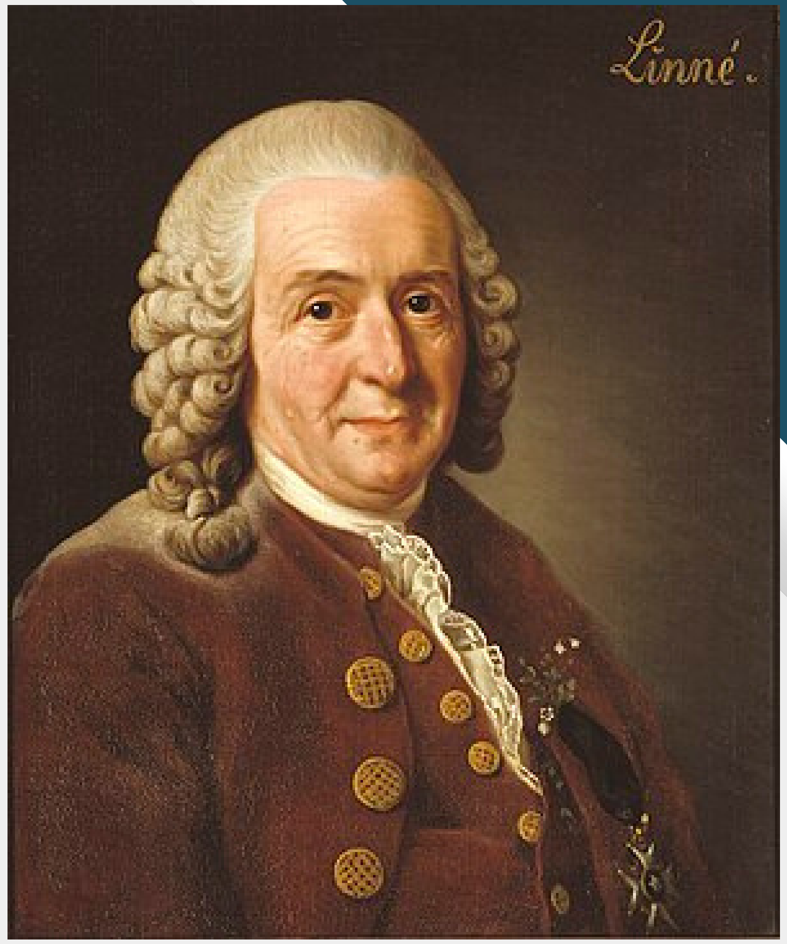
Termes: os cupins saltitantes e colaboradores da América do Sul

O que são os termes?

Carlos Lineu, botânico, zoólogo e médico sueco, em seu livro Systema da Nature (1758), descreveu pela primeira vez um cupim do gênero Termes. Espécie que possui mandíbulas extremamente fortes que, ao serem estaladas, lançam o inseto em um salto que o desloca de lugar.
Além dessa característica, os cupins colaboram para construir suas casas movimentando particulas de solo, saliva e escrementos.



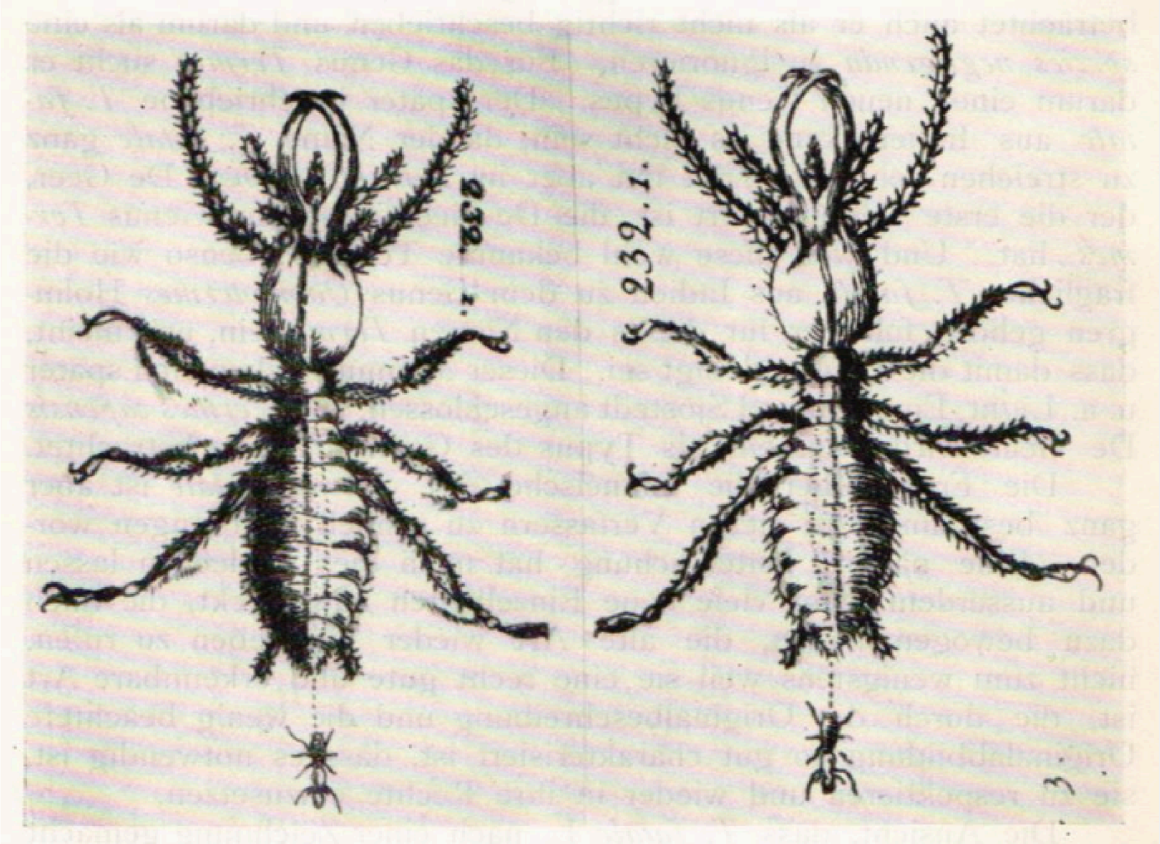


Fig. 1. *Termes fatale* Linné. Links: das Originalbild aus der Tafel der Dissertation Pandora Insectorum 1758. An der Basis der Oberkiefer ist der Stirnhöcker deutlich zu sehen. — Rechts: das ungestochene Bild aus Amoenitates Academicae Bd. V. 1760. Der Stirnhöcker ist verwischt.

Motivação para o domínio

O domínio se baseia no fato da colaboração mútua do cupins para construir suas casas e trata da ideia de agentes trabalhando em conjunto empilhando blocos em lugares específicos.

Sobre o domínio

Artigo científico

Em 2019, pesquisadores da Universidade Carlos III de Madrid publicaram um artigo entitulado como Insights from the 2018 IPC Benchmarks, analisando a similaridade de cada problema em seus respectivos domínios.
O artigo conclui que o domínio Termes possui uma baixa diversidade em arquivos de problemas diferentes. Ou seja, os arquivos de problemas tem caracterísiticas similares, o que leva a uma performance mais uniforme em diferentes planejadores.

Ferramentas de apoio

As ferramentas encontradas foram apenas os diversos arquivos de problema presentes no próprio repositório do BitBucket.

Insights from the 2018 IPC Benchmarks

Isabel Cenamor and **Alberto Pozanco**
Departamento de Informática, Universidad Carlos III de Madrid
Avda. de la Universidad, 30. 28911 Leganés (Madrid). Spain
icenamorg@gmail.com, apozanco@pa.inf.uc3m.es

Abstract

The International Planning Competition (IPC) empirically evaluates state-of-the-art planning systems on a set of benchmark problems. The selection of this benchmarks plays an important role in the competition, since they can significantly affect competition results.
In this paper we analyze the diversity of the benchmarks employed in the last IPC through extracting some features from the domains and problems of the optimal track. Finally, we provide some insights from the collected data and propose to use a similar method to select the benchmarks of future competitions.

Introduction

In Artificial Intelligence, it is common to have competitions associated with each particular research area. These competitions aim to bring together different state-of-the-art systems, evaluating them on a set of benchmarks. Just like in Satisfiability Testing (Järvisalo et al. 2012), or in Answer Set Programming (Gebser, Maratea, and Ricca 2017), the Automated Planning community promotes the development of innovative planning techniques since 1998 through the International Planning Competition (IPC).

In the IPC, participating planning systems are tested in several benchmark problems. The selection of these benchmark domains and problems instances plays an important role in the competition, since they can significantly affect competition results (Howe and Dahlman 2002). This task is non-trivial, and it has given a lot of headaches to the organizers of previous competitions (Linares López, Celorrio, and Olaya 2015; Vallati, Chrpa, and McCluskey 2018). One of the main consensuses among the different post-competition discussions, is that benchmark domains and problems should be as diverse as possible (Vallati and Vaquero 2015), in order to (1) enrich the competition, and (2) not bias the results in favour of any planner.

In this paper, we analyze the diversity of benchmarks employed in the IPC 2018. We do that by extracting some features from the domains and problem instances of the optimal tracks. Features from domains and problems have been successfully used to predict planner's coverage (Roberts et al. 2008; Roberts and Howe 2009) or run time (Fawcett et al. 2014); and also to generate state-of-the-art planning portfolios (Cenamor, de la Rosa, and Fernández 2016). Here we use these features to evaluate and analyze the diversity of the competition benchmarks.

In the rest of the paper we introduce the feature extraction process, including a brief description of the features. Then, we detail how we process the raw data and introduce our different analyses, in which we also include the IPC 2014 for comparison purposes. Firstly, we perform an intra-domain analysis to test how diverse are the problem instances within the same planning domain. Secondly, we perform an inter-domain analysis to test how diverse are the domains and problems among them. Finally, we merge the data from IPC 2014 and IPC 2018 to group the domains and problems based on their similarity. We conclude our analysis by providing some insights from the results, and outlining a procedure similar to the one we carried out to select the benchmarks of future IPCs.

Planning Features

We use the same features extracted by the IBaCoP family of portfolios (de la Rosa, Cenamor, and Fernández 2017). The extraction process collects data from different steps of the Fast Downward system (Helmert 2006), in the version that was available before the IPC 2014. We briefly describe the set of 114 real-valued features we will use throughout our analysis by classifying them into the following categories:

- **PDDL.** These features are extracted from the original domain and problem definition in the PDDL files. If the domain contains conditional effects, we parse them using ADL2STRIPS (Hoffmann et al. 2006). Specifically, we have implemented the compilation that creates artificial actions for effect's evaluation (Nebel 2000). Some of these features are: number of actions, number of objects or number of goals.
- **Fast Downward Instantiation.** The pre-processor of Fast Downward instantiates and translates the planning tasks into a finite domain representation (Helmert 2009). Some of these features are: number of mutex groups, memory used for the translation process or whether action costs are used or not.

Características do domínio

Predicados

Os predicados são definidos para noções de altura, posição, ter ou não bloco, ter um vizinho, ser a posição um depósito e sucesso.

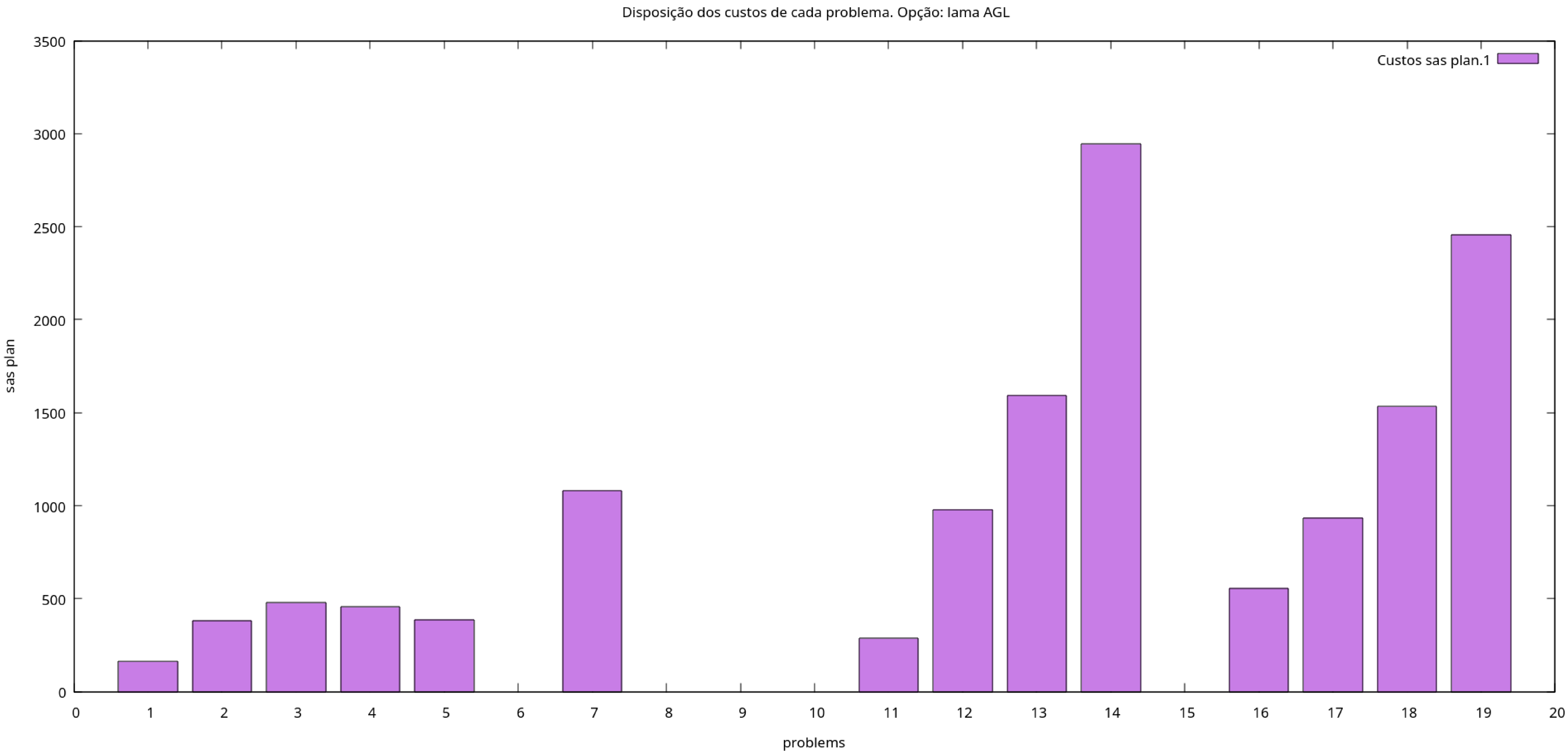
Ações

As ações são definidas para ideias de mover, mover para cima, mover para baixo, colocar bloco, mover bloco, criar bloco e destruir bloco.

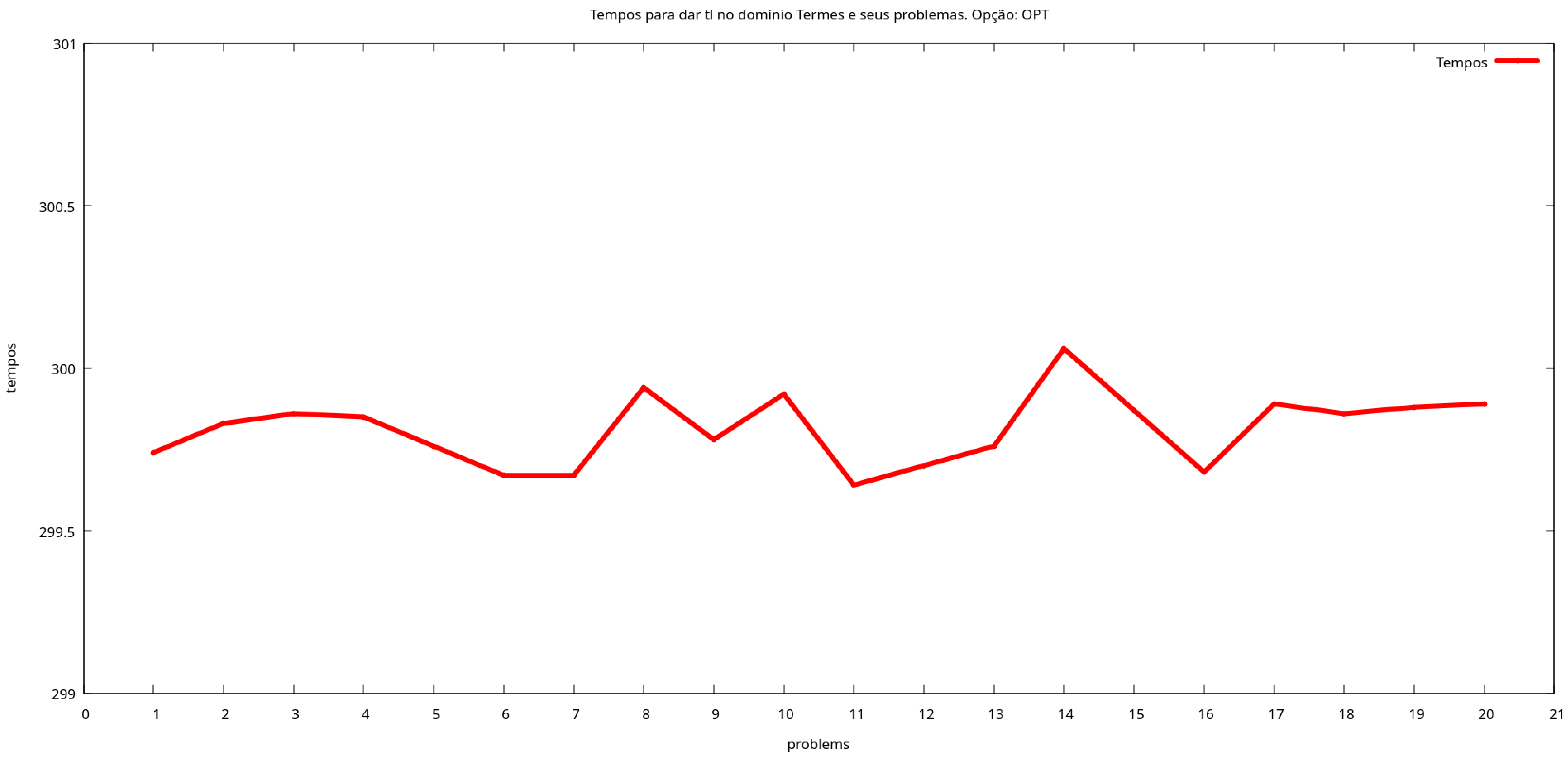
Tabela de Funções

Problems	AGL (lama-first)	SAT (seq-sat-fdss-2018)	OPT (seq-opt-fdss-1)
1	Custo: 162 passos; Tempo: 1.10 seg	Time Limit 5m reached; Melhor custo encontrado: 114 passos;	Time Limit 5m reached;
2	Custo: 382 passos; Tempo: 0.80 seg	Time Limit 5m reached; Melhor custo encontrado: 184 passos;	Time Limit 5m reached;
3	Custo: 478 passos; Tempo: 22.88 seg;	Time Limit 5m reached; Melhor custo encontrado: 490 passos;	Time Limit 5m reached;
4	Custo: 456 passos; Tempo: 1.64 seg;	Time Limit 5m reached; Melhor custo encontrado: 244 passos;	Time Limit 5m reached;
5	Custo: 388 passos; Tempo: 30.04 seg;	Time Limit 5m reached;	Time Limit 5m reached;
6	Time Limit 5m reached;	Time Limit 5m reached;	Time Limit 5m reached;
7	Custo: 1082 passos; Tempo: 185.15 seg	Time Limit 5m reached;	Time Limit 5m reached;
8	Time Limit 5m reached;	Time Limit 5m reached;	Time Limit 5m reached;
9	Time Limit 5m reached;	Time Limit 5m reached;	Time Limit 5m reached;
10	Time Limit 5m reached;	Time Limit 5m reached;	Time Limit 5m reached;
11	Custo: 287 passos; Tempo: 0.39 seg;	Time Limit 5m reached; Melhor custo encontrado: 182 passos;	Time Limit 5m reached;
12	Custo: 980 passos; Tempo: 1.84 seg;	Time Limit 5m reached; Melhor custo encontrado: 420 passos;	Time Limit 5m reached;
13	Custo: 1592 passos; Tempo: 4.21 seg;	Time Limit 5m reached; Melhor custo encontrado: 1374 passos;	Time Limit 5m reached;
14	Custo: 2944 passos; Tempo: 56.35 seg;	Time Limit 5m reached; Melhor custo encontrado: 1918 passos;	Time Limit 5m reached;
15	Time Limit 5m reached;	Time Limit 5m reached;	Time Limit 5m reached;
16	Custo: 556 passos; Tempo: 1.49 seg;	Time Limit 5m reached; Melhor custo encontrado: 430 passos;	Time Limit 5m reached;
17	Custo: 934 passos; Tempo: 3.23 seg;	Time Limit 5m reached; Melhor custo encontrado: 934 passos;	Time Limit 5m reached;
18	Custo: 1534 passos; Tempo: 11.99 seg;	Time Limit 5m reached; Melhor custo encontrado: 1646 passos;	Time Limit 5m reached;
19	Custo: 2458 passos; Tempo: 26.55 seg;	Time Limit 5m reached;	Time Limit 5m reached;
20	Time Limit 5m reached;	Time Limit 5m reached;	Time Limit 5m reached;

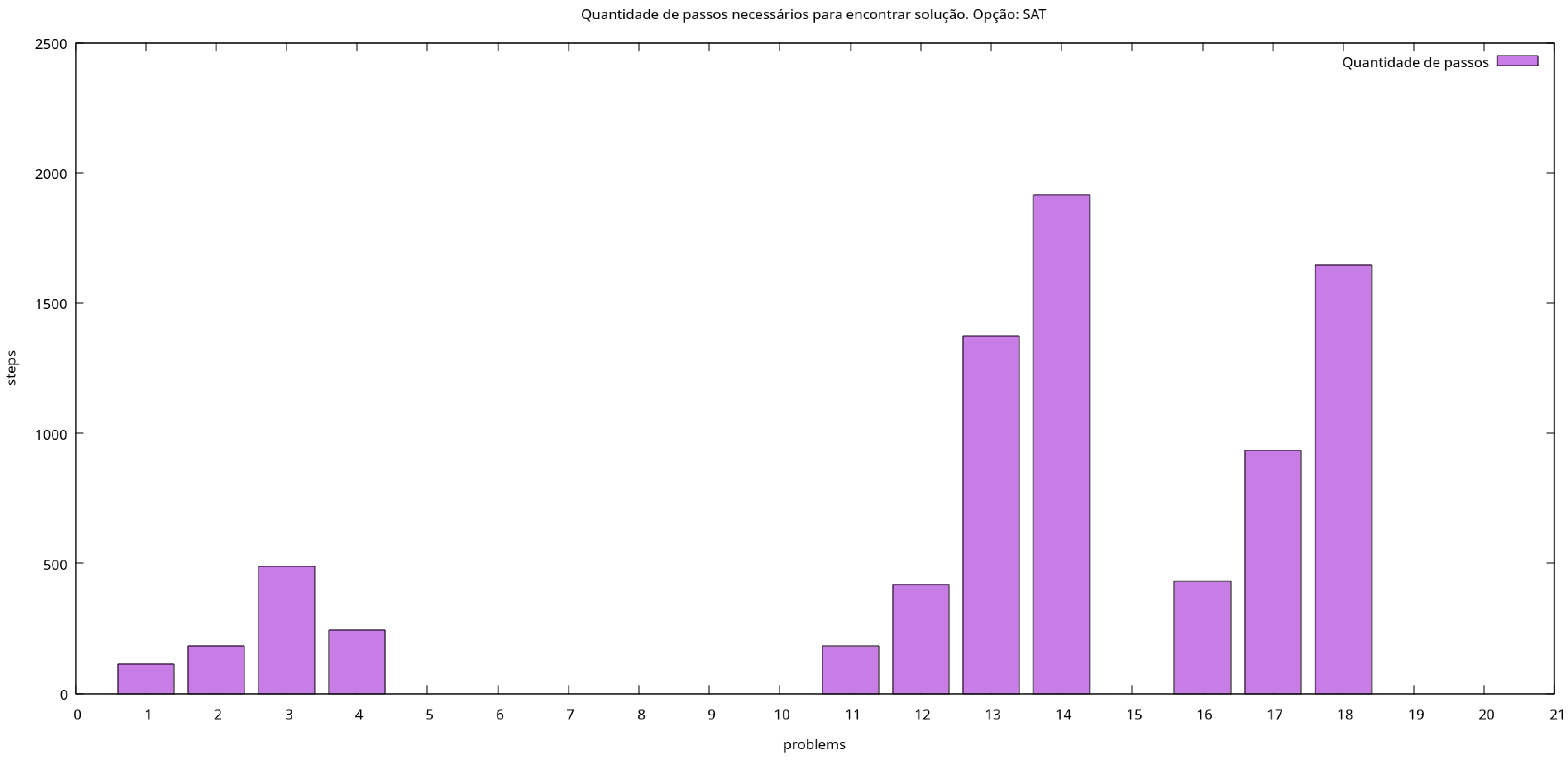
Gráfico


Disposição dos custos de cada problema. Opção: lama AGL
Custos sas plan.1
sas plan
problems
0
500
1000
1500
2000
2500
3000
3500
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Gráfico


Tempos para dar tl no domínio Termes e seus problemas. Opção: OPT
Tempos
tempos
301
300.5
300
299.5
299
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
problems

Gráfico



Quantidade de passos necessários para encontrar solução. Opção: SAT
Quantidade de passos
steps
problems
2500
2000
1500
1000
500
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Muito obrigado!