Symbolic Differentiation of Complex Expressions

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Abstract

hello world

1 Introduction

- Why is analyticity important?
- Differentiation as a small application of analyticity.
- Why is finding analyticity hard?
- Ways to find where a function is analytic.
- Computer algebra systems for finding analyticity.
- Our contributions.

2 Expressions

- What are our expressions?
- Where are various expressions analytic?
- Pose question: how can we find analyticity of compositions?

2.1 What are our expressions?

$$
\begin{aligned}
\langle Expr \rangle &::= z \mid \mathbb{C} \mid \sin(\langle Expr \rangle) \mid \cos(\langle Expr \rangle) \mid \exp(\langle Expr \rangle) \\
&\mid \log(\langle Expr \rangle) \mid \langle Sum \rangle \mid \langle Term \rangle \\
\langle Sum \rangle &::= \langle Expr \rangle \times \mathbb{C} \mid \langle Expr \rangle \times \mathbb{C} + \langle Sum \rangle \\
\langle Term \rangle &::= \langle Expr \rangle^{\mathbb{C}} \mid \langle Expr \rangle^{\mathbb{C}} \times \langle Term \rangle
\end{aligned}
$$

Figure 1. The grammar for the allowed expressions

Our system allows the expressions defined by

3 Analyticity of Compositions

- Singularities -> Rootfinding
- Branch Points -> Rootfinding + Singularities
- Cluster Points -> Evaluation + Singularities + Branch Points

4 Symbolic Root Finding

5 Implementation

6 Future Work