Completely Autonomous UAV Capable of Detecting Anti-Personnel Land Mines With Minimal Radar Interception

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At the moment, there are over 60,000 km² of mined areas around the world and approximately 110 million landmines remaining, while their manual removal is not feasible at the current rate of clearance. The demining process is complex and very dangerous with a high risk for casualties. The general techniques currently used include a series of sensors that need to be in the proximity of the explosives (<1m), resulting in an increased risk of losing the equipment and human lives. Additionally, current methods are slow, inefficient and produce many errors. Our project focuses on a completely autonomous UAV (Unmanned Air Vehicle) system, capable of navigating, scanning and identifying the mines without the need of an operator. The drone is equipped with a variety of sensors which allows it to gain a hyperspectral insight of the soil. To identify the mines we collect input data from the sensors and provide it to an AI model that is tasked with detecting presences of mines. After the detection phase, we mark the mines' locations on a map with fixed coordinates. To avoid the need of communicating with a ground base we have developed a visual localization method that keeps the UAV on the designated flight path using live images from the frontal camera system and information from the in-built odometry. The UAV is also designed to reduce the radar cross section in order to make its presence almost undetectable and avoid being intercepted. In addition, the UAV will operate under the minimal height where the radars can see, while keeping a balance between the resolution of the sensors and the area covered. This solution will help us identify the unmapped mines at a reduced cost, while also maintaining safety and avoiding conflict.

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