

EGNOS Application in Robotics for Agriculture

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Credits: INESC TEC

The Laboratory of Robotics and IoT for Smart Precision Agriculture and Forestry uses EGNOS in robots to improve positioning. EGNOS is used in Variable Rate Technologies, such as spraying and fertilisation tasks. The accuracy provided by EGNOS helps reduce the overdosage of fertilisers or phytochemicals-based products and contributes to a more precise distribution of these products. There are also other benefits, such as creating virtual fences and assisted mapping.

[INESC TEC](#) is a Portuguese Associate Laboratory with 35 years of experience in R&D and technology transfer, having as associates the University of Porto, INESC, the Polytechnic Institute of Porto, University of Minho and University of Trás-os-Montes and Alto Douro. This private and non-profit research institution, dedicated to scientific research and technological development, has a Laboratory of Robotics and Internet-of-Things (IoT) for Smart Precision Agriculture and Forestry. This lab was established in 2013 with the mission to develop solutions based on robotics, automation, and IoT. They contribute to improving levels of precision agriculture and forestry (“right time, right amount, right place”), profitability and automation in three main environments: permanent crops (such as steep slope vineyards, olive groves, tree fruits), forest biomass harvesting and protected cultivation (conventional and urban).

Filipe Neves dos Santos is the manager of the Laboratory and sees the potential of EGNOS “when we acquire GNSS receivers.” In fact, “EGNOS compatibility is a prerequisite to achieving basic functions in the agricultural

context.” He heard about EGNOS early in his research career, around 2005, “at that time, I was developing GPS algorithms for aerial vehicles attitude estimation, and EGNOS emerged as a promising solution to replace DGPS base stations/solutions.”

The use of GNSS-based positioning is relevant in almost all their machines. They have smart traps (IoT devices), variable rate technologies and robots that need medium localisation accuracy provided by GNSS receivers. Regarding the use of EGNOS, Filipe explains: “In most of our acquired GNSS receivers, we have easy access to the configuration of EGNOS feature. In fact, most of the time, we activate it in a matter of minutes (when it is not activated by default), and it is clear and very simple to use, requiring nothing else from us.”

In some agricultural robotics applications (e.g., arable farming), EGNOS is combined with other positioning techniques to improve overall accuracy and reliability. According to their tests, Filipe clarifies: “we get horizontal accuracy below 1 metre; sometimes in harsher conditions (dense canopy or surrounding buildings) we get an accuracy below 1.5 metres.”

They currently use EGNOS fused with simultaneous localisation and mapping algorithms (sometimes as ground truth) or ground-penetrating RADAR and advanced spectrum-based sensors to extract relevant maps to feed into agronomic decision support systems. In the future, they plan to use satellite imagery from the Copernicus programme to merge with in-situ data collected by IoT devices and ground robots.