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Investigating the giant magnetoresistance in a two-dimensional square network including two materials with a diagonal boundary

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Abstract
Large magnetic resistance has been widely considered due to its many applications in various fields, including the manufacture of magnetic sensors. An important case of this type of resistance is the linear magnetoresistance caused by the inhomogeneity of charge distribution. The magnetoresistance of heterogeneous conductors is simulated by the two-dimensional resistance network model. In the network model, the resistance unit of a homogeneous circular disk with four current terminals and the potential difference between the terminals is considered, and the currents and potential differences are connected to each other by means of the impedance matrix, and the magnetic field is perpendicular to the lattice. In this work, we study and investigate the changes in magnetoresistance for a network including two subsystems with different resistances with a diagonal arrangement. The results show that the changes in the magnetic resistance of the heterogeneous system depend on the resistance ratio of the two materials as well as the location of the boundary between them. In addition, it was observed that for large values of the resistance ratio or high inhomogeneity, there is the possibility of the existence of a peak of resistance variation.
Keywords: giant magnetoresistance, two-dimensional resistive network, inhomogeneity

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