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Quantum Relativistic Informatics: Computer Science, Quantum Intelligent Cognitive Control and Smart Robotics Applications

Quantum relativistic mechanics, quantum thermodynamics and quantum relativistic information theory laws are the background of quantum relativistic informatics. Quantum computing, quantum programming, and quantum algorithm theories are oriented on simulation of quantum relativistic (open) dynamic systems using future quantum computer (Feymann & Manin). Unconventional computational intelligence toolkit for simulation dynamic quantum relativistic system as relativistic navigation of unmanned air vehicle (UAV) and control of quantum relativistic particle with spin $\frac{1}{2}$ (Dirac equation) in gravitation field on classical computer based on IT design of quantum algorithmic gates is developed. We consider any Benchmarks of applications of quantum relativistic informatics. As example from computer science modified Grover's quantum search algorithm is considered that can be effectively realized on classical computer. Application for extraction of knowledge from big data for model presentation of physical processes is considered. Quantum relativistic logic of physical theory of model correctness interpretation is discussed. Intelligent control of quantum and relativistic dynamic system as example from control systems theory is demonstrated based on the model of quantum fuzzy inferences and corresponding computational intelligence toolkit. Effective applications of developed toolkit presented with intelligent cognitive control of mobile smart robots based on "brain-computer" neurointerface and new toolkit as Soft & Quantum Computing Optimizer of controller's knowledge base. Experimental results (see figure below) of quantum fuzzy inference application in intelligent cognitive control of mobile collective robots with video are demonstrated.

The results are developed in mutual R&D project between Laboratory of Information Technologies, JINR (V.V. Korenkov), Veksler and Baldin Laboratory of High Energy Physics, JINR (G.P. Reshetnikov) and Dubna State University (S.V. Ulyanov).

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