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Vortices revealed: Swimming faster JOSJE VAN HOUWELINGEN, WILLEM VAN DE WATER, RUDIE KUNNEN, GERTJAN VAN HEIJST, HERMAN CLERCX, Fluid Dynamics Laboratory, Dept. Physics, Eindhoven University of Technology, P.O. Box 513, 5600 MB, Eindhoven — Understanding and optimizing the propulsion in human swimming requires insight into the hydrodynamics of the flow around the swimmer. Experiments and simulations addressing the hydrodynamics of swimming have been conducted in studies before, including the visualization of the flow using particle image velocimetry (PIV). The main objective in this study is to develop a system to visualize the flow around a swimmer in practice inspired by this technique. The setup is placed in a regular swimming pool. The use of tracer particles and lasers to illuminate the particles is not allowed. Therefore, we choose to work with air bubbles with a diameter of ˜4 mm, illuminated by ambient light. Homogeneous bubble curtains are produced by tubes implemented in the bottom of the pool. The bubble motion is captured by six cameras placed in underwater casings. A first test with the setup has been conducted by pulling a cylinder through the bubbles and performing a PIV analysis. The vorticity plots of the resulting data show the expected vortex street behind the cylinder. The shedding frequency of the vortices resembles the expected frequency. Thus, it is possible to identify and follow the coherent structures. We will discuss these results and the first flow measurements around swimmers.

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