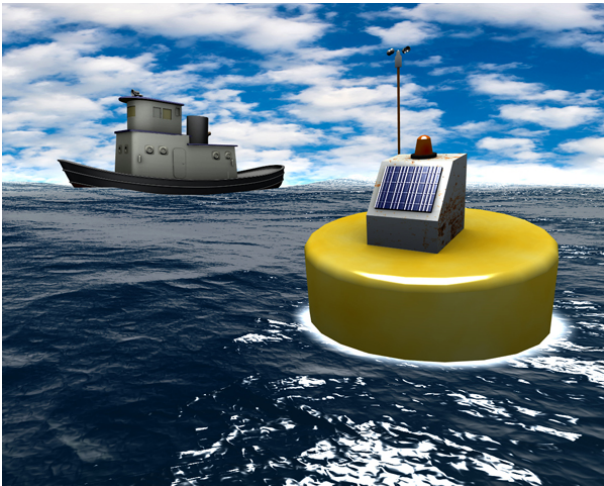


Realistic Buoyancy Model for Real-Time Applications

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Following Archimedes Principle, any object immersed in a fluid is subject to an upward buoyancy force equal to the weight of the fluid displaced by the object. This simple description is the origin of a set of effects that are ubiquitous in nature, and are becoming commonplace in games, simulators and interactive animations. Although there are solutions to the fluid–solid coupling problem in some particular cases, to the best of our knowledge, comprehensive and accurate computational buoyancy models adequate in general contexts are still lacking. We propose a real-time Graphics Processing Unit (GPU) based algorithm for

realistic computation of the fluid–solid coupling problem, which is adequate for a wide generality of cases (solid or hollow objects, with permeable or leak-proof surfaces, and with variable masses). The method incorporates the behaviour of the fluid into which the object is immersed, and decouples the computation of the physical parameters involved in the buoyancy force of the empty object from the mass of contained liquid. The dynamics of this mass of liquid are also computed, in a way such that the relation between the centre of mass of the object and the buoyancy force may vary, leading to complex, realistic behaviours such as the ones arising for instance with a sinking boat.