Designing a Visual, Block-Based Environment to Create & Execute Haskell Code

Students

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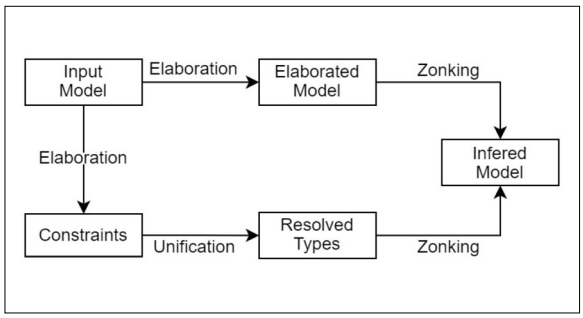
Initial Situation: Many teachers use tools like Scratch or LEGO Mindstorms when introducing children and young adults to the programming world. Such visual, block-based tools eliminate the hurdle of code syntax, allowing beginners to concentrate on the program they want to write.
But almost all visual tools for teaching programming are made for the imperative programming paradigm. Visual tools exist for functional programming but lack visual aesthetics or hide essential concepts required to understand functional programming.

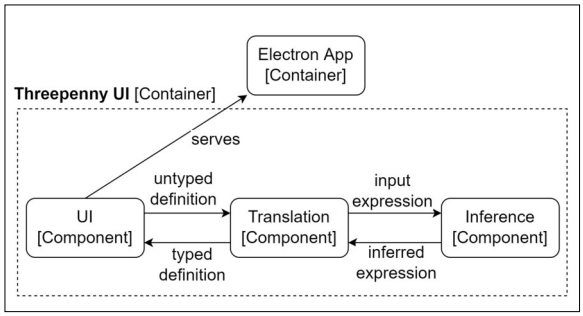
Objective: With VisualFP, a visual, block-based tool should be designed that can be used to teach functional programming. At the center of this project is a design concept for visual function composition, describing how the visual editor of such a tool would work. A proof of concept application with a visual function editor should be created to prove the concept is feasible.
A potent type inference engine is necessary for such an editor to work. Additionally, the application should run on the user's machine to be used in classrooms without server infrastructure.

Result: The developed concept uses nested blocks to represent function definitions. Type holes guide the development flow as typed placeholders for the values required for the definition to be valid. Users can drop value blocks into a type hole to fill it with that value. Value blocks are provided by the editor or are defined by the user.
The concept was implemented in a proof-of-concept application written using Haskell and Electron.js. The application includes a small selection of pre-defined values that can be used to build a user-defined function.
The implemented application proves that the developed design concept works as envisioned. However, the application is not yet ready to be used in classrooms as additional design and development is required to bring the idea to its full potential.

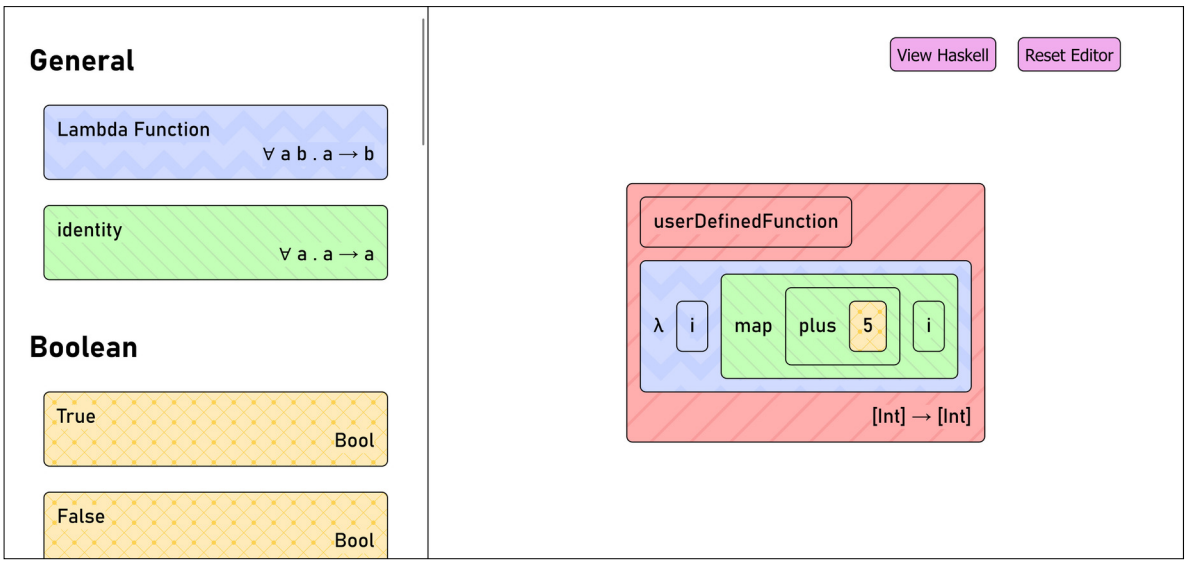
Inference Engine flow diagram
Own presentment



C4 component diagram
Own presentment



Screenshot of the mapAdd5 function definition in VisualFP
Own presentment



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Subject Area
Software

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