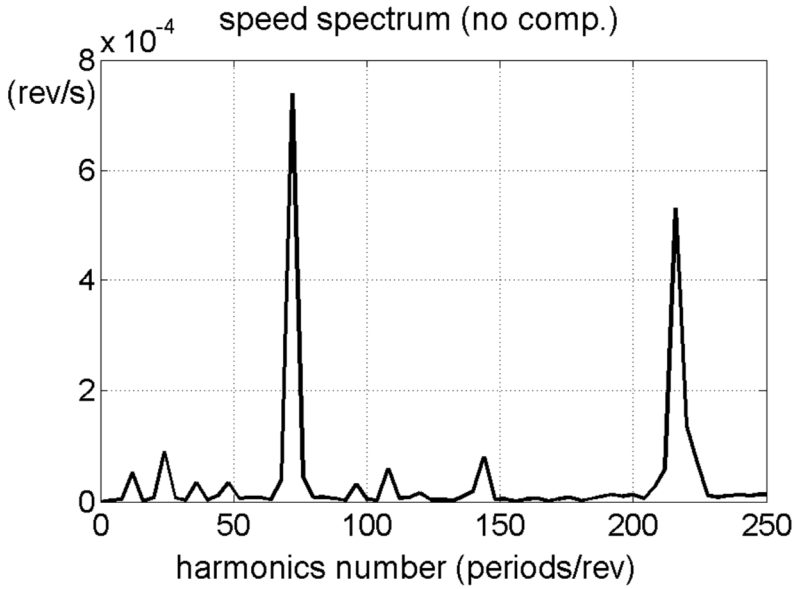
Torque ripple compensation

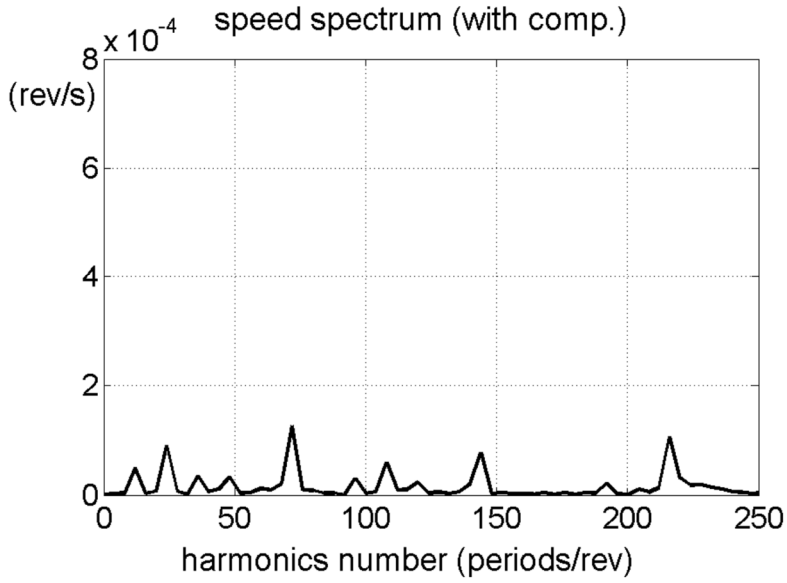


Torque ripple compensation

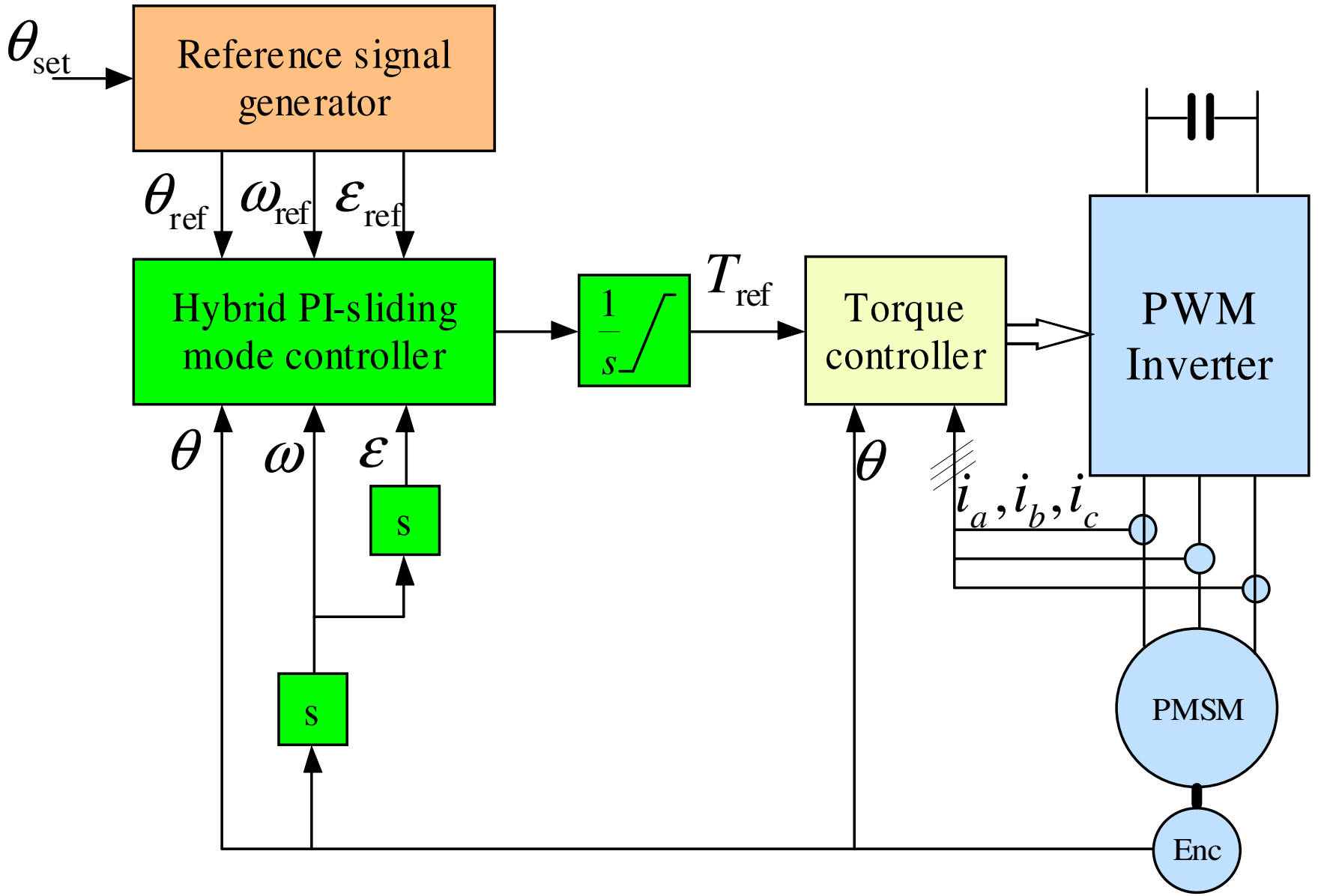


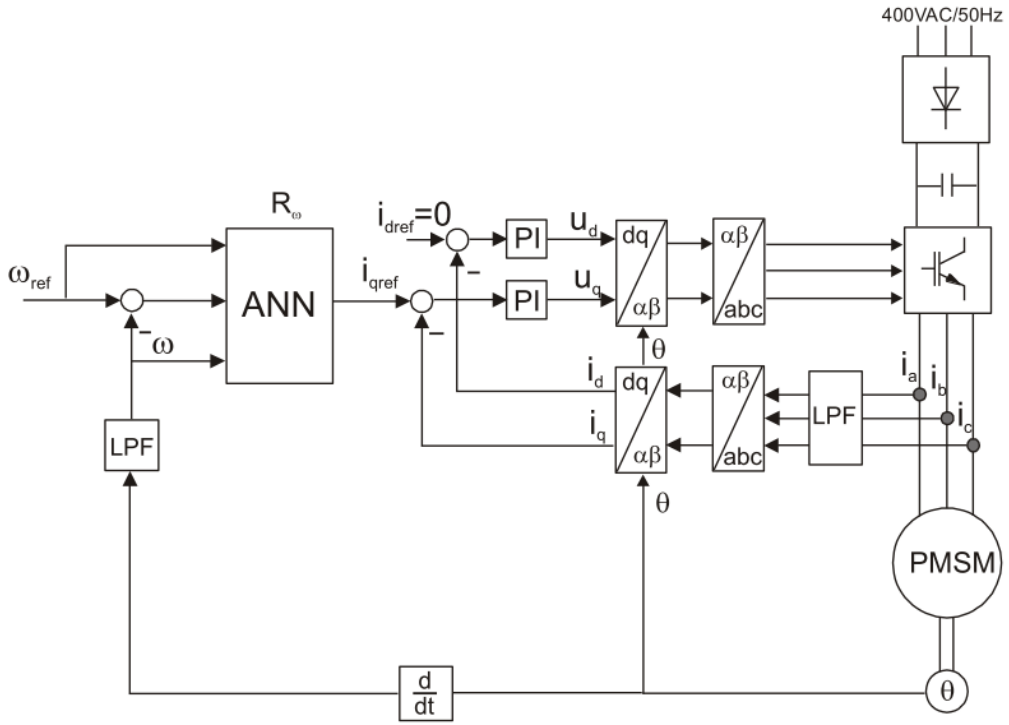






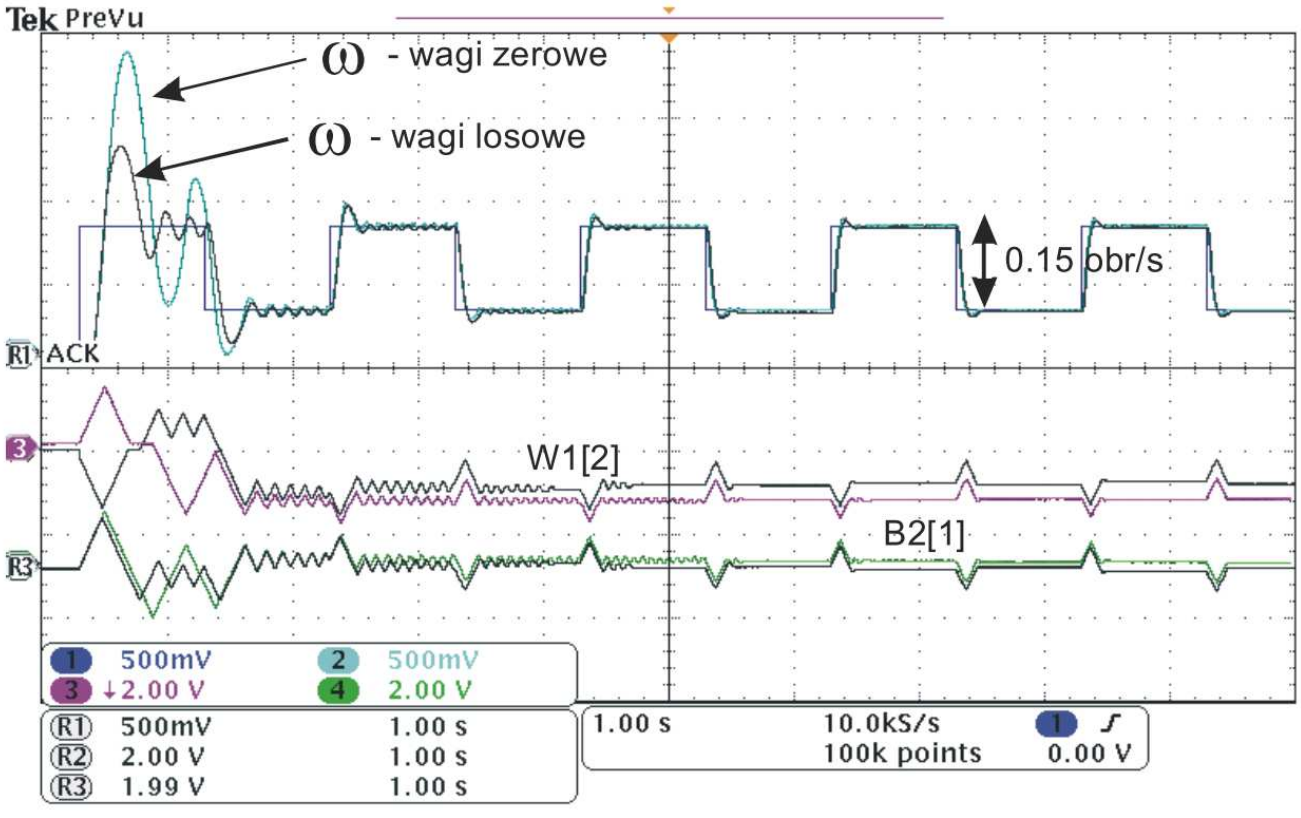
Robust control for drive with changing inertia





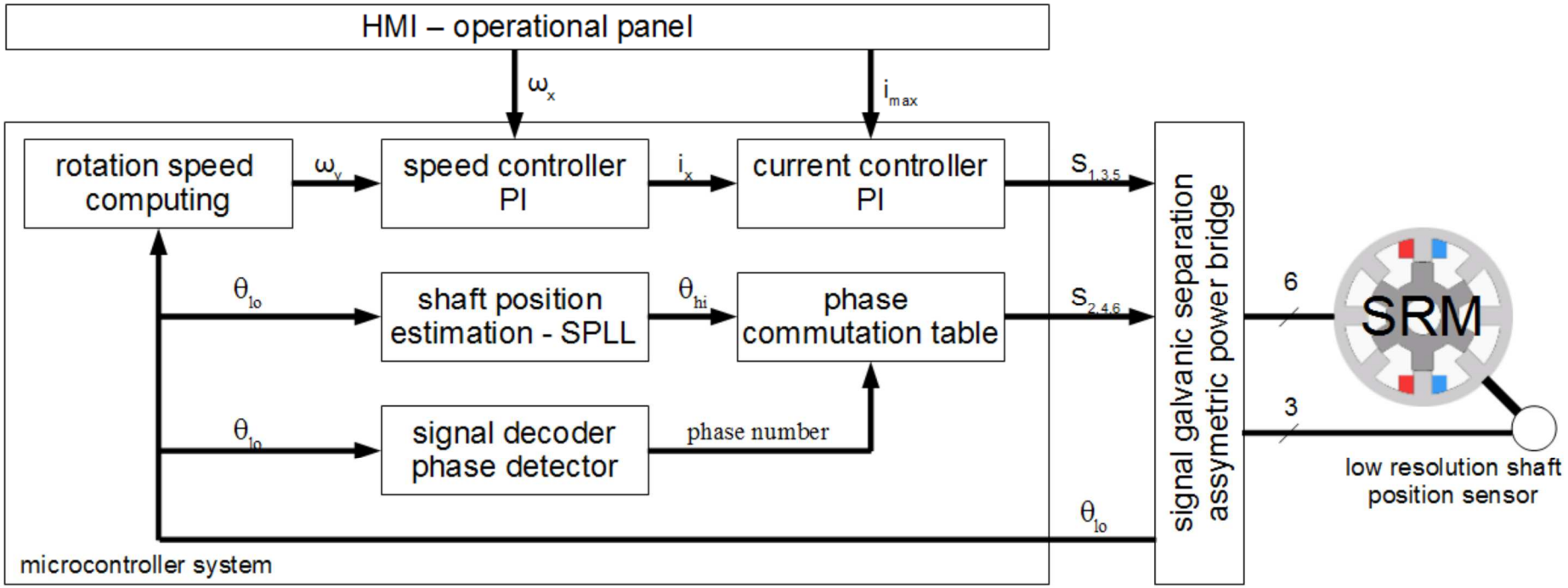
Adaptive control for drive with changing inertia

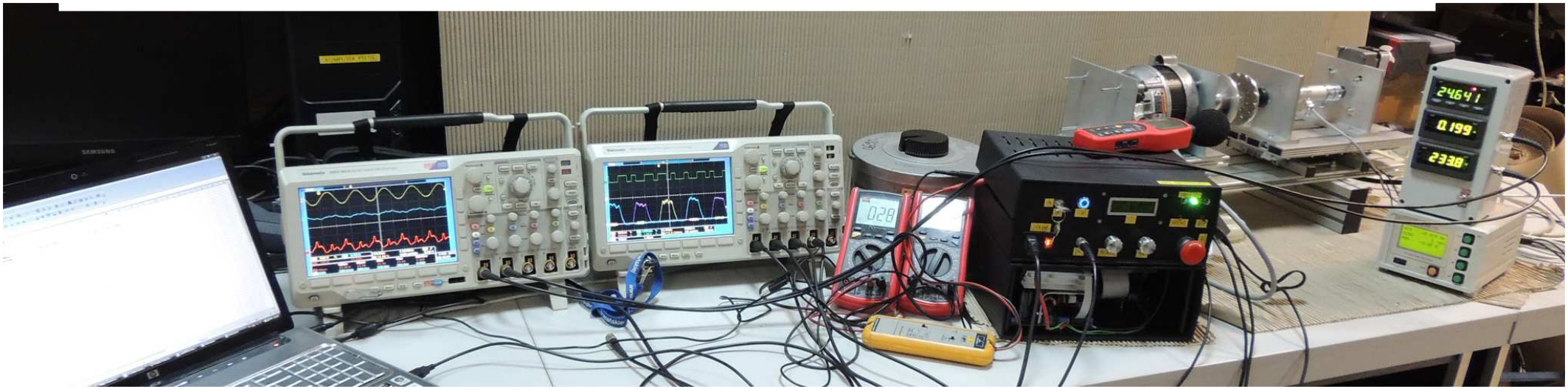
ANN with on-line learning



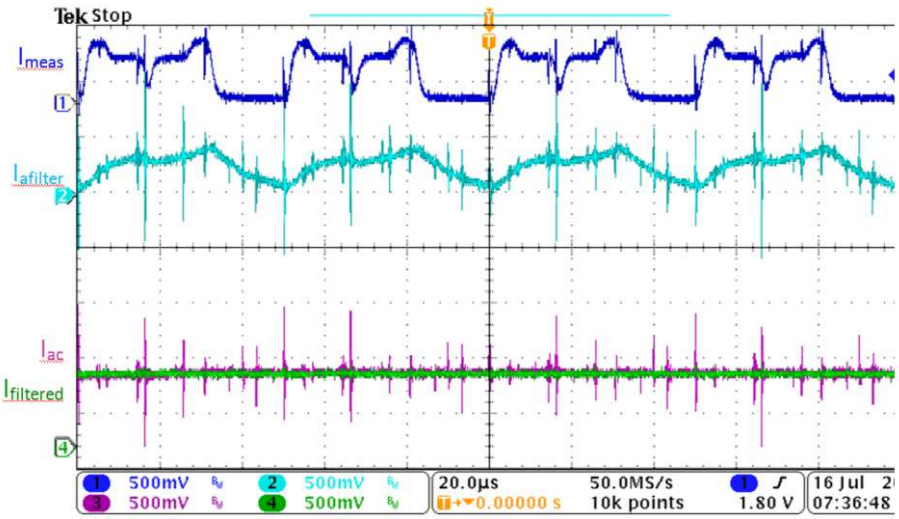
Subautonomiczny katamaran pełnomorski (2020-2024)

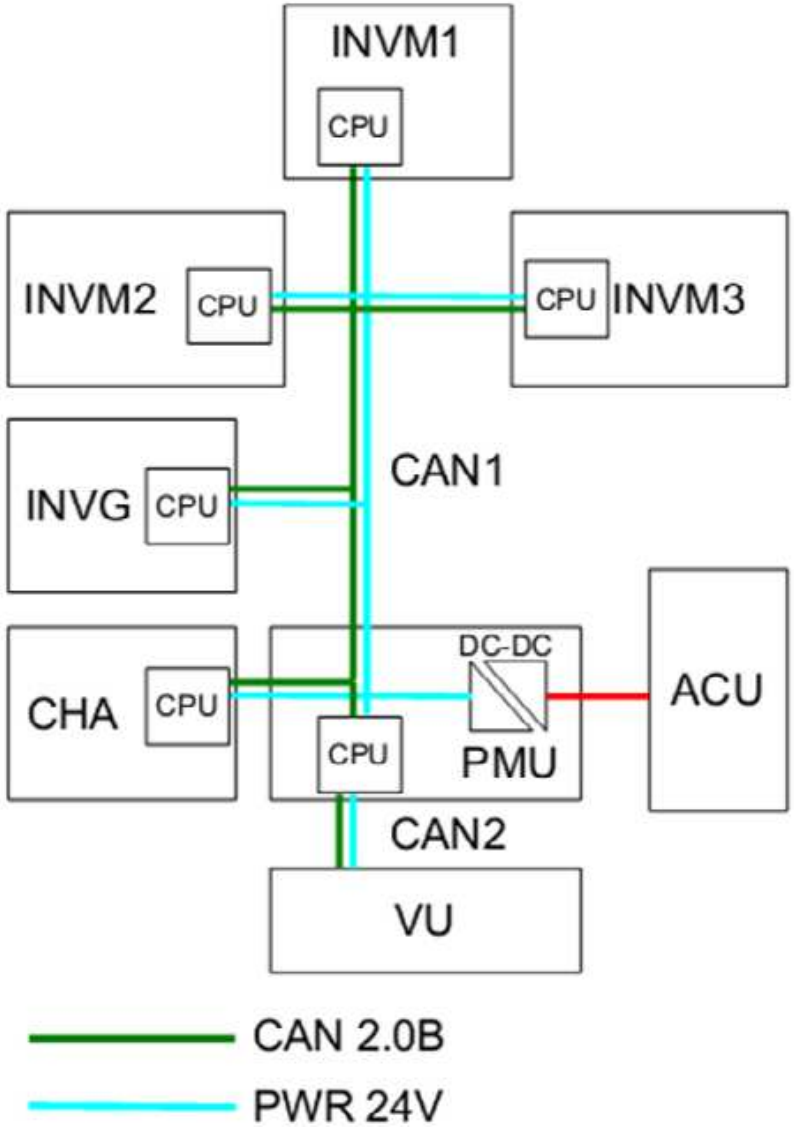
Control of switched reluctance motors (classical and iron powder based)





Regenerative drive for new kind of electric bicycle






Zapraszamy do wybrania studiów magisterskich na specjalności
Inteligentne Systemy Automatyki