The EU: Using Airborne Technology to Detect Water Leakage in Underground Pipes

As global warming heavily impacts water sources globally, it is important to address any wastage owing to faulty water infrastructure and facilities. In some countries in Europe, a large quantity of water is lost owing to leakages in underground pipes. It is difficult to monitor the water transmission mains in rural localities, as traditional field surveys are costly both in terms of time and money. In order to increase efficiency in infrastructure monitoring, and in turn eliminate water wastage, European researchers are looking towards innovative approaches that can help water companies locate leakages in their systems.

One such approach has recently been developed under the European Union (EU) project, WADI, coordinated by youris.com. This innovation uses drones to detect water leakages in infrastructure. The drones are equipped with multispectral and infrared cameras and can cover wide areas, as well as sites that are too difficult to access. Data from these drones is analysed using an approach called the Triangle method.

The Traingle method of data analysis combines surface temperatures and a vegetation index to determine water leaks. Leakages lead to lower surface temperatures, which is detected by a thermal infrared camera. However, the thermal response of vegetated soils differs to bare land, making it difficult to obtain clear results on moisture content and potential water loss. To deal with this issue, researchers have included a parameter in the data analysis that measures the vegetation cover fraction, which is inferred by hyperspectral cameras to get a temperature-dependent humidity scale that varies according to vegetation.

This innovation was initially tested in France and Portugal where the equipment was validated and the measurement strategy fine-tuned. The images collected during the drone flights were processed and analysed, and potential leakages identified. Detected sites were then categorized as true positive/true negative /false positive /false negative, and associated with the technology used, environmental conditions, vegetation type, soil type, humidity, soil temperature, irrigation presence and precipitation in the ten days prior to the flights. Overall, the system proved able to detect water in the soil (on vegetated and bare land) in approximately 70% of the cases, while the performance of the technology in discovering actual water leaks (not owing to the land being vegetated) was approximately 50%. Most importantly, it was observed that the accuracy of the system in targeting true events improved significantly over time.

This technology works best in agricultural regions with bare soils, with crops at the initial stages of growth, and in areas with a mix of both. The solution also works well in clay and sandy clay soils. However, its performance is limited in areas with silty clay soils. Moreover, the complexity or diameter of the pipes being investigated, and the type of technology used in the water system does not have an impact on the performance.

The WADI system is one of a kind as it can monitor complex networks and long pipes (50 to 90 km/h depending on the use of drones or planes), and as it's airborne it can reach inaccessible or

secluded locations in spite of difficulties in terrain. Moreover, the cost of conventional ground detection techniques ranges from EUR 1,000 to EUR 5,000 per kilometre, while this airborne technology ranges from EUR 50 to EUR 200 per kilometre. While this innovation ensures greater availability of water resources by giving water companies an efficient mechanism for detecting leakages it can also significantly reduce energy consumption. Further, it is estimated that applying the WADI technique to 5% of European water distribution systems could potentially reduce 166.5 million kg of CO2/year by cutting the energy consumption of water supply.

The service is now at the prototype stage. A group of partners within the EU have prepared a roadmap for the release and development of a full service in the future. It is expected that the commercialisation of this technology would begin after the project ends in 2022.

References

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