



DIDRO – An innovative multi-sensor UAV system for routine and crisis monitoring of dikes

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Dike management has become a major concern in France over the last 20 years, after several major flood disasters caused by river and sea dikes failures. These events, the poor state of more than 60% of the dikes in the country, and the ever-growing threat of floods occurrence increase due to global climate change, have only made obvious the need for dikes reinforcement and for their tighter surveillance. Today, the most commonly used method for both routine and crisis monitoring of dikes is based on visual inspections by field operators. It allows precise detection of most of the surface indicators (i.e animal burrows, structural deformations, topographic anomalies, water seepage, etc.) resulting from disorders affecting these structures. However, this method is time consuming when long sections of dikes are inspected and is not entirely safe for the field operators during a flood.

The DIDRO (Dike monitoring by DRones) project aims at developing a solution for high efficiency routine and crisis monitoring of dikes using a UAV system carrying multiple remote sensing sensors and aquatic measurements equipment. Remote sensing sensors include LiDAR, thermal infrared, near-infrared and visible image sensors, and provide very high resolution data of the surface of the dike. Such very high resolution sensors, which have never been combined so far on a UAV for this type of survey, allow precise detection of a large number of surface indicators of internal and external dike disorders. They can be implemented for both routine and crisis monitoring. Aquatic measurements consist in flow velocity estimations using floating targets dropped in the river or in the sea by the UAV and in a system for water turbidity estimation towed by the UAV. This system is particularly useful for the detection of signs of dike materials erosion during a flood. Also, geophysical methods having proved efficient at providing information on the internal state of dikes, it has been considered very useful to integrate geophysical equipment to the UAV system. Geophysical measurements are conducted using electrical resistivity tomography, self potential and background seismic noise equipment. The UAV is then used to tow or to drop the equipment along the dike and to remotely collect data generated by devices manually positioned. This can be particularly useful during flooding, when accessing the dike may be dangerous. The switch from one payload configuration to another is made easy by a specific mounting system, adaptable to different types of UAV. This makes the DIDRO solution more easily deployable during flooding events. This presentation will focus on the description of the different payload configurations of DIDRO and on the specifications of the equipment used, and will present some results obtained during tests carried out on several dikes in France.