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Designing modern slot machines using probabilities, combinatorics, and optimization

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Abstract. This talk provides an introduction to the fundamentals of casino slot game mathematics [1, 2]. We give a short overview of key elements such as Return-to-Player (RTP), volatility, and probability, and how they influence gameplay and player experience [3]. In addition, we present a Variable Neighborhood Search (VNS) metaheuristic approach for solving the RTP optimization problem [5]. A large number of software companies in the gaming industry [4] seek to solve the RTP optimization problem, in order to develop modern virtual casino gambling machines. These slot machines have a number of reels (e.g., three or more) that spin once a button is pressed. Each slot machine is required to have an RTP in a particular range according to the legislation of each country. By using a VNS framework which guides two local search operators we show how to control the distribution of the symbols in the reels in order to achieve the desired RTP. This talk is based on a recent collaboration with the Zeusplay casino game developer company (`https://zeusplay.com`).

Keywords: casino slot game mathematics; slot machine optimization; return to player; metaheuristics; variable neighborhood search.

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