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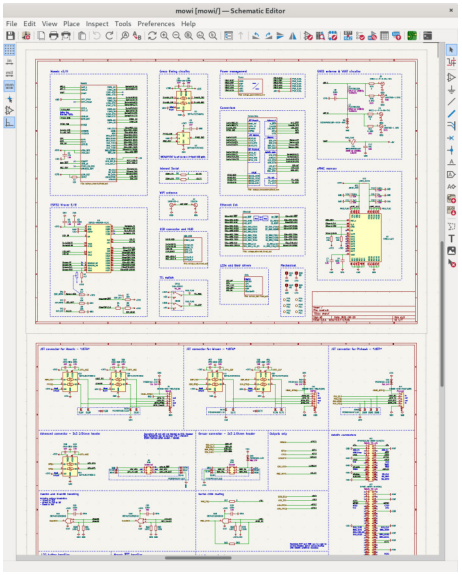
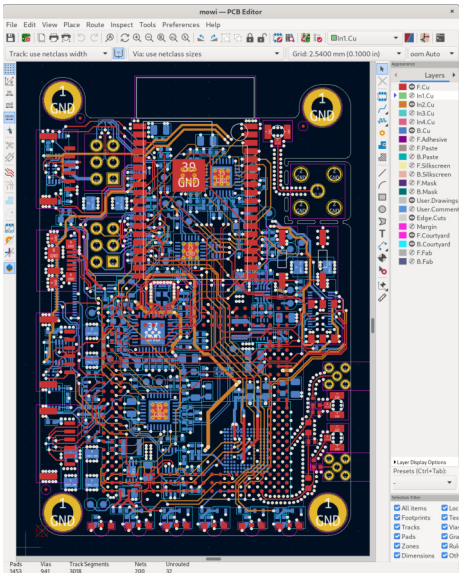
MOWI

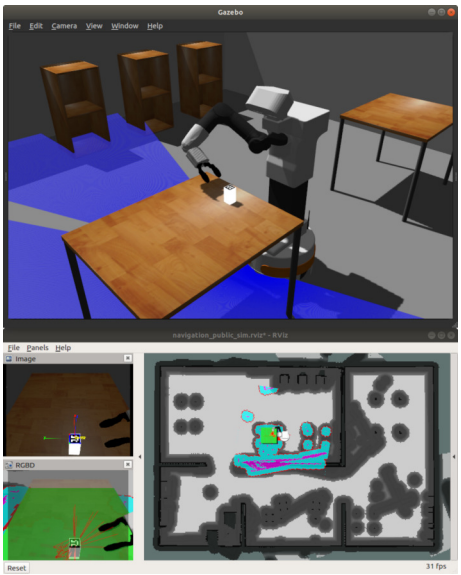
Septentrio N.V. 2021

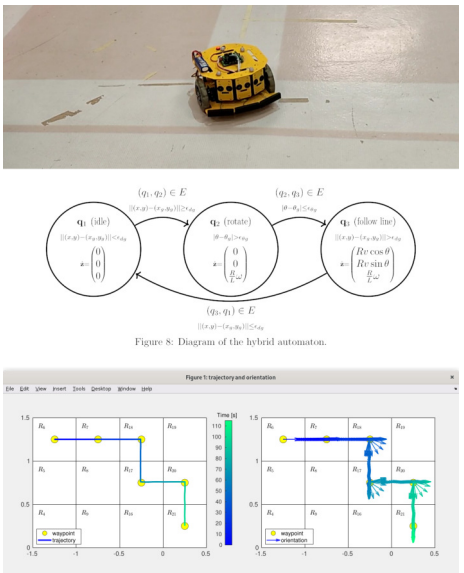




Mowi is an HW board integrating Septentrio's GNSS receiver with an ESP32 WiFi module. This interconnection is accommodated by an onboard 802.3 Ethernet link providing full wireless connectivity to the GNSS module. Mowi's design also features a high-speed USB hub, an eMMC memory, robust power management, an FTDI driver, and multiple ESSD-protected peripherals. This project included system design, scheme and PCB design in KiCad, coordination of manufacturing, and delivering Ethernet drivers and example scripts in C.

MASTER'S SEMESTRAL PROJECTS

KTH Stockholm 2021-2022





a. We made a robot pick up and move a cube between tables in different rooms. Our task was to design a robust behavior tree and implement sub-processes of SLAM and locomotion, utilizing ROS and Gazebo.
b. We tried to estimate a vehicle's speed from passing traffic signs. We used computer-vision methods to detect the signs on a video, a particle filter to track them, and a Kalman filter to estimate the speed.
c. Our task was to create a path planner and a hybrid controller for a small two-wheeled robot navigating a grid environment with penalties. We used MATLAB to design and C++ to implement the controllers.

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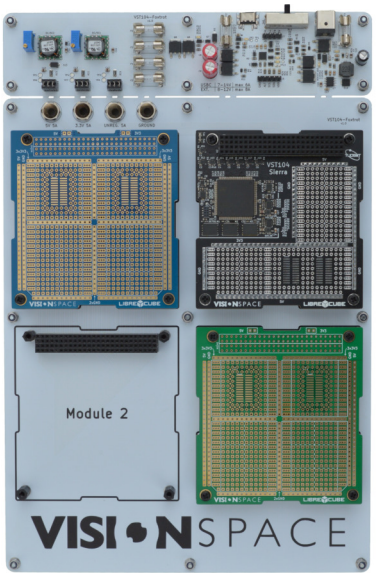
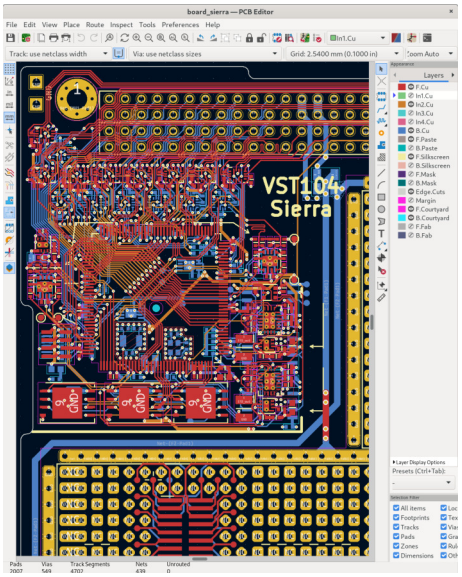
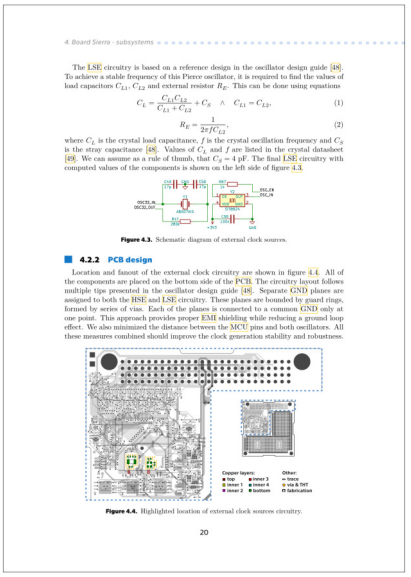
VST104

VisionSpace Tech. GmbH. 2020



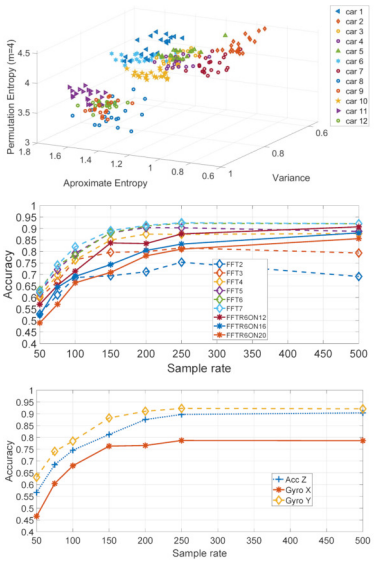




VST104 is a family of HW boards designed for PC104 format CubeSats. The main board is a single onboard computer featuring a powerful STM32 microcontroller, redundant flash and FRAM memories, separate data bus insulators, and power management. The auxiliary board is a FlatSat testbench with USB-C power delivery capabilities. I worked on the system, scheme, and PCB design in KiCad and a manual assembly of fine-pitched components. This project, extended with radiation testing, became my award-winning bachelor thesis.

VEHICLE IDENTIFICATION

JRC of European Commission 2019



In the vehicle identification project I joined a research team answering a cybersecurity call. We developed a method of fingerprinting vehicles using IMU measurements. The identity of each vehicle could be verified by trained machine learning models based on the vehicle's mechanical vibrations and driving style. My tasks included creating datasets, automating signal processing in Python, and designing dimension reduction and deep learning experiments in MATLAB. The research resulted in two peer-reviewed papers (here and here).

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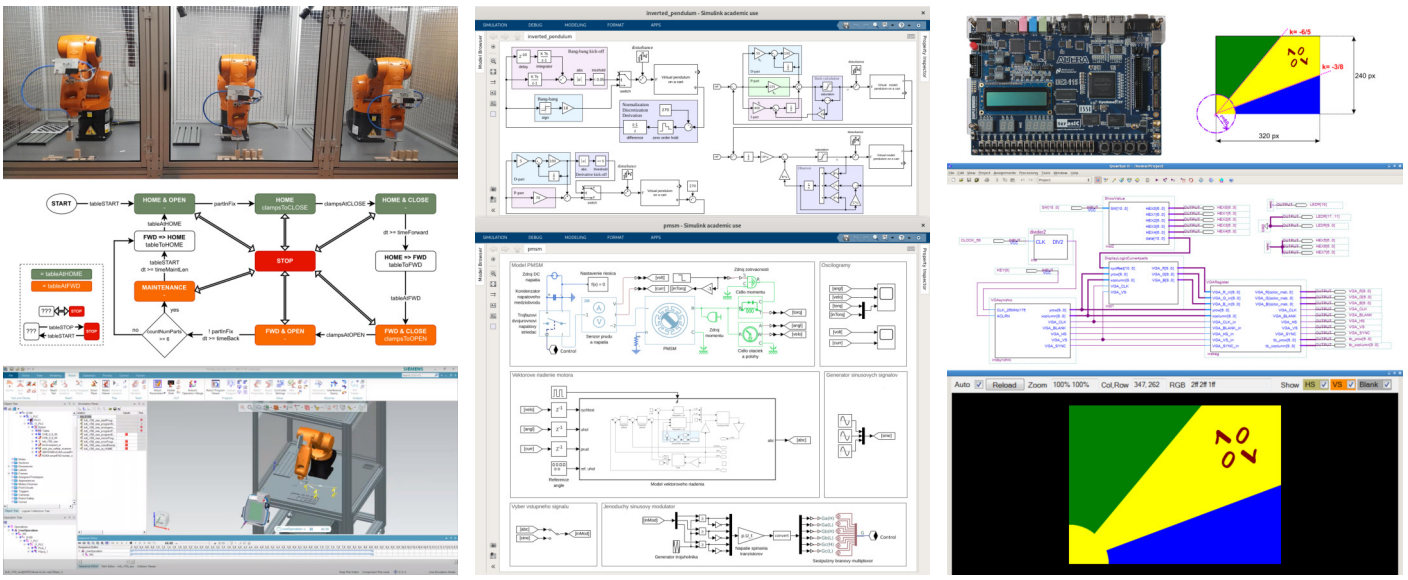
BACHELOR'S SEMESTRAL PROJECTS

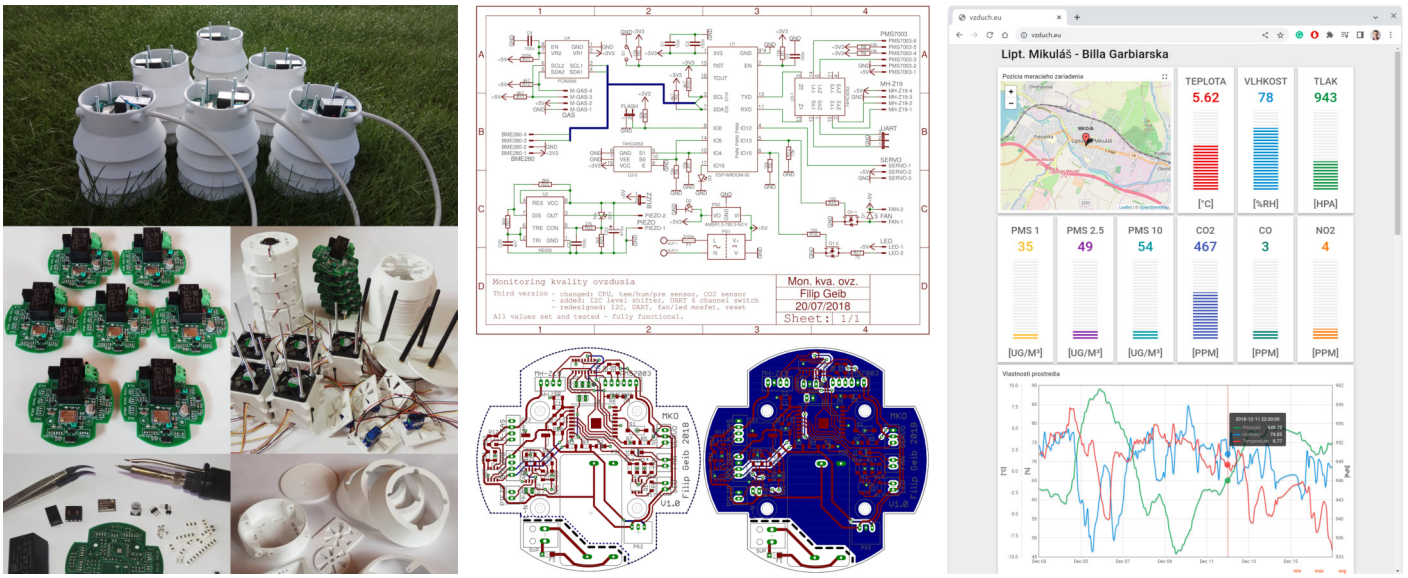
CTU Prague 2018-2021



a. Our task was to build a toy block house with a 6-DOF robotic arm. We designed a state machine and HMI in TIA Portal, simulated the process in PLCsim and Process Simulate, and delivered it to a real robot.
b. We simulated multi-domain systems and designed controllers in various classes using MATLAB and Simulink. These included a robust control of an inverted pendulum or a vector control of a PMSM motor.
c. On an FPGA board Altera DE2, we created two video signal generators and a fade switch in between them. We designed the HW using VHDL in Quartus, simulated it in ModelSim, and tested it on the board.

AIR QUALITY MONITORING

LEAF Award 2018-2019



I won a national environment-developing award with an IoT network of air quality monitoring devices. Each device is wirelessly connected to a server and constantly measures and sends a wide set of parameters. They include basic meteorological properties, three types of dust particles, and a set of chemicals such as CO2 or NO2. All the data is then processed and visualized on a website. This project included system design in KiCad, 3D design in FreeCad, software development in C/C++, and website front end using PHP and JavaScript.

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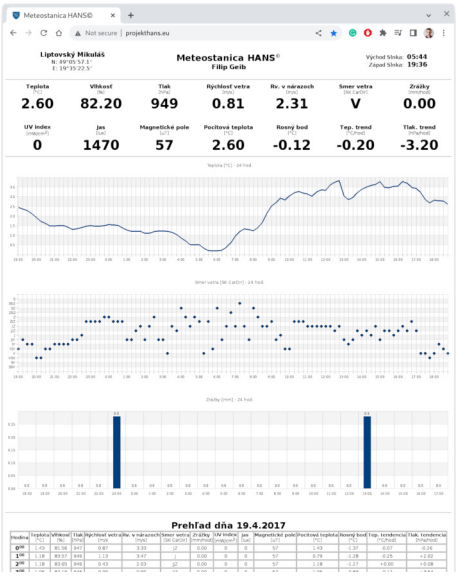
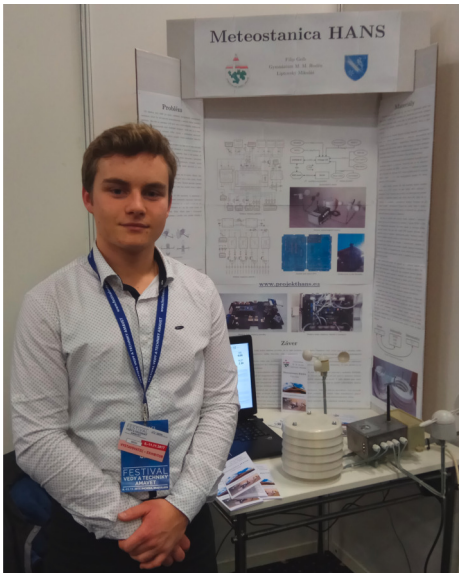
WEATHER STATION HANS

Gymnasium 2016

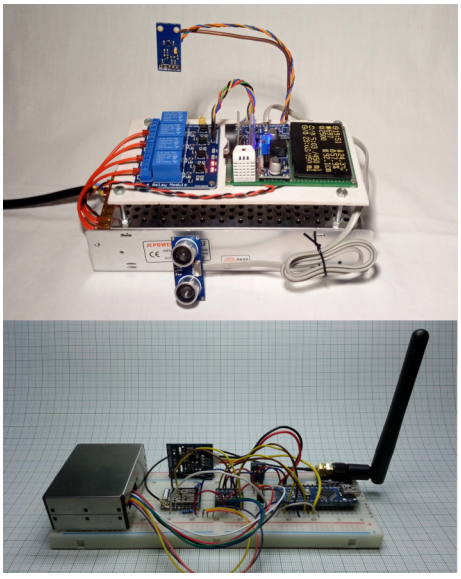
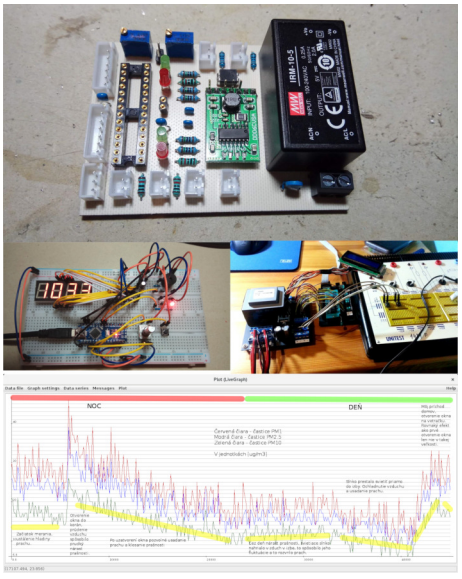





The weather station HANS is a project I created for a STEM fair AMAVET. The station features a radiation shield for precise measurements, a heated anti-freeze anemometer and wind vane, and a snow-melting rain gauge. Additional properties such as UV index, strength of magnetic field, or light intensity were also measured. All the data is wirelessly transmitted to a server and displayed on a website providing detailed charts, measurement history, and extra information such as a dew point or an apparent temperature.

EARLY PROJECTS

Gymnasium 2013-2015

My passion for electrical engineering and programming started during my gymnasium studies. I worked on many small projects, such as an automatic grow station for plants, a system measuring air dust, a chronograph for airsoft weapons, or a regatta timer for sail ships. As a group project with my friends, we built a Spark Gap Tesla Coil generating 25kV arcs. Our show of catching arcs with a grounded screwdriver or lightning up neon tubes on a classroom ceiling was the most popular part of the gymnasium's open day.