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DRONE USE CASES

Drones in Water Sampling for Detecting Water-Borne-Diseases

In emergency incidents such as severe flooding phenomena, earthquakes or malicious attacks which may cause failures in the water supply system and wastewater network, pathogens can easily spread via water, leading to serious health issues or even deaths. First responders, due to the nature of their work, are more likely to become contaminated when operating in areas where water is present. The same potential risks may apply to the general public of the affected area, region or city.

The PathoCERT project, a H2020 EU-funded research project, aimed to strengthen the coordination capability of first responders operating in places where the risk of contamination via water is high. Within this scope, the project produced pathogen contamination emergency response technologies, tools and guidelines to be validated by first responders, helping them to collect data rapidly, detect and address waterborne pathogens quickly, and to better control emergency situations which is crucial for safety and response mechanisms.

PathoCERT

What is it, where and how is it used?

One of the case studies tested and validated in the project was the remote mapping and sampling of water with the use of a drone for the detection of possible pathogen aquatic contamination after heavy rainfall and flooding at the Axios river basin, Thessaloniki. The search and rescue (SAR) teams of the Hellenic Rescue Team (HRT) were the main actors involved in the use case. The drone carried out two tasks: mapping the flooded area and water sampling collections in remote areas. The solution was first deployed in 2022 in the context of the EU PathoCERT research project and was used in all of the project's pilot demonstrations (Thessaloniki - Greece, Limassol - Cyprus, Granada - Spain, Sofia - Bulgaria, Amsterdam - The Netherlands).

Technical and organisational aspects

The key technological components developed by the technical partners within the project consisted of a DJI M300 drone (octocopter), a DJI H20T camera, a water sampling mechanism (PathoDRONE sampling) and an autonomous flying software designed to simultaneously operate a swarm of drones in the same area - a safety measure to avoid collisions. A demonstration of the drone flight and the use of the PathoDRONE water sampling mechanism is provided in this video.

Communication with the command-and-control center should be maintained all the time and in case of connection failure with the remote control the drone returns by itself to its home location.

Funded by the European Union

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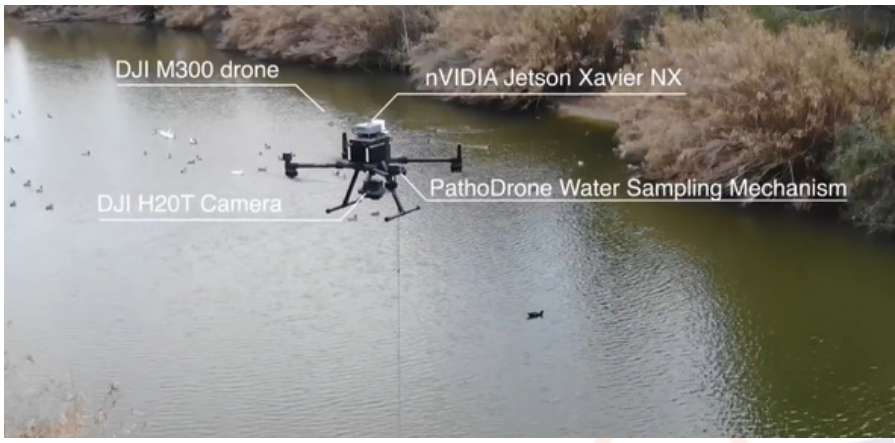

The data collected includes drone location, location images and software auto image creation in each separate location. All the data is compiled in one picture to offer instant “helicopter view” and stored in a software platform.

Benefits and effectiveness

As a result of several meetings with EU water sampling specialists, the following requirements and recommendations were collected to ensure the effective design of the drone-based water sampling mechanism. Requirements: sampling from a specific water depth, minimum water amount collection, no alteration/contamination of the water sample(s), acquisition of multiple samples, lightweightness, low power consumption, and ease of use. Recommendations: easy attachment and detachment of the water sampling mechanism to the UAV.
The two main outcomes which contributed to the success and effectiveness of the solution were the successful image production and the water sampling mechanism.
In terms of tangible benefits, the solution provided an easy, fast and secure method for sampling of water in remote areas and one picture offering instant “helicopter view” of the situation.
The entire solution was built following EU legislation and regulations about aviation, GDPR etc.

Key challenges

With traditional methods, water sampling was conducted by hand and in some locations was not even possible. The main limitations of the drones’ usage in water sampling in the past were: the lack of the water sampling mechanism, the payload weight and the flight time. With the advancement of UAV technology, several attempts were made to take water samples using a drone.
According to a public report produced by the PathoCERT project, the key observed challenges included: the small volume of the water sample, the low success rate (69-83%) and inconsistencies in water chemical parameters of drone-assisted and traditional water sampling methods.

Future potential

Based on the results of the research, most attempts at UAV water sampling use custom-designed UAV for their trials. Consideration should be given to the use of larger off-the-shelf UAVs which could be extended to undertake water sampling missions. Examples include the MATRICE 300 RTK (930 g payload weight) and the DJI Agras T30 (30 kg payload weight).

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