

## The time constant and critical probabilities in percolation models

Leandro Pimentel, *Ecole Polytechnique Federale de Lausanne*

### Abstract

We consider a first-passage percolation (FPP) model on a Delaunay triangulation  $D$  of the plane. In this model each edge  $e$  of  $D$  is independently equipped with a nonnegative random variable, with distribution function  $F$ , which is interpreted as the time it takes to traverse the edge. Vahidi-Asl and Wierman (1990) have shown that, under a suitable moment condition on  $F$ , the minimum time taken to reach a point at distance  $n$  from the origin is asymptotically  $m(F)n$ , where  $m(F)$  is a nonnegative finite constant (the time constant). However, its exact value still a fundamental problem in percolation theory. Here we prove that if  $F(0) < 1-p'_c$  then  $m(F) > 0$ , where  $p'_c$  is a critical probability for bond percolation on the dual graph  $D'$ .

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