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SEVENTH FRAMEWORK PROGRAMME

RHEA Newsletter

Robot fleets for highly effective agriculture and forestry management

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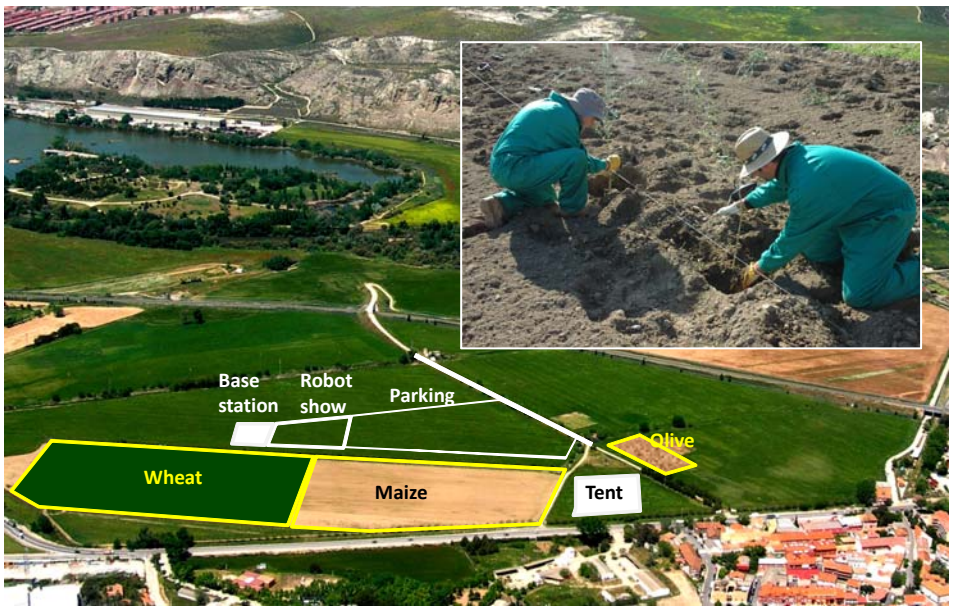
1. Working for the final demo

Although the project has just started, at the Institute of Agricultural Science (CSIC) they are already planning everything for the final demonstration and project assessment that will take place in May 2014 (almost 4 years from now!). They have the right place: La Poveda, an experimental farm located 20 km south of Madrid. They have already selected the fields that will be used for the experiments and they have established a new super intensive olive orchard to be used in the final tests. All the measurable criteria that will be used for project assessment have been defined and they are looking forward having the robot fleet ready in order to test its behaviour.

General view of La Poveda Experimental Station, location of assessment/demonstration fields and establishment of the superintensive olive orchard

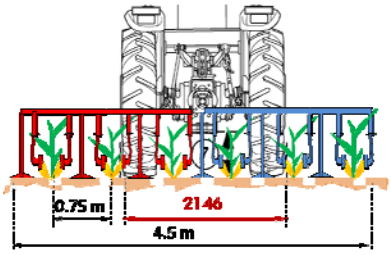


2. The ground units are on the way

After some discussion about the ideal features for the ground mobile units, it has been agreed to build them on Boomer T3050 CVT tractors. These are New Holland tractors 1.7 m wide with a 51 Hp engine and a maximum payload of 1.6 ton. The relatively small size, high reliability and good fulfillment of standards of these vehicles make them very adequate for this task. Currently, CNH and BlueBotics are working on adapting these units to their role as autonomous units, introducing

The research leading to these results has received funding from the European Union's Seventh Framework Programme [FP7/2007-2013] under Grant Agreement nº 245986

View of the New Holland Boomer T3050 CVT with the cab removed



First prototype of precision hoe for mechanical and thermal weed control

numerous new features, such as a motion and a actuation controller, a new steering and braking system, changes on the actuation on the 3 point hitch and on the engine RPM, etc. We expect to have the first units ready in a short time in order to start our first tests with them.

3. New physical weed control tools

The University of Pisa has designed a precision hoe in order to perform mechanical and thermal weed control in maize. The machine will be equipped with rigid elements for a shallow soil cultivation (5 cm of depth at maximum) between the rows and couples of burners for selective in-row flaming, as maize is tolerant to the thermal shock. In order to enhance the precision of the treatment, the hoe will be equipped with directional wheels connected to an electronic row detection system. The thermal treatment will be performed only in case of weed detection by the perception system of the aerial and ground unit, while the mechanical treatment will be performed independently from weed presence. The LPG dose per surface unit (hence the intensity of heat transfer) will be adjusted according to the level of weed canopy, which will be detected separately in the different bands where the burners will operate.

4. Using aerial vehicles for weed detection

Maize rows and weed patches as shown by a segmented image obtained by an unmanned aerial vehicle

Last May, a team of remote sensing experts from the Institute of Sustainable Agriculture (CSIC) started a series of preliminary tests with unmanned aerial vehicles (UAV) flying at different heights (from 30 to 100 m) over a maize field infested with different weed species. The UAV unit was equipped with a multispectral camera that obtained images with pixel sizes ranging from a few mm to 3 cm (depending on flying height). After each flight mission, the images were downloaded from the unit storage device and post-processed by image mosaicking, georeferencement/orthorectification and segmentation. The quality and precision of images obtained is very promising.

5. Past activities

Working session and field visit in the technical meeting held in Cordoba in February 2011

The second technical meeting of the project took place in Cordoba, Spain, in February 21-22, 2011. It was hosted by the Institute of Sustainable Agriculture (CSIC) and was attended by 40 researchers from all the RHEA partners. In this meeting the consortium made a significant effort to get ready the Project Deliverables due by May 31, 2011. As a result of all that work, six Deliverables were released: Del 2.1 (Description of the Mission Planner and action strategies), Del 3.3 (Description of the laser-based Ground Sensing Equipment), Del 4.1 (Description of the High-Level Decision Making System), Del 5.1 (Ground Mobile Unit: features and assessment measurements), Del 6.1 (Architecture and Infrastructures of the Communication and Location) and Del 7.1 (Specifications of the Base Station).

After the meeting, most of the participants attended to a guided tour to Córdoba`s countryside, visiting typical winter wheat crops as well as olive and plum orchards with various cover crops. An excellent opportunity to know first hand the agricultural systems of that region of Spain.

Visit to the Château de Chillon, Veytaux, Switzerland

Article published in the Spanish magazine "Tierras"

RHEA poster delivered to project participants and potential stakeholders

The third technical meeting was held on the campus of the "Swiss Federal Institute of Technology" in Lausanne, Switzerland, in June 9-10, 2011. It was hosted by Cyberbotics and BlueBotics and was attended by 38 participants. During this meeting, the drafts of the 12 Deliverables due by July 31, 2011 were presented and discussed. The Deliverables that were finally released were: Del 2.2 (Description of the Mission Supervisor), Del 3.1 (Description of the Remote Sensing Equipment), Del 3.2 (Description of the camera-based Ground Sensing Equipment), Del 4.2 (Description of the Low Level Actuation System and the Device System), Del 5.2 (Aerial Mobile Unit: features and assessment measures), Del 5.3 (Safety system of the Mobile Units: definition and assessment measures), Del 6.3 (Description of the Localization functions and definitions of all pre-integration), Del 6.4 (On-board network system and relevant pre-integration tests), Del 9.2 (Dissemination plan and Reports), Del 9.6 (Modifications to the consortium agreement (I)), Del 9.9 (Exploitation plan (I)) and Del 10.1 (Periodic report (1)).

After the meeting, a touristic visit to the "Château de Chillon" was organized and attended by several participants.

6. Work in progress

The forth technical meeting is going to be held in Montpellier, France, in September 8-9, 2011, hosted by Cemagref.

For the dissemination of the project results, the RHEA consortium envisages the celebrations of an Annual Workshop to be organized at the end of every year. Consequently, on the last day of the Montpellier meeting the First RHEA Workshop will take place, with a programme including 17 oral presentations. In addition, 13 communications have been presented by project participants in different national and international conferences, disseminating some of the preliminary results of the RHEA project. Two technical articles have been published in farmers magazines and another two in scientific journals. A poster has been produced containing information regarding de project consortium, approach, objectives and major technical specifications. This material has been distributed to project participants in order to be displayed in their work places as well as in various meetings.

Project reporting is a crucial part of project management and, equally important, to the actual execution of the tasks. The first periodic report of RHEA is due by September 2011. Consequently, in the next months a considerable effort will be made to prepare this project report.

In addition, in the next six-month period (August-December, 2011) the consortium has to focus in the development of the mission planner and of aerial and ground perception systems, the construction of the mobile units and the actuation systems and the initial integration of the system.