RECOGNITION OF EXPLOSIVE DEVICES BASED ON THE DETECTORS SIGNAL USING MACHINE LEARNING METHODS

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This work emerges in response to the need for advanced demining techniques, amplified by the ongoing war in Ukraine, emphasizing the development of automated solutions to identify explosive threats effectively.

The primary objective centers around the construction of an information system that leverages convolutional neural networks (CNNs) and autoencoders to analyze signals from metal detectors and ground-penetrating radar (GPR). This system is designed to distinguish explosive devices from other subterranean metallic objects with high accuracy. The research thoroughly examines the operational principles of these detection devices, discussing their individual advantages and limitations in the context of demining [1, 2].

Utilizing a dataset composed of GPR scanned images, the developed model achieves a classification accuracy of 97.83%. This high level of precision underscores the model's capability in handling real-world applications, where the accurate detection of explosive devices can significantly mitigate risks to human life.

The study also delves into the comparative effectiveness of various detection technologies. It highlights the superior performance of combined systems that integrate metal detector and GPR technologies, reflecting the latest advancements in detection capabilities. These hybrid systems are shown to enhance the identification process, adapting to diverse environmental conditions and varied explosive device types, including those not previously encountered in training datasets.

The proposed machine learning approach not only refines the accuracy of existing detection systems but also offers scalable applications that can be integrated into robotic demining operations.

References:

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2. Minelab's official site with information about their MDS-10 metal detector. [Electronic resource] – Access mode: https://www.minelab.com/countermine/detectors/mds-10-dual-sensor-landminedetector-by-minelab.