

Extended Summary

Project Title: Intelligent Detection & Identification Scheme of Concealed Objects/Drug Substance

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The concealed object detection under people clothing, in bags, and in containers is a very interesting and challenging task, with applications with public security. For this reason, it is intended to propose a project for the current Horizon Europe Call [Border Management 2024 \(HORIZON-CL3-2024-BM-01\)](#) Improved detection of concealed objects/Substances. The proposed system is capable of detecting and identifying any hidden objects. The hidden objects can be weapons, explosives, drugs, and currency. The proposed method will detect and localize the position, estimate the shape/size, and identify the composite materials of the object. Once the concealed object is detected and identified, a risk level will be assigned to it.

The system will display the information for the operator, the information will including the target image, concealed object image, object type, and object composite material. The operator will also receive a relative risk level, and depending on the type of object and assigned risk level, the system may pass the information directly to relevant Law Enforcement Agencies (LEA). The proposed method will also have the capability of searching the LEA database system to identify the target identity using the target image.

The proposed system will include a Decision Support System (DSS) component, which is a hybrid artificial algorithm for information fusion (collected data from different sources to estimate risk), Machine Learning (for threat classification). The DSS will analyze risk and communicate the risk to users and relevant LEAs. The DSS will also include a model based on criminological theories of rational choices and environmental criminology; it will facilitate identification:

1. Target Emotion related issues
2. Expected targets based on space temporal characteristics of the places where a terrorist attack may cause the maximum damage.

Based on the proposed method location and operating environment, the system will utilize all available infrastructure, including a camera to track the target. In some cases, based on the predicted risk level, the proposed method may launch and control a drone that is assigned to track the target.

The proposed method constitutes several components: hardware that includes the two detection methods (Millimeter Wave Imager and Spatial Offset Raman Spectroscopy), which will be designed and developed for this project. While other components are software-based, including Artificial Intelligent components for image processing (Image filtering, Segmentation, detection, identification, and tracking). And the DSS component. A special communication management software component will also be developed for this project. This component will include the relevant communication protocol needed to transmit and receive information between all parties involved in executing an operation within the proposed method. Hence a light encryption layer will be developed and added to the communication component, this layer will protect the information exchange while using open communication lines.

The proposed method is split into a number of Work Packages (WP), each work package will be assigned to one or more of the project members. The assigned members will work together to prepare and develop a functional WP.

A possible project partners (Consortium) are from Four EU countries and four EU supporting countries, including

- Poland
- Germany
- Austria
- Turkey
- czech republic
- Finland

The proposed project consortium contains a diverse group of organizations and researchers from different SME's, Universities, research organizations, and Customs/Border Security agencies.

The number of custom/Border Security agencies required for this project is three. However, within this consortium, the number is so far is 2 from Turkey, and we require 1 more. The custom/Border Security agencies will provide the consortium with knowledge and insight plus system requirements needed to design and develop a functional system capable of executing the task required by the EU call.

The expected WP of the proposed method are:

WP No	WP Title
1	Updating the Context of Existing Technology/Tools
2	Decision Support System
3	Detection, Identification, and Tracking
4	System Communication
5	Distributed Database
6	Instrumentation and Hardware
7	Legal and Ethical Supervision
8	System Integration validation and Testing
9	Communication and Dissemination
10	Project Management

The Block diagram of the proposed method is as given in Figure 1 below.

Figure 1: Proposed Method Block Diagram

