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# MECHANICAL PROJECT AND SUPPORT FOR THE ROBOTIC INFRASTRUCTURE OF AN AUTONOMOUS ELETRIC MINI-VEHICLE

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**Abstract**

Currently in Brazil the initiatives of the automotive industry in the sector of autonomous vehicles are incipient. In addition, research is still very limited in this area and when it comes to the control of all-terrain vehicles, as well as farm vehicles, it is still more sparse. Given the great importance of the agricultural sector in the Brazilian economy, the development of technology in the area could become more than a scientific exponent, a great agent of social development. In this context is the project VERDE - Robotic Electric Vehicle of Electronic Differential (2014 - 2018) conducted by FEM-UNICAMP, in partnership with CTI - RENATO ARCHER, in which the present scientific initiation project is inserted ...

***Key words:***

*Autonomous Vehicle, Electronic Differential, Mechanical Project.*

## Introduction

Most of the scientific research in land mobile robotics in recent years has focused on the development of autonomous road vehicles, which suppose navigation in a well-behaved environment such as flat pavement with few irregularities. This allows the knowledge of certain variables related to the environment, as well as simplifications with regard to tire-road contact conditions (Rajamani, 2012).

In view of this, the present project aims to develop and finalize a platform for the development of force estimation techniques and the multi-traction control in adverse terrains, as well as the production of technical documentation of the prototype's construction / adaptation to facilitate the reproduction of the platform in any national research center thus fostering the development of technologies in the area.

## Results and Discussion

For the development of a vehicle that could be easily replicated as a base, the HPI Baja 5B SS scale vehicle was chosen, after undergoing an adaptation process to accommodate the electric motors together with the embedded electronics present in the vehicle. An initial part of the work was the digitalization of all the parts of the vehicle in CAD, as well as the validation of the model with the real vehicle which was of fundamental importance for the increase of reliability in the project.

After that, a new Powertrain support system was developed, which did not require many adjustments in the assembly. Thus, a pin system has been chosen to couple the drive pulleys and motors with the driven pulleys and wheel axles. In addition, part of this project corresponds to the production of two manuals to facilitate the replication of the vehicle: One regarding Manufacturing explaining the processes used for the reproduction of the vehicle and containing technical drawings of the parts, along with the complete CAD models of the vehicle, both for playback as well as to facilitate possible platform enhancements. The other manual is the User's Guide, which contains all the materials necessary as well as a step by step assembly of the vehicle.

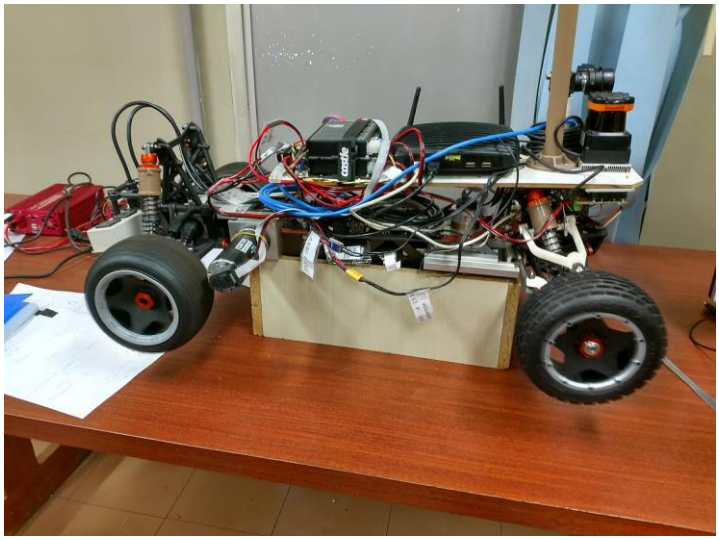

**Image 1.** *VERDE* - Robotic Electric Vehicle of Electronic Differential

## Conclusions

A platform for developing force estimation techniques and multi-traction control in adverse terrain is a major impetus for the development of new technologies in this area. In the period of project execution, several scientific works have already been compiled, and can now be tested and validated experimentally in the field (Cordeiro, 2016) (Ribeiro, 2016), (Lemos, 2017).

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