

Cooperative Research Projects

School of Mechanical Engineering (FEM) of UNICAMP

Multi-institutional research projects with CTI-Renato Archer, UFAM, ITA, EESC-USP, UFMG and IST-Portugal, Eudiasyc-UTC, Heriot-Watt University and Concordia University

Project VERO

Project VERO (2009) – “VEículo RObótico de exterior” is an institutional project conducted by CTI-Renato Archer addressing the gradual development of autonomous navigation methodologies for terrestrial vehicles in outdoor environments for two main scenarios: agricultural robotics and urban. The platform is a 4-wheels electrical vehicle with two rear independent motors with electronic differential distribution system, fully instrumented with inertial navigation system INS / GPS, onboard computer and CAN bus, laser scan, camera, and encoders. Its main objective is the development of torque / speed distribution approaches on the non-steerable wheels of a multi-purpose vehicle, known as an electronic differential distribution system, which is useful for off-road autonomous navigation, such as in the case of a tractor, for example, where the knowledge of the adhesion properties is extremely complex.



Da esq. para a dir., Rafael Angelis Cordeiro, Samuel Siqueira Bueno e Ely Carneiro de Paiva e o veículo robótico: plataforma usada no estudo

Project AURORA



Project AURORA —Autonomous Unmanned Remote monitoring Robotic Airship— (1997-2017) was a pioneer project conducted by CTI-Renato Archer, responsible for the historical landmark of **the first autonomous airship flight** of the scientific literature (in March,03,2000). Researchers of FEM participating: Prof. Ely Paiva.

Projects DRONI & InSAC



Project DRONI - “Dirigível Robótico de Concepção Inovadora” / “Robotic Airship with an Innovative Conception”, coordinated by CTI and funded by CNPq (2014 - 2017) developed a new robotic airship with four independent vectoring electric thrusters and on-board sensors and processors, communication and ground control station. The airship is an experimental platform for development of control and autonomous navigation strategies, as well as to be used in socio-economic and environmental applications at Amazon rainforest.

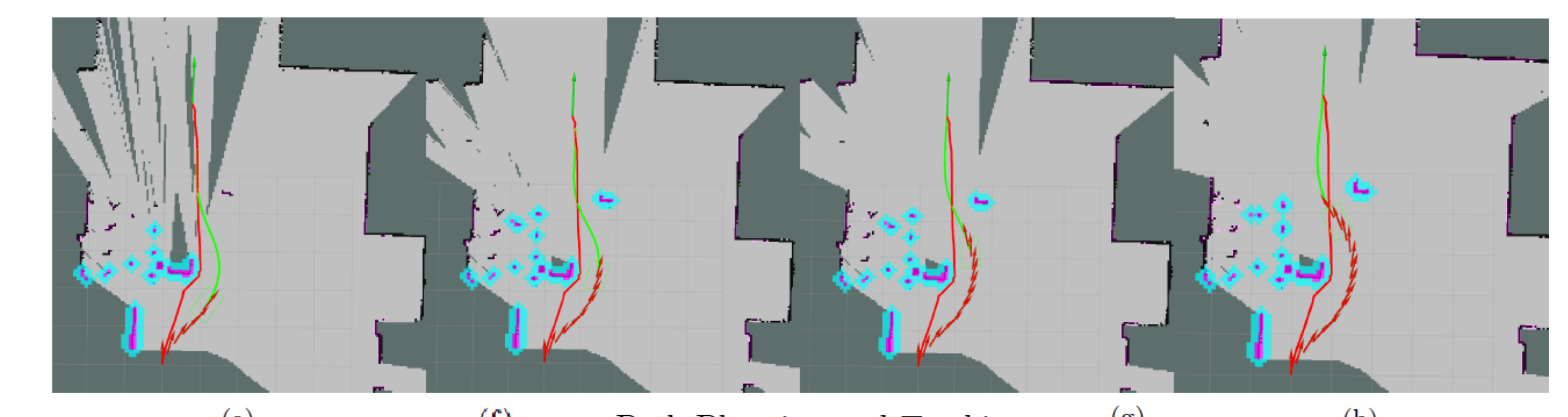
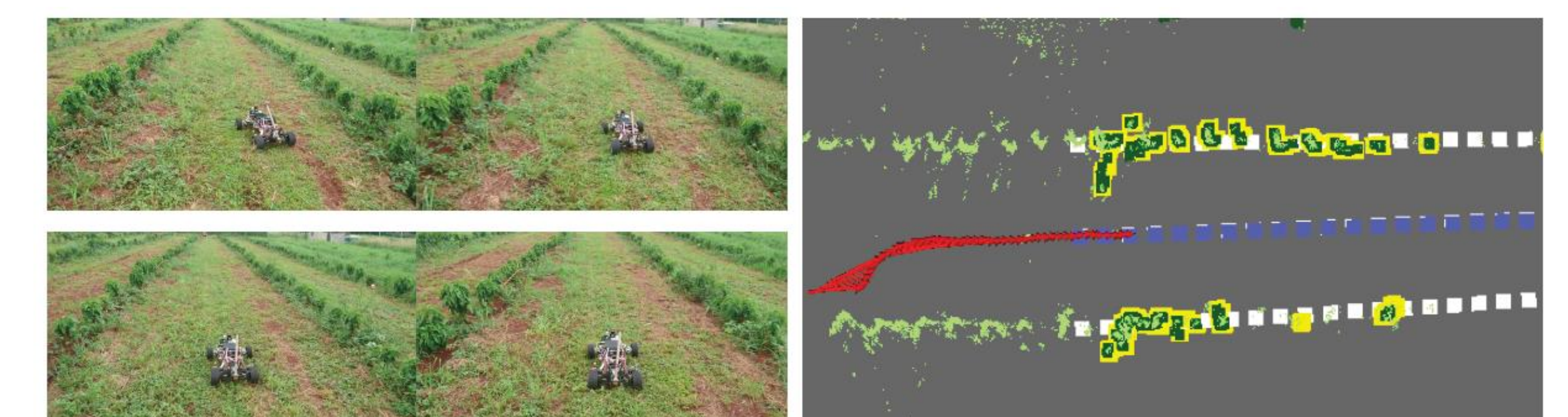
Project INCT-InSAC – “National Institute of Science and Technology for Cooperative Autonomous Systems Applied to Security and Environment” (FAPESP-CAPES-CNPq), coordinated by USP-São Carlos, more specifically in the work group “Lighter than air platforms for sensing, communication and information systems applied to Amazonia”. This work group in a multi-institutional network composed by different research institutions, including UNICAMP, CTI-Renato Archer, UFAM, EESC-USP, ITA, IDSM - Mamirauá, and IST-Portugal (Prof. José Raul Azinheira). The objective is the establishment of a multidisciplinary group to design and integrate airships and aerostats, using the different fields of aerial robotics, communication, sensory systems, and information processing, aiming environmental applications in Amazon.



Projects VERDE & Auto_VERDE



Project VERDE - “Veículo Elétrico Robótico de Diferencial Eletrônico” (Fapesp 2014 / 02672-9) resulted in the construction of two instrumented mini-vehicles with independent electric motorization in the rear wheels. VERDE is a platform similar to the VERO car, with an electronic differential distribution for an optimized torque / speed distribution. Testing full-sized robotics cars in off-road conditions may be dangerous and cost-prohibitive, and a solution is to use a miniaturized version of a robotic car, while maintaining the same level of sensing capabilities and processing power. Such a vehicle can serve as a testbed for validating autonomous driving applications in aggressive environments such as slippery and highly uneven terrains. The new Fapesp **Project Auto_VERDE** (2018 / 04905-1) will allow the evolution and experimental validation of the control approaches developed and / or under development for applications in vehicles for extreme conditions terrains like those found in agricultural applications. Researchers of FEM participating: Prof. Ely Paiva, Prof. André Fioravanti and Prof. Niederauer Mastelari.



(e) (f) Path Planning and Tracking (g) (h)