



The Role of Robotics in Agriculture Sciences' Automation in Sud -Oeste of Buenos Aires - Argentina



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Abstract

In this paper ongoing projects are presented enlighten the important role of automation and robotics in developing countries such as Argentina. In particular, two salient cases are examined: the automation of an animal research's station for feed activities and a mobile robot to reconfigure an entire flexible fence control.

Keywords: Robotics; Automation; Precision agriculture; Precision animal control

Introduction

Several activities encompass agriculture's field, however some of them requires a special care and precision. This is the case of fungicides; herbicides and insecticides sprayers [1].

To spray such a products is nowadays implemented by a person dedicated to it. Due to the dangerous nature of these chemical, alternative technologies are under study such as Robotic sprayers [2,3].

These robotic technologies are under the scope of precision agriculture: monitoring, harvesting, spraying, weeding, cultivation or even planting [4,5]. However a little is known or even developed for precision animal control [6,7].

Moreover, different countries face different problems with different solutions needed. Notwithstanding, a few several countries share problems and solutions, as for the case of countries in Europe [8].

In this way, Sud-oeste of Argentine's Buenos Aires Province possesses a top activity in animal exportation for food. However, technology adoption for such an activity is low or inexistent (see for instance the Phd thesis [9] in Spanish).

On the side of mathematical models, several models have been evaluated to interpolate special data [10-12]. In particular [11] provides an online application to allow the farmer or engineer to extract information up to date.

As explained, dealing with animal technology falls under the scope of precision animal control with recent projects towards the traceability in real time on the basis of satellite monitoring with geo-referenced collars [13].

As it can be envisioned, the problem of animal tracking, control and monitoring in countries like Argentina were areas are so big, encompass a tremendous effort to cover the area with transmission (collars) but at the same time the problem of battery replacement, base station receiving data and autonomous robot navigation outdoor in unstructured and rough terrains.

Working and Work-in-Progress

To cope with the needs detected, several projects have been proposed to solve (in part) these shortcomings. Besides the project completed to solve the traceability problem in [13], it is worth to mention to work-in-progress projects:

- Autonomous animal control robot: electric fence control
- Animal feed station with automatic counting and renewable energy

Autonomous animal control

Electric fences are a practical yet effective way to control the animal occupation of determined areas of a field [14]. However, to the time of changing them are under control, the complete electric wire must be removed and reinstalled.

To solve this problem an automatic system was proposed in cooperation with INTA (Argentina) and Dr. Andrés García to automatically move an electric fence to some predetermined (and able to be reprogrammed) instants of time based upon a microcontroller and Bluetooth communication (Figure 1 for a descriptive ide of this work-in-progress project).

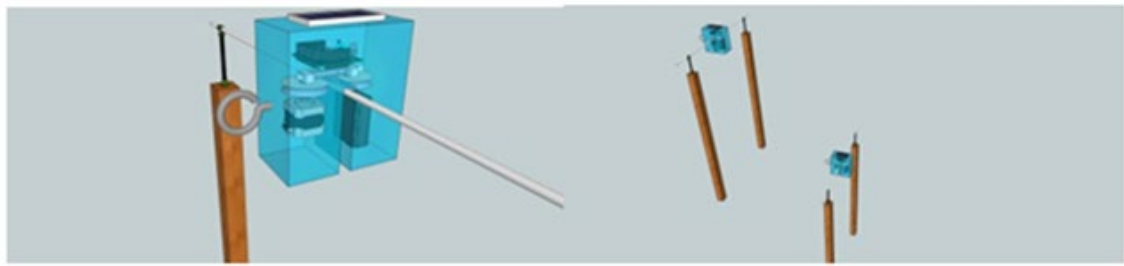


Figure 1: Robotic system to control an electric wire autonomously.

Animal feed station

Another interesting project attacks the problem of modeling the amount of feed of some specified animal along the

day. To cope with this problem, a station of three houses was constructed (Figure 2), each house delivers food only to some specific animal carrying a specific numbered collar.

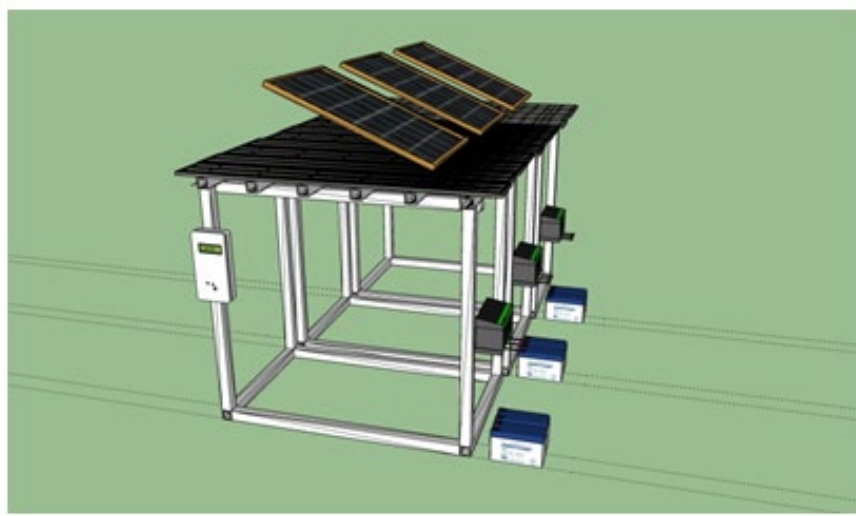


Figure 2: Animal feed control station with solar panels, intelligent battery chargers and Bluetooth sending information.

These collars transmit their number wirelessly to a receptor at the base and then, if acknowledged, the door is opened to receive the food. Besides, the station possess three independent charges using PV arrays in order to minimize the use of energy but also providing a ready to use equipment for animal field control.

Conclusion

This paper presents an opinion regarding the developing countries' necessity to rapidly adopt technologies that alleviates heavy duties' farmers.

In this respect, several technologies were envisioned; in particular two ongoing projects that are being carried out in Argentina were discussed:

- Autonomous animal control robot: electric fence control
- Animal feed station with automatic counting and renewable energy

The first case shows the possibilities using an autonomous robot reconfiguring an entire flexible electric fence, whereas the second project provides an insight into feed's animal research.

Future work considers technology providing farmers with technology able to automatize essential systems such that aerial vision to track animals getting on-line counting.

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