TOWARDS THREE-DIMENSIONAL EXPERIMENTAL INVESTIGATION ON FISH SPERM MOTILITY IN OILY WATER BY DIGITAL HOLOGRAPHIC MICROSCOPY FOR ENVIRONMENTAL PROTECTION

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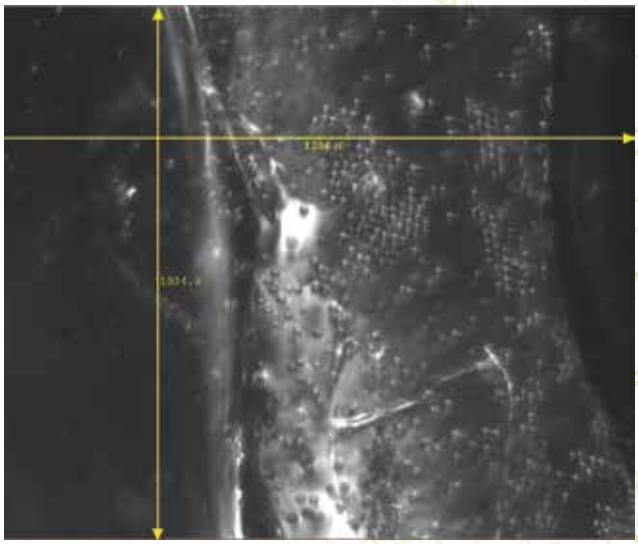
Fish is the primary source of protein and essential nutrients for growing global population. Fish and fisheries products provide sustainable income with multi-dimensional livelihoods for numerous communities across the world. The contribution of fisheries and aquaculture to food security and nutrition is largely affected by environmental quality. Addressing the growing demands for fish, conservation of natural resources and environmental protection are undeniably important. A large variety of studies have been conducted examining physiology of fish sperm, understanding the combined effects of heavy metals, inorganic and organic pollutants on sperm motility, to name but a few. However, there is a limited study concerning the dynamic behaviour of fish sperms in polluted environments and its consequences on historical sperm motility. In this research, a custom-made digital holographic microscope has been successfully designed, calibrated and tested. Digital holographic microscopy (DHM) is a promising three-dimensional fluid flow measurement technique as it can easily provide detailed three-dimensional microscale observation and visualization of flow field in real time. Initial preliminary experiments using 10 µm polystyrene microspheres as fish sperm substitutes flowing in oily water were performed and demonstrated promising results.

Digital holographic microscope for three-dimensional (3D) imaging recently developed



Digital image of 10 µm polystyrene microspheres (sperm substitutes) flowing in oily water inside a fabricated microchannel. Image size is 0.85x0.68 mm^2.