Numerical method for determining potential coefficients matrix for multiconductor transmission line

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Consider the numerical technique for computing the matrix of potential coefficients for multiconductor electrical lines, i.e. for a system consisting of an arbitrary number of electrical conductors. The transmission line equations [1] contain the matrix of the coefficients of electrostatic induction which allows to express the charge vector through the vector of potentials in each conductor. The method for calculating the exact values of its coefficients is proposed in [2]. For this purpose it is necessary to solve n (number of conductors) Dirichlet problems with known boundary conditions. At the same time it is proposed numerical method for calculating the potential coefficients matrix, which allows to express the vector of potentials through the charge vector in each conductor. In order to obtain the elements of this matrix we obtain the problem that differs from the classical Dirichlet problem for the Laplace equation. The difference consists in replacing the Dirichlet condition by some special boundary condition, which contains integrals over the boundary of the domain from the values of the unknown function. Such problems are called problems with nonlocal boundary conditions. The existence and uniqueness of the solution of such a problem are proved in this paper.

Bibliography

[1] Paul Clayton R., *Analysis of multiconductor transmission lines*, 2nd Ed. Wiley-IEEE Press, 2007, 780 p.

[2] Demirchean C.S., Korovkin N.B., Chechiurin V.L. *Teoreticheskie osnovi electrotehniki*, Vol. 3, St. Petersburg, 2004. 364 p. (in Russian).