ESR24-053 - AI-supported Holographic Environmental Water Monitoring

Zusammenfassung

The drinking water provision of Vienna represents one of the most critical infrastructures of the city. The water for this service is sourced from the environment and lead through two mountain spring pipelines from the areas around Schneeberg, Rax, Schneealpe and Hochschwab to Vienna with minor treatments. Current methods for quality control of the water consist mainly in several online measurements of e.g. the turbidity and absorption spectra. These are used to decide which water from 70 possible sources is mixed together when. Relatively little information on the origin of the turbidity is currently available.

In HoloWaterAI, we will use holographic microscopy to characterize the objects that contribute to the measured turbidity and couple the data using state of the art machine learning methods to provide new insights in environmental water monitoring. Holographic microscopes will take samples fully autonomously and image each and every light scattering object in the sample volume to see what causes the turbidity: sediments, plastic objects, plant fragments, small animals, algae and bacteria. These can be characterized on their appearance, color, shape, light scattering and speed (flow, sedimentation and swimming). This detailed information will allow to correlate observed drifts in water parameters, kindly provided by Wiener Wasser and the partners of the interuniversity cooperation center water & health and with changes in the environment upstream of the source.

Novel IoT tools coupled with machine learnig based methods and digital twin technology will facilitate real time analysis and thus better decisions with short reaction times. In addition, based on the long term data aggregation, it will be possible to reveal changes in the water quality that cannot be detected otherwise. The developed methods will be broadly applicable.

Wissenschaftliche Disziplinen:
Environmental physics (30%) | Artificial intelligence (50%) | Optics (20%)

Keywords:
Holographic microscopyImage analysis Light scatteringMonitoring supply waterDrinking water supplyEnvironmental water monitoring AI-supportTime-series analysisDigital twin

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Principal Investigator:	Peter Van Oostrum
Institution:	BOKU - University of Natural Resources and Life Sciences
Co-Principal Investigator(s):	Ivona Brandic (TU Wien)

Status: Vertrag in Vorbereitung

Weiterführende Links zu den beteiligten Personen und zum Projekt finden Sie unter
https://www.wwtf.at/funding/programmes/esr/ESR24-053/