

# KNAPSACK AND SUBSET SUM FOR GROUPS BEYOND THE INTEGERS

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Recently, Myasnikov, Nikolaev and Ushakov considered classical knapsack related decision problems for arbitrary finitely generated (f.g.) groups instead of the group of integers (the classical case). Among others, they studied the following problems for a f.g. group  $G$  (where elements of  $G$  are represented by finite words over the generators):

- Subset sum problem for  $G$ : Given elements  $g_1, \dots, g_k, g \in G$ , decide whether there exist  $e_1, \dots, e_k \in \{0, 1\}$  such that  $g = g_1^{e_1} \cdots g_k^{e_k}$ .
- Knapsack problem for  $G$ : Given elements  $g_1, \dots, g_k, g \in G$ , decide whether there exist  $e_1, \dots, e_k \in \mathbb{N}$  such that  $g = g_1^{e_1} \cdots g_k^{e_k}$ .

In the talk, I will speak about some recent results for knapsack and subset sum in various classes of groups: nilpotent groups, polycyclic groups, right-angled Artin groups (aka graph groups), co-context free groups, certain wreath products. More precisely, we will discuss the following results and (if time permits) will prove some of them:

- There exists a f.g. 2-step nilpotent group  $G$  with an undecidable knapsack problem.
- For every co-context-free group, knapsack is decidable.
- Knapsack in right-angled Artin groups is in NP, and one can exactly characterize those graph groups where knapsack is NP-complete.
- Knapsack is decidable for a large class of wreath products. In particular, knapsack is decidable for free solvable groups.

This is joint work with Moses Ganardi, Daniel König (both from University of Siegen) and Georg Zetsche (Université Paris 7).