Type System for F888

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1 Introduction

The type system of F888 is based upon the Hindley-Milner type system.

2 Formal Definition

2.1 Variable Access

$$\frac{x : \sigma \in \Gamma}{\Gamma \vdash_D x : \sigma} \tag{1}$$

2.2 Application

$$\frac{\Gamma \vdash_D e_0 : \tau \to \tau' \qquad \Gamma \vdash_D e_1 : \tau}{\Gamma \vdash_D e_0 e_1 : \tau'} \tag{2}$$

2.3 Abstraction

$$\frac{\Gamma, x : \tau \vdash_D e : \tau'}{\Gamma \vdash_D \lambda x.e : \tau \to \tau'} \tag{3}$$

2.4 Let Bindings

$$\frac{\Gamma \vdash_D e_0 : \sigma \qquad \Gamma, x : \sigma \vdash e_1 : \tau}{\Gamma \vdash_D \text{ let } x = e_0 \text{ in } e_1 : \tau} \tag{4}$$

2.5 Instantiation

$$\frac{\Gamma \vdash_D e : \sigma' \qquad \sigma' \sqsubseteq \sigma}{\Gamma \vdash_D e : \sigma} \tag{5}$$

2.6 Generalization

$$\frac{\Gamma \vdash e : \sigma \qquad \alpha \notin \text{ free}(\Gamma)}{\Gamma \vdash_D e : \forall \alpha.\sigma} \tag{6}$$

3 Types

3.1 Monotypes

An object is a monotype if said object is either a type constant (I.E. An integer, a String), or a type variable (I.E. α or β), where α or β may be substituted for a type constant. Monotypes also include the type of a function application. For example, a function accepting an argument of type α, and returning a value of type β would be type $\alpha \to \beta$, thus being a monotype.

3.2 Polytypes

An object is a polytype if said object is a monotype, or if the type of said object is contains a variable bound by a type.