Autonomous Demining UAV System

DESCRIPTION

Minect is a complex to detect, recognize landmines from visual streams of drones and robots, thermal imagers, ground penetrating radars, aimed to build an interactive map of landmines positions on the particular territory. The system combines innovative development from the Artificial Intelligence area and provides the best solution that able to detect and recognize landmines from the visual streams and able to work on different devices, even smartphones.

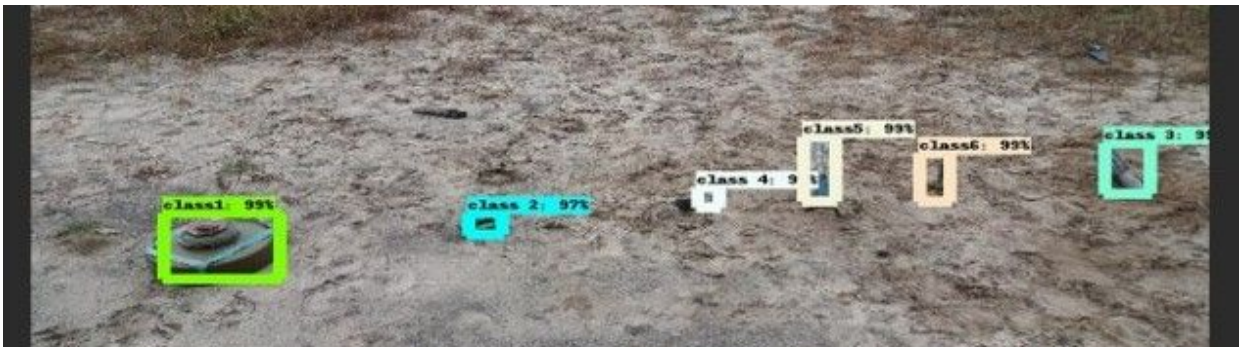
IMPLEMENTATION

The complex is fully automatic, controlled by one operator. The system is given a perimeter, after that the drones are launched and then the complex performs the task independently.

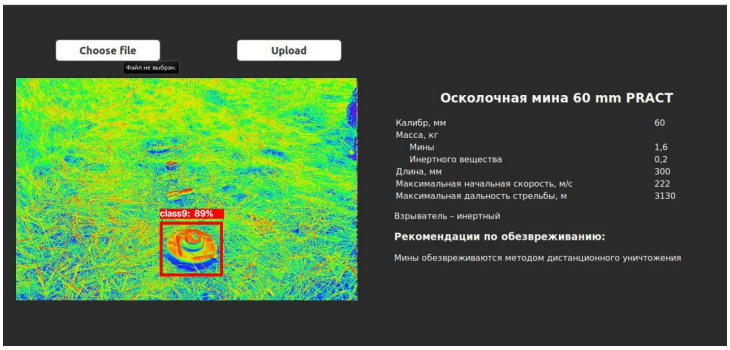
SOFTWARE

Neural network for the detection of land and underground objects.

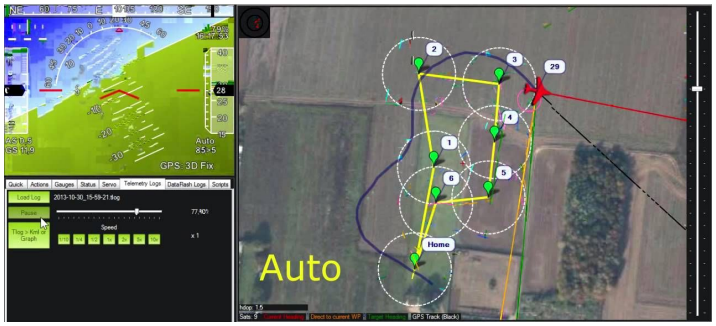
The system is based on object detection neural networks and works on the datasets library, which consists of different landmines classes and types. Each class has its profile with specs.



Software for decoding visual streams (conversion of streams from cameras, thermal imagers, radars, metal detectors, polarization radars).



Software autopilot-based for compiling routes of search drones and drones-scanners



WORK

- After the system has been started by the operator and a working perimeter was set up, the drones are taking off by the turn, flying along the vectors laid on the selected perimeter.
- This process is being implemented by the camera, thermal imager, SAR radar (Ka-Band, 27-47GHz frec.)
- Each drone puts data on into the system, creating an interactive map with geolocation of detected objects and an identifier.
- Each next drone filters the received information, analyzing the data already recognized by the previous drone.
- As a result, the last (detonating) drone receives a carefully constructed and analyzed an interactive map of the occurrence of objects, which it detonates.
- Detonation occurs in several ways, depending on the identified object (metal rods, magnetic detonation, etc.).

WORK SPECS

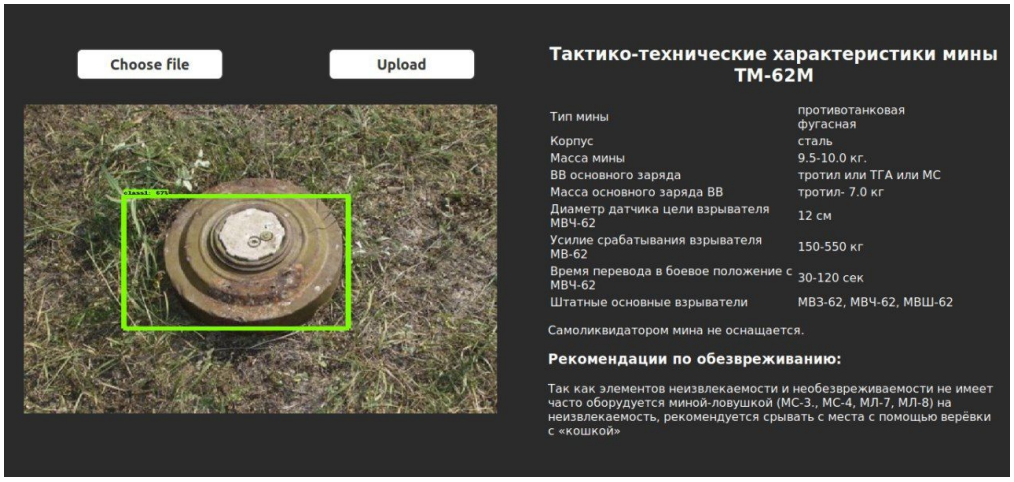
- Activity time: 55 minutes
- Working height: 5-10 meters
- Speed: <45 km/h
- Max distance from ground station: 20 kilometers (can be enhanced by using commuting points or transmitting UAV's).

MINECT DEEP NEURAL NETWORK

Before launching the system for each new assignment, the Minect team starts collecting the data for training all system sensors.

Neural Network training

Minect deep neural network algorithm has been trained on various datasets



There are some differences among the parameters and types of mines and explosive items on sensor layers, including heatmap, frequency, electromagnetic interference, the form of the object, chemical. Such a combination of sensor inputs to DNN brings the possibility for more accurate detection of the objects and reduces standard deviation for detection processing.

Minect
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