

## Perfect state transfer

Perfect State Transfer (PST) označava prenos kvantne informacije sa verovatnoćom 1 u sistemu dvodimenzionalnih kvantnih čestica koje nazivamo kubiti. Mrežu kubita predstavljamo prostim, povezanim grafom a interakciju među njima kvantno-mehaničkim Hamiltonijanom koji diktira evoluciju. Karakterizovali smo Platonove grafove po tome da li, i pod kojim uslovima, dozvoljavaju Perfect State Transfer između svojih čvorova. Obradili smo neobrađenu klasu grafova, hiper-oktaedre, i dokazali postojanje Perfect State Transfera u njima. Materija predstavljena u uvodu prevazilazi znanje fizike i matematike srednjoškolaca. Zbog toga, rad je pisan tako da se sam rezultat može razumeti čak i bez razumevanja uvoda. Međutim, jedan od ciljeva autorâ bio je da objasni i približi kompleksnu teoriju nivou znanja upravo srednjoškolcima. Glavni rezultat je dokazana mogućnost PST-a u hiper-oktaedarskim grafovima stepena  $2n$  kada je  $n$  deljivo sa 2 i između dijametralno suprotnih čvorova, i nemogućnost PST-a pod bilo kojim dugim uslovima.

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Perfect State Transfer (PST) represents the transfer of quantum information with probability unity in the system of particles with two-dimensional quantum state named qubits. The qubit network is represented by a simple, connected graph, while the interaction between the qubits is with a quantum-mechanical Hamiltonian which determines the evolution. We characterized Plato's graphs by if, and under which conditions, they allow Perfect State Transfer between any two vertices. Also, we examined hyper-octahedron graphs and have found the existence of PST in them. The matter presented in the introduction goes beyond average high school knowledge of mathematics and physics. Therefore, the paper is written so that it can be understood without full understanding of the introduction. Nevertheless, one of the objectives of the authors was to explain and lower the complex subject for the sake of high school students. The main result of this work was a proven possibility of Perfect state transfer in a hyper-octahedron graph with the degree of  $2n$  in the case when 2 divides  $n$ , and between two opposite vertices. In addition, we proved that in all other cases there is no Perfect state transfer in a hyper-octahedron graph.

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