European Project Semester

PROJECT OUTLINE

Project dates: March 2017 - June 2017

Title: Autonomous vacuum

Project activity areas:	**Keywords:**
Autonomous system Embedded Multi-physic system Power electronics. Mechanical engineering.	Design embedded system Home aid system Electromechanical conversion Automous decision.
Tutor's name and coordinates Client – End-user: CSI teaching department of ENIT Technical ENIT Supervisor + contact: Paul-Etienne VIDAL paul-etienne.vidal@enit.fr	**Project origin** Research / Teaching

Project technical background:

Within the frame of Integrated System Design teaching department of the ENIT, some studies of interest are linked with autonomous systems.

The main objective of the project is to design an autonomous system where several components will be further studied by students. The system proposed hereby is a vacuum cleaner which should be adapted in order to become fully autonomous. With a "usual" hoover – a Tornado Bolido 4515 - the students will propose - design and adapt all components necessary to make it autonomous. Indeed, among the following proposals:

- the power electronics part, which allows to manage the electricity energy exchange between the source and the hoover;
- the mechanical frame, which should guaranty a mechanical assembly and a free movement of the whol systems;
- the control system (hardware in the loop), which allows to connect measurement to the decision components;
- etc.

the students will define on which aspects they are going to work on, to finally deliver an autonomous vacuum cleaner.

A previous study as already designed and furnished the following part:

- the "old" hoover;
- the 2 DC motors to speed up the 2 back wheels;
- the front free wheel;
- and a first mechanical structure where all components are embedded.

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Project team:

This study will be done at the Laboratoire Génie de Production of the Ecole Nationale d'Ingénieurs de Tarbes (team DIDS - http://www.enit.fr/fr/recherche-et-valorisation.html).

Figure 1: Up to day picture of the autonomous hoover.

Studied topics:

Following the number of students the tasks will be adjusted. Based on the generic picture presented in Figure Up to day , the following stage are defined :

- Define, size and realize (or select) the "missing" components, sensors, Integrated Cricuits etc.
- Mechanical frame to receive the autonomous hoover;
- Define select and realize (or select) the measurement chain (sensor selection, sensor placement, check the measurement signals; interconnect them with the control measurement operating system etc.)
- Assemble and start the control operating system;
- Define and realize the control scheme,

All these topics should be prepared and realized using a traceability and quality chart to allow further user (students or researcher) testing campaigns.

As far as the background required, an overall curiosity for multiphysic subjects is needed. A general understanding of electrical engineering would help a lot. Depending on the student background some subjects could be more developed for instance :

- For mechanical engineers, the focus will be done on the hooving performance and the mechanical frame to support the whole hoover,
- For informatics or control engineers, the focus will be given on the control operating system as well as the control scheme to implement,
- For electrical engineers, it is obvious…
- For others, we will find together something suitable.