White-Box Performance Discovery

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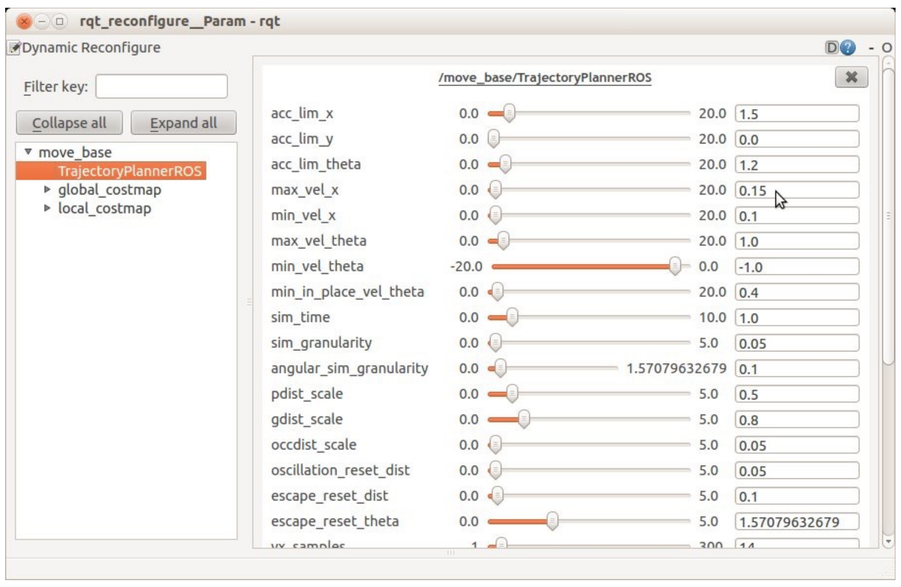
Discovery of Performance Models for Adaptation



Challenge:

Most systems are highly configurable.

Options influence performance.

Different techniques for discovering performance models.

Idea:

Determine what configurations to sample.

Build accurate models that help adaptation.

Black-Box Drawbacks

	A	B	C	T
1	0	0	0	1
2	0	0	1	1
3	0	1	0	1
4	0	1	1	1
5	1	0	0	4
6	1	0	1	4
7	1	1	0	9
8	1	1	1	9

Cannot sample all configurations.

Might miss interactions.

Sampled configurations

Missed interaction!

White-Box Advantages

```
void foo(boolean a, boolean b) {
    boolean x = false;
    ... // 1s
    if(a) {
        ... // 3s
        x = true;
    }
    if(b && x) {
        ... // 5s
    }
}
```

Exploit **Irrelevance**: not all options influence performance

Exploit **Orthogonality**: not all options interact with each other

The ConfigCrusher Approach

Static Taint Analysis: Find code regions influenced by options

```
void foo(boolean a, boolean b) {
    boolean x = false;
    ... // 1s
    if(a) {                      R1
        ... // 3s                {A}
        x = true;
    }
    if(b && x) {                 R2
        ... // 5s                {A,B}
    }
}
```

Configuration Compression: Find minimum set of configurations to sample

	A	B	C
1	0	0	_
2	0	1	_
3	1	0	_
4	1	1	_

Build Model: Calculate influence of options in the regions

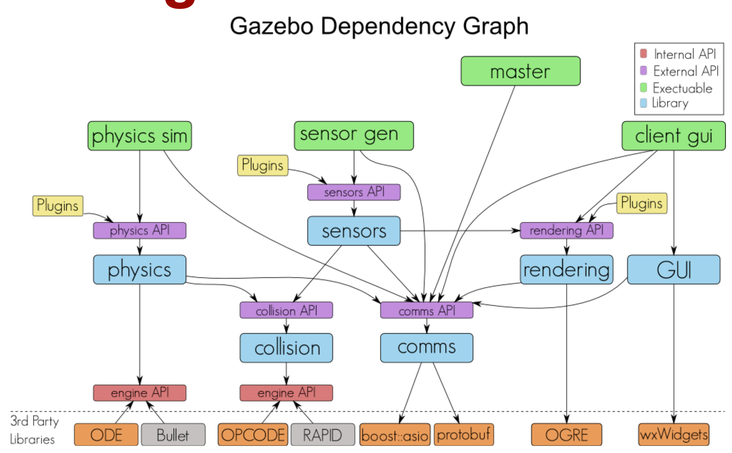
	A	B	B	R1	R2
1	0	0	1	0	0
2	0	1	1	0	0
3	1	0	1	3	0
4	1	1	1	3	5

$T = 1 + 3A + 5AB$

Results

	Configurations	Measured Configurations	Error (RMSE)	Performance range (s)
Running Example	16	4	0.0s	1 - 15
Color Counter	32	4	0.134s	5 - 6
Pngtastic Optimizer	32	10	4.585s	0 - 212
Prevayler	512	128	5.734s	5 - 70

ConfigCrusher in Architecture



Taint analysis on components.

Measure influence on performance.

Work part of the BRASS Project MARS
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