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KIN-VADASE: AN ALTERNATIVE REAL TIME AND LOW-COST METHODOLOGY FOR
AGRICULTURAL VEHICLES NAVIGATION**Abstract**

The work aims to provide agricultural vehicle of alternative low-cost intelligent systems to control continuously their position in the field, with high precision, exploiting the GNSS signal.

Presently, the usual modality adopted to track vehicles positions in agricultural applications is the Real-Time Kinematic (RTK) differential positioning, which allows to have good accuracy, but strictly requires a network of GNSS receivers (at least one reference station) and a continuous data transmission (enabled by mobile Internet) between the receiver placed on the vehicle and the reference station. The disadvantage of this classical method is that the above conditions are not always satisfied, especially in peripheral areas.

In this context a valid alternative is represented by an innovative approach implemented in the software Kin-VADASE, extension of the VADASE approach described in.

VADASE was originally proposed in 2010 ([2]) in the frame of GPS Seismology to retrieve in real-time waveforms and coseismic displacements for tsunami early warning with a single low cost GNSS receiver. Its effectiveness was recognized by DLR (German Aerospace Agency), and VADASE was awarded the DLR Special Topic Prize at the European Satellite Navigation Competition 2010. Moreover, VADASE potential was proven in the dramatic occasion of the Japanese earthquake occurred on March 11, 2011 ([1]); it was able to provide the first estimates of the displacements suffered at the IGS sites of MIZU and USUD [3], as soon as the data of these stations were available. The results were then confirmed by the international scientific community. The new challenge is further exploit the potential of VADASE to develop a new kinematic module (Kin-VADASE) that allows to track the agricultural vehicle in real time using a unique GNSS receiver, placed on the vehicle itself, providing the vehicle kinematic parameters with high precision and thus allows to optimize the fieldwork reducing cost and environmental impact. Furthermore, Kin-VADASE uses data acquired by low cost receivers, hence it is a real affordable alternative for a great number of farmers.

[1] Branzanti M, Colosimo G, Crespi M, Mazzoni A (2012) GPS near real-time coseismic displacements for the great Tohoku-Oki earthquake, doi:10.1109/LGRS.2012.2207704, IEEE Geoscience and Remote Sensing Letters

[2] Colosimo G, Crespi M, Mazzoni A (2011). Real-time GPS seismology with a stand-alone receiver: A preliminary feasibility demonstration. JOURNAL OF GEOPHYSICAL RESEARCH, ISSN: 0148-0227, doi: 10.1029/2010JB007941

[3] <http://supersites.earthobservations.org/sendai.php>