



# RHEA Newsletter

*Robot fleets for highly effective agriculture and forestry management*

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## 1st International Conference on Robotics and Associated High-technologies and Equipment for Agriculture

The First International Conference on Robotics and Associated High Technologies and Equipment for Agriculture (RHEA -2012) was held in the beautiful city of Pisa, Italy, on September 19 to 21, 2012. The meeting was hosted by the University of Pisa and attended by more than 70 participants coming from 13 countries. The program included a total 53 oral communications on various aspects related with robotics applied to precision agriculture.

### Topics covered

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| Automated machines for chemical and physical weed control and for tree crop protection |
| Design and control of automated agricultural vehicles and systems                      |
| Computer vision and image analysis in agricultural processes                           |
| ICT technologies in precision agriculture  |

Two excellent plenary sessions presented by Paolo Bàrberi (*"The EU Framework Directive on sustainable pesticide use: prospects for site-specific weed management"*) and by Paolo Gay (*"Automation and Robotics for precision agriculture: state of the art and perspectives"*) completed the scientific program.

The Proceedings of this conference, edited by Andrea Peruzzi and published by Pisa University Press, are available at:

[www.rhea-project.eu/Workshops/Conferences/%20Proceedings\\_RHEA\\_2012.pdf](http://www.rhea-project.eu/Workshops/Conferences/%20Proceedings_RHEA_2012.pdf)



The research leading to these results has received funding from the European Union's Seventh Framework Programme [FP7/2007-2013] under Grant Agreement n° 245986



The scientific sessions were followed by a practical demonstration of the operation of the physical weed control unit developed by the University of Pisa and the airblast sprayer developed by the University of Florence. Two guided tours, one of them to the experimental station of the Faculty of Agronomy and the other to Pisa monumental area, completed the program. The final gala dinner was conducted at the beautiful facilities of the Calci Natural Museum of the University of Pisa



### Ground Mobile Units (GMU)

After the preliminary integration of one of the Ground Mobile Units (GMU), conducted in May at Zedelgem (Belgium), two full equipped units have been provided by Case New Holland (CNH) to the Centre for Automatic and Robotics (CSIC-CAR) in Arganda (Spain). Here, integration work has been continued. Currently, the reintegration of one of the units (GMU-1) has been completed and the preliminary integration of the second unit (GMU-2) has also been finished.



### Base Station (BS)

The objective of the Base Station is to be a point of interaction between the RHEA mobile units and the human operator. It consists of a cabinet located next to the mission field and equipped with a computer and software specially designed to plan and control the missions of the ground and flying units. A wireless device and a GPS antenna have been installed to allow a real time communication with each of the mobile units and to correct the signal of each mobile unit GPS receiver. A powerful computer is in charge of handling the RHEA simulation software component, developed to test in advance the missions of the mobile units. A Graphical User Interface (GUI) is in charge of controlling the system operation and for record-keeping.



### Physical weed control (PWC)

After the tests performed during the integration meeting held in Zedelgem, the structure of the operative machines for PWC was modified by the University of Pisa, changing the configuration of the apparatus that caused problem of stability of the whole unit after coupling the tractor to the implement (the increase of weight determined by the presence of the LPG feeding system made the tractor flip over, a serious safety and operating problem). In order to reduce the weight of the machine, two working units were eliminated. In this new configuration the





working width of the machine is 3 m covering 4 crop rows spaced 75 cm. The systems for the LPG feeding, the ignition of the burners and all the sensors were implemented on this machine. In October 2012 a technical meeting took place in Pisa in order to verify the proper functioning of the implement. Blubotics, in collaboration with the UP, have installed and connected the PLC and, finally, successfully tested the low level actuation system and devices system.



### Airblast sprayer

RHEA airblast sprayer is a semi-mounted equipment, coupled to the GMU, equipped with sensors capable to recognize the presence, shape and thickness of the various horizontal bands of the canopy. Spray application is variable on each canopy band in terms of direction of diffusers, airblast flow rate and liquid dose. These variables are adjusted to the presence or thickness of the canopy by innovative devices developed in the RHEA project. The major innovations introduced in this equipment are the air flow rate control at each single diffusers and a main butterfly valve to adjust the total air flow rate at the fan in order to reduce power requirement.



### Testing algorithms for ground weed detection

During November/December, 2012 a field of grass was conveniently arranged at CSIC-CAR facilities, simulating maize crop lines and weeds. This was intended for adjustment and validation of methods for automatic crop lines and weed detection as a previous step to subsequent tests in maize fields (to be conducted this coming May and June).



This work represents a continuation of previous studies carried out by the Universidad Complutense de Madrid. The camera-based system has been integrated into the Ground Mobile Unit (GMU) and it is now already operative. Work in progress involves activities oriented to solve additional problems emerged during these tests (illumination, boundary conditions) with the aim that the equipment is ready for the next tests to be conducted in maize fields.



### Exploitation Strategy Seminar (ESS)

This one- day seminar took place in November in Sevilla (Spain) and consisted on several presentations by the Paloma Mallorquin (ESS expert) and the WP leaders. Working groups were formed to discuss interrelated benefits among participants, which were presented to the attendees by the working group representatives. Four major subjects were presented and discussed:



**Achieving project goals** (with examples of successful exploitation of project results and suggestions for building a successful exploitation team).

**Strategies for managing intellectual capital & IPRs** (understanding and valorising intellectual capital, defining key exploitable results and intellectual property).

**The Capitalization Strategy** (carrying out SWOT analysis, capitalization principles and concepts, guidelines for the preparation of the capitalization strategy, capitalization plan: structure and contents).

**Reviewing and assessing the "Plan for using and disseminating the foreground"**

At the end of the day, participants enjoyed a guided tour through the streets of Sevilla, followed by a dinner at the Guadalquivir riverside, with spectacular sights of Sevilla at night.

