Topic

Event

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Abstract

Write a short abstract. Do not give to much details here, but arouse the readers interest. A nice opportunity to comment the text is given by the following: Especially if you write in german, you sometimes need to specify the hyphanation, as e.g. for the word thisisaverylongwordwhosehyphanationmustbedefined.

1 Introduction

Begin your paper with an introduction into your topic.

1.1 hallo

tschuess.

2 Preliminaries

2.1 Virtual Substitution

In 1993, the concept of Virtual Substitution (VS) was first introduced. Initially it was a procedure to eliminate quantifier/variable elimination for linear real arithmetic formulas. Further, VS became a procedure of quantifier elimination for non-linear arithmetic formulas. But one of the most significant limitation of VS is that it cannot eliminate quantified variables whose degree is higher than 2.

VS is a procedure to eliminate a quantified variable. Let $\varphi^{\mathbb{R}}$ is a quantifier-free real-arithmetic formula where $x \in p(x)$ and $p(x) \sim 0, \sim \in \{=, <, >, \leq, \geq, \neq\}$ is a constraint of $\varphi^{\mathbb{R}}$. Degree of x in $p(x)$ must be ≤ 2. Then, after quantifier elimination by VS we get the following equivalence,

$$\exists x.\varphi^{\mathbb{R}} \iff \bigvee_{t \in T(x,\varphi^{\mathbb{R}})} (\varphi^{\mathbb{R}}[t \backslash\backslash x] \wedge C_t)$$

where T is a finite set of all possible test candidates for x and C_t is a side condition of $t \in T$.

2.2 Test Candidates and Side Condition

To solve non-linear equalities with VS first we have to choose a variable, $x \in p(x)$ to eliminate and then compute all possible test candidates(TCs). $\varphi^{\mathbb{R}}$ is satisfied if there is a test candidate (TC) $t \in T$ such that $\varphi^{\mathbb{R}}[t \backslash\backslash x] = p_1[t \backslash\backslash x] \wedge \cdots p_n[t \backslash\backslash x] \wedge C_t$ is satisfiable.

So, the indices of the substitutions are the side conditions of the TC it considers and the labels on the edges to a substitutions are the constraints which provide TC. A detailed explanation of how to construct TCs with side condition is provided in the section 3.1.

2.3 Square Root Expression

A square root expression(SRE) has the form,

$$\frac{p + q\sqrt{r}}{s} \qquad \text{, where } p, q, r, s \in P$$

and the set of all square root can be expressed by,

$$SqrtEx := \{\frac{p + q\sqrt{r}}{s} | \ p, q, r, s \in P\}$$

Definition 2.1 (Polynomial) *A polynomial is a mathematical expression consisting of a sum of terms, each term including a variable or variables raised to a power and multiplied by a coefficient. If a polynomial has only one variable, it is called univariate. An univariate of degree d has the following form where $a_d \neq 0$,*

$$p(x) = a_d x^d + a_{d-1} x^{d-1} + \ldots + a_0 x^0$$

If a polynomial has two or more variables, it is called multivariate. A multivariate (two variables) of degree d has the following form where $a_{dd} \neq 0$,

$$p(x, y) = a_{dd} x^d y^d + a_{d(d-1)} x^d y^{d-1} + a_{(d-1)d} x^{d-1} y^d + \ldots + a_{10} x^1 y^0 + a_{10} x^0 y^1 + a_{00} x^0 y^0$$

The following expression is a quantifier-free real-arithmetic formula where a, b, c are the polynomials and the set of all polynomials in $\varphi^{\mathbb{R}}$ is $P = \{a, b, c\}$,

$$\varphi^{\mathbb{R}} = (a \leq 0 \vee b = 0) \wedge (b < 0 \vee c \neq 0)$$

Let, $p(x) = ax^2 + bx + c = 0$ is a quadratic equation of variable x where $a, b, c \in P$ and $x \notin a \cup b \cup c$. Now, the solution formula for x in $p(x) = a_d x^d + a_{d-1} x^{d-1} + \ldots + a_0 x^0$ considers the following four cases,

$$x_0 = -\frac{c}{b} \qquad \text{, if } a = 0 \wedge b \neq 0 \tag{2.1}$$

$$x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \qquad \text{, if } a \neq 0 \wedge b^2 - 4ac \geq 0 \tag{2.2}$$

$$x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a} \qquad \text{, if } a \neq 0 \wedge b^2 - 4ac \geq 0 \tag{2.3}$$

$$x_3 = -\infty \qquad \text{, if } a = 0 \wedge b = 0 \wedge c = 0 \tag{2.4}$$

Note that, x_0 is a real zero of $p(x)$ for linear equation, for quadratic equation x_1 and x_2 are two real zeros of $p(x)$. x_4 is any real number which is also a solution for x.

Now, we can express the symbolic zero of x in a polynomial, which is quadratic in x by a SRE $\frac{p+q\sqrt{r}}{s}$ as given in table 2.1.

Remark We can construct TCs by the comparison with SRE (table 2.1) and also considering that TCs can be supplemented by an infinitesimal ε.

Table 2.1 Comparison with SRE $\frac{p+q\sqrt{r}}{s}$

Equation No.	p	q	r	s
2.1	$-c$	0	1	b
2.2	$-b$	1	$b^2 - 4ac$	$2a$
2.3	$-b$	-1	$b^2 - 4ac$	$2a$
2.4	0	1	0	0

3 Topic

This section concerns the main topic. In the following you can see a small illustration of how to use itemizings and enumerations.

- Point 1.
- Point 2.

1. Point 1.
2. Point 2.
   I) Point 1.
   II) Point 2.

1. Point 1.
2. Point 2.

Term one: Description of term one.

Term two: Description of term two.

In Algorithm 1 you can see how we define an algorithm.

3.1 Example

Give an example to illustrate the idea of your topic. Import images in the following way. Store the images in a separate folder as precasted in our template.

4 Conclusion

Give a conclusion on your topic. Give a few sentences to summarize the topic. If possible, point out the quality of the result and give $\exists$ a small prospect of subsequent works.

Algorithm 1 Describe the purpose of the algorithm. For more information see the newalg-Manual.

```
VOID METHOD ( typeA argumentA, typeB argumentB )
 write the algorithm in pseudocode
 it should not go into detail, but display main idea
 however, keep being consistent
x ← 1  (this is how to assign a value to a variable)
while  a condition being True or False
do  do something
    and something else

if  a condition being True or False
   then  point  1

   else  if  another condition
            then  point  2

   else   point  3
          return True
```

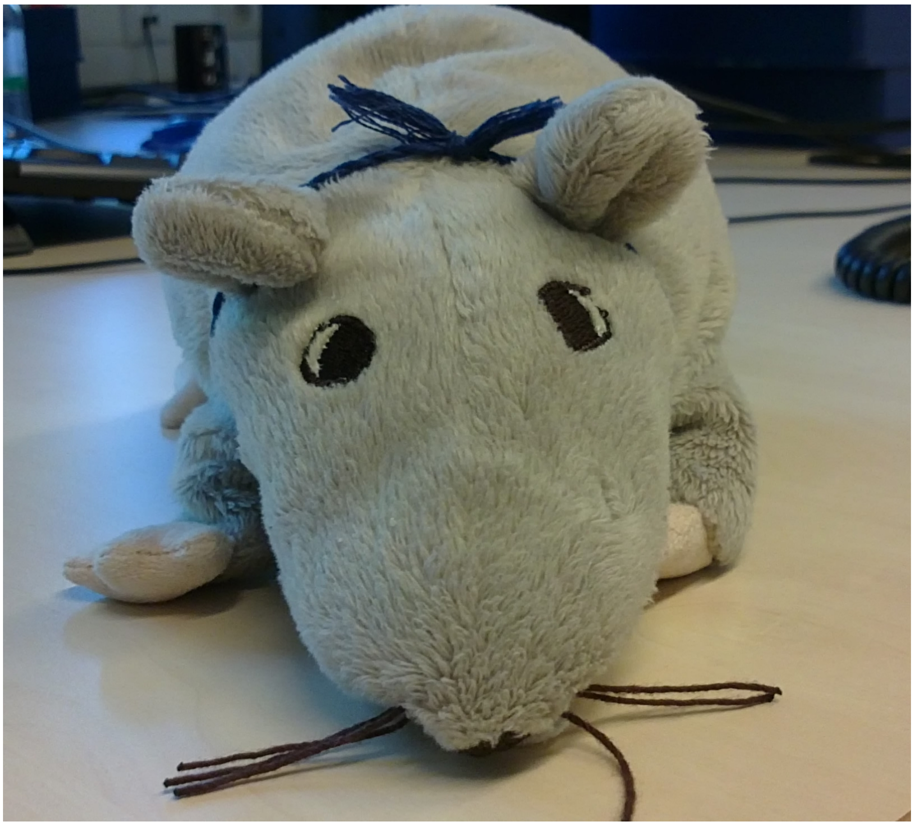

Figure 1: Proseminar supervisor's pet.