

# From Untouchable 11 to Hazmat Cargo

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*Untouchable 11 is a packing puzzle designed by Peter Grabarchuk. This paper describes Untouchable 11 and its 'untouchable' concept, and explores applying this concept to other hexomino packing puzzles. Every untouchable packing puzzle can be mapped to an equivalent conventional packing puzzle (in which pieces can touch), enabling the use of existing software tools for analysis. Exploring this puzzle space led to the creation of a new puzzle, Hazmat Cargo.*

## 1 Introduction

UNTOUCHABLE 11 is a packing puzzle consisting of eleven pieces based on the eleven possible unfoldings of a cube, which themselves are a subset of the 35 *hexominoes*.<sup>1</sup> The goal is to place all eleven pieces onto a board such that no pieces touch, even diagonally at corners. The pieces can be rotated and flipped, but must be placed orthogonally onto the grid of the board. The puzzle offers three challenges:

1. *Easy* ( $9 \times 17$  board).
2. *Medium* ( $10 \times 15$  board, Figure 1).
3. *Hard* ( $12 \times 12$  board).

This paper describes how this idea of 'untouchable' packings has spread to other puzzles, and ultimately led to a new design of mine, described in a later section.

### 1.1 History

Untouchable 11, designed by Peter Grabarchuk,<sup>2</sup> first appeared on the gaming website SmartKit.com,<sup>3</sup> which sponsored the development of the associated app. In October 2008, it was launched with a contest<sup>4</sup> which gave a Smartkit t-shirt and the book *Puzzles' Express 3* [1] to the first person to solve all three challenges.

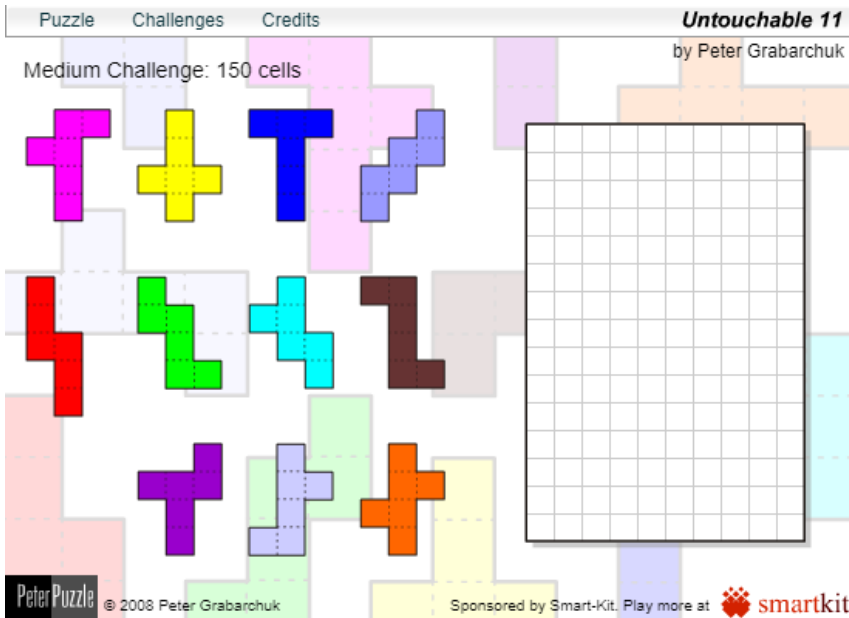


Figure 1. Screenshot of the medium ( $10 \times 15$ ) Untouchable 11 challenge.

<sup>1</sup><http://mathworld.wolfram.com/Polyomino.html>

<sup>2</sup><http://www.grabarchukpuzzles.com>

<sup>3</sup><http://smart-kit.com>

<sup>4</sup><http://smart-kit.com/s1512>