2019 Thesis robotics

InSystems Automation GmbH, Berlin Germany

Content

#2019-1-Master: Predictive Maintenance for Lithium Ion Battery packs of mobile robots

Introduction

Our mobile robots are equipped with a battery pack of 8 Lithium battery cells. The whole pack and every cell is controlled and monitored by a Battery Management System BMS.

Mission

The cell data from the BMS should be stored to build a history of battery behavior over the time. Based on statistic of this historic data, development of an predictive algorithm should be main part of the thesis. In result we like to have following battery reports out of the data:

- Live report for status and maintenance
- Aging report for warranty purpose
- Failing report for predictive maintenance

Following issues has the be included in the master thesis:

- BMS data collection (C#)
    - Data base (open)
- Data statistic (C#)
- Algorithm for prediction (C#)
- Installation and test on a robot. Results.

Support & Schedule

Our robot R&D team and our robot installation / test team will support above described installation and development. This team will support the student with hardware and interfacing to the robot.

We guess following schedule for the scope of this master thesis:

- 2 weeks understanding and documentation of BMS interface and data
- 1 week test the BMS and battery hardware
- 8 weeks development of data base statistic and software algorithm
- 2 weeks testing
- 3 weeks documentation
- Summary = 16 weeks

#2019-2-Master: Predictive Maintenance for Servo Drives of mobile robots

Introduction

Our mobile robots are equipped with a servo motors for controlled driving behavior. The servos are controlled by a Beckhoff or PLC or other controllers with an CAN data interface. Servo data are not monitored now.

Mission

The servo data (current, temperature, …) should be interfaced and stored to build a history over the time. Based on statistic of this historic data, development of a predictive algorithm should be part of the thesis. In result we like to have following servo reports out of the data:

- Live report for status and maintenance
- Aging report for warranty purpose
- Failing report for predictive maintenance

Following issues has the be included in the master thesis:

- Servo controller data collection (open running on Linux robot PC)
    - Data base (open)
- Data statistic (open running on Linux robot PC)
- Algorithm for prediction (open running on Linux robot PC)
- Installation and test on a robot. Results.

Support & Schedule

Our robot R&D team and our robot installation / test team will support above described installation and development. This team will support the student with hardware and interfacing to the robot.

We guess following schedule for the scope of this master thesis:

- 3 weeks understanding and documentation of Servo interface and data
- 3 weeks development and test of Servo interface
- 8 weeks development of data base statistic and software algorithm
- 2 weeks testing
- 3 weeks documentation
- Summary = 19 weeks

#2019-3-Master: Concept and algorithms for monitoring of transport capacity for a fleet of mobile robots

Introduction

A fleet of mobile transport robots has a system target always. This target is to transport the right material at the right time to the right location. Every fleet has a maximum capacity of transports per hour in each environment. This is normally calculated one time only, when the project starts or roll out.
Over a time, changing in the environment could cause reductions in the transport capacity.

Mission

Development of a monitoring software that could indicate and predict capacity reductions. Record and analyze static transport data and show this in a GUI dashboard of the software.

Following issues has the be included in the thesis:

- Transport data collection (C#)
    - Data base (open or depends on AIC data base)
- Data statistic (C#)
- Algorithm for prediction (C#)
- Dashboards (C# or web based)
- Installation and test on a customer's fleet. Results.

Support & Schedule

Our robot R&D team and our robot installation / test team will support above described installation and development. This team will support the student with access to a fleet of robots.

We guess following schedule for the scope of this master thesis:

- 2 weeks understanding transportation data
- 1 week interfacing transportation data
- 8 weeks development of data base statistic, software algorithm and GUI
- 2 weeks testing
- 3 weeks documentation
- Summary = 16 weeks

#2019-4 Master: Market analysis of the safety components for mobile robots (AGV) according to EN1525

Introduction

A autonomous driven transport robot contains several components to ensure the personal safety in operational mode. The chosen components have to be evaluated according to EN 1525.

Mission

A market analysis has to be performed for all available components which are necessary to make the system personal safe with the goal to validate the components robustness in 24/7 usage on the mobile platform.
Following components of the safety system have to be investigated:

- 2D Safety Scanner
- Safety PLC plus additional safety cards
- Encoder-Monitoring
- Safe 3D technics

Goal

- Cost optimization
- Saving installation space
- Expanded, advanced and new functionality
- Better methods and abilities for diagnosis

Support by InSystems Automation GmbH

Our AGV-Installation Team will constantly support during the whole implementation of the theme.

More topics Master:

Follow Function with Laser scanner

- Investigation and evaluation of existing ROS packages:
  - Adaptation or
  - Complete new development of a ROS node
- Test and validation of the “Follow” function

Boxmover warehouse management implementation with GUI and Simulation

- Concept for a depot:
  - Layout
  - How much space is necessary in between the individual storage locations/places?
- Container Terminal:
  - How does this work with containers for goods?
  - Management of the storage places

Sharing context information in the fleet of robots (dynamic context)

- Reducing the robots speed in advance of being self-aware (without observation) of the obstacle
- Plan alternative routes when context indicates difficulties to increase the performance of the fleet
- Obstacle information (palettes, humans, other mobile systems not part of the fleet)