INTEGRATING SENSORS WITH DRONES FOR WATER QUALITY SURVEYS

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We are developing a sensing device for in-situ pathogen detection and a drone to collect water samples, with an ultimate goal to integrate them together. The sensing device is designed to detect E. coli outbreaks that threatens many coastal regions around the world. This device allows us to detect E. coli much faster than traditional culture approaches, lowering the analysis time from ~2 days to ~2 hours. The device is capable of bacteria lysis and DNA enrichment, enabled by ball-based valves for the storage and sequential delivery of reagents. The collected DNA is amplified by loop-mediated isothermal amplification (LAMP), followed by colorimetric detection. The platform has potential to detect a dozen of E. coli strains and we have confirmed the detection of three types of E. coli so far.

We have designed and built a drone-based sampling device to sample normally inaccessible areas. A commercial-off-the-shelf drone (DJI M-600) provides an ideal platform to carry the water collection payload, due to its endurance and weight capacity. This allows the collection of water samples in difficult to access areas with little risk to the drone or ground personnel. The payload sampling mechanism, which takes the form of a small boat hull, is attached to the drone by a tether line and lowered into the water by a winch. A water sensing device embedded within the hull triggers a pump to draw water into a sterile bag within the vessel. Once samples are collected the drone returns to the launch site, then proceeds to land on a small foldable raft. This will allow for safely landing the drone away from any personal operating the drone/boat.

PRESENTER BIO: Dr. Ifju is a Professor and Associate Chair in the Mechanical and Aerospace Engineering Department at the University of Florida. He has over 20 years of experience developing unmanned aircraft systems for a variety of applications including natural resources, infrastructure inspection, survey/mapping and application for the DOD.