

# Abstract

The Lambda Calculus is a broad, complex area of mathematical and computational theory. It is prevalent in society today through common functional programming languages, but is still the source of confusion for many people studying these languages. This confusion is founded upon two distinct aspects of the Lambda Calculus, the structure of the language and the computation of the language, known as beta reduction.

Visualisation is a commonly used technique to help people understand a topic more easily. Several attempts to visualise Lambda Calculus expressions and animate beta reduction have been made before. Some of these have been proposals for designs and some have been working implementations but each has issues that were not addressed by their creator.

This work proposes a new design for untyped Lambda Calculus visualisation and beta reduction animation. Each of the existing designs discussed are evaluated and contribute elements to the design. The field of data visualisation overlaps with this work significantly and so several resources were used in the design to benefit from the extensive research available in creating effective visualisations. An implementation of the design is provided that can be used online.

The system proposed acts as a foundational step in the area, leaving ample work for future research. As is typical with applications, user trials are the next step in future work so that the effectiveness of the design can be evaluated in a controlled environment.