Obstacle avoidance safety system for agricultural tractors and autonomous vehicles based on Bluetooth and passive RFID

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***Abstract.*** Proper interaction of workers on foot and machines is a key aspect for safety analysis of agricultural and forestry operations. Autonomous vehicles might utterly increase accident probability and severity, meaning that such vehicles must rely on inherently safe designs and that better safety devices for workers should be developed.

An attempt to address these challenges for safer working contexts in future is represented by the “SMARTGRID” project, funded by the Italian National Institute for Insurance against Accidents at Work (INAIL), which designed a brand-new wireless safety network based on Bluetooth Low Energy (BLE) devices and passive Radio Frequency IDentification (RFID) tags. The whole point of its design is to rely on a multilayer infrastructure made of two wireless networks with very different performance levels, where the strengths of a system can fill the gaps of the other and vice versa.

SMARTGRID involves antennas placed on every vehicle in order to scan for the presence of nearby RFIDs attached on workers’ personal protective equipment. To complete the system, BLE beaconing systems are also placed on vehicles: such systems will both deliver alerts to nearby workers as they enter a higher-risk area and notify all the occurrences to a backend server to store statistical data for safety purposes.

System’s range of detection spans within 8 and 12 meters, but it may vary depending on tractor’s height and field conditions. Further test programs are underway in an experimental farm and will provide additional results by the end of 2022.