Functional Differential Equations and Applications to Physics

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Abstract

The 2-body problem of classical electrodynamics (as distinct from the classical 2-body problem of Newtonian gravitation) involves functional differential equations which were confounded with or incorrectly approximated by ordinary differential equations by a long line of physicists starting from Einstein.[1] Based on these incorrect approximations, it was prematurely concluded that the classical hydrogen atom is unstable, and cannot exhibit a discrete spectrum. Some surprising solutions of these equations, in a significant physical context, were published recently.[2] Subsequently, such equations were promoted as "Atiyah's new mathematical basis for physics/quantum mechanics", though this author's work has more recently been acknowledged.[3]. In this talk I review the past work and point to the important future applications to quantum computing and bioinformatics of this new way of doing physics.

[1] C. K. Raju, *Time: Towards a Consistent Theory*, Kluwer Academic, 1994. (Fundamental Theories of Physics, vol. 65.) Also, "Electrodynamic Time", *Physics Education*, **9** (1992) 252–65, and "Quantum Mechanical Time", *Physics Education* **10** (1993) 143–61.

[2] C. K. Raju, "The Classical Electrodynamic 2-Body Problem and the Origin of Quantum Mechanics", *Found. Phys.* **34** (2004) 937–62

[3] *Notices of the American Mathematical Society*, 54(4) (April, 2007) p. 472; available online at `http://www.ams.org/notices/200704/commentary-web.pdf`