1023-94-1846 **Ilya Grigoriev*** (ilyag@uchicago.edu). *Resistor Networks with Finitely Many Solutions to the Discrete Inverse Boundary Problem.* Preliminary report.

The discrete inverse boundary problem is the problem of recovering the values of the conductors of a resistor network from voltages and currents measured at the boundary vertices of the network. The inverse boundary problem for most networks has either one solution or infinitely many solutions. Some networks had also been known to have 2^n solutions for some n.

We study the question of whether these are the only possible values. To this end, we develop various methods of constructing resistor networks with specific relationships between the boundary information and the conductances. Using these methods, we construct a resistor network that has exactly three solutions to the inverse boundary problem, providing a counterexample and resolving the question.

The methods developed are also used to resolve another question: if negative values are allowed for the (formal) conductances, then how many solutions are possible? We show how to construct a resistor network for any given number of such solutions. Finally, we indicate how the solution of this problem might lead to additional insights on what other numbers of non-negative solutions might be admitted by networks, and discuss several open questions in the area. (Received September 27, 2006)