Hazel PHI: 10-modules

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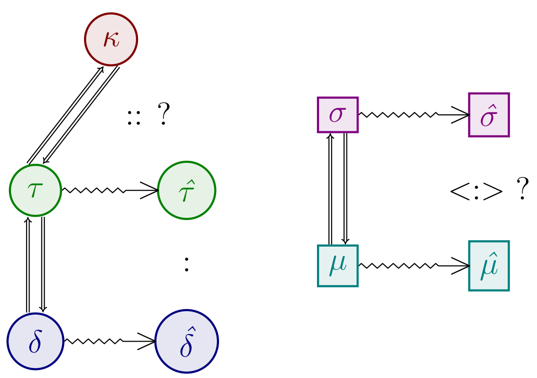
how to read

800000	kinds	800080	signatures
008000	types (constructors)	008080	modules
000080	terms		

notes



$\sigma := \hat{\sigma}$

$\tau := \hat{\tau}$

$\mu := \hat{\mu}$

syntax

kind	κ	$::=$	$\texttt{Type}$	kind of types
		$\mid$	$\texttt{S}(\hat{\tau})$	singleton kind
		$\mid$	$\texttt{KHole}$	kind hole
		$\mid$	$\Pi_{t::\kappa_1}.\kappa_2$	dependent function kind

HTyp	$\hat{\tau}$	$::=$	t	type variable
		$\mid$	bse	base type
		$\mid$	$\hat{\tau_1} \oplus \hat{\tau_2}$	type binop
		$\mid$	$[\hat{\tau}]$	list type
		$\mid$	$\lambda t :: \kappa.\hat{\tau}$	type function
		$\mid$	$\hat{\tau_1}\ \hat{\tau_2}$	type application
		$\mid$	$\{lab_1 \hookrightarrow \hat{\tau_1}, \ldots\ lab_n \hookrightarrow \hat{\tau_n}\}$	labelled product type (record)
		$\mid$	$\hat{\mu}.lab$	module type projection
		$\mid$	$(\!\|\!)$	empty type hole
		$\mid$	$(\!\|\hat{\tau}\|\!)$	nonempty type hole

base type	bse	::=	$\texttt{Int}$	
		|	$\texttt{Float}$	
		|	$\texttt{Bool}$	

HTyp BinOp	$\oplus$	::=	$\times$	
		|	$+$	
		|	$\rightarrow$	

external expression	δ	::=	$\ldots$	
		|	x	
		|	$\texttt{signature}\ s = \sigma\ \texttt{in}\ \delta$	
		|	$\texttt{module}\ m = \mu\ \texttt{in}\ \delta$	
		|	$\texttt{module}\ m <:> s = \mu\ \texttt{in}\ \delta$	
		|	$\texttt{functor something} = \texttt{something in}\ \delta$	
		|	$\mu.lab$	module term projection

internal expression	$\hat{\delta}$	::=	$\ldots$	
		|	x	
		|	$\texttt{signature}\ s = \hat{\sigma}\ \texttt{in}\ \hat{\delta}$	
		|	$\texttt{module}\ m <:> s = \hat{\mu}\ \texttt{in}\ \hat{\delta}$	
		|	$\texttt{functor something} = \texttt{something in}\ \hat{\delta}$	
		|	$\hat{\mu}.lab$	module term projection

signature	$\hat{\sigma}$	::=	s	signature variable
		|	$\{sdecs\}$	structure signature
		|	$\Pi_{m<:>\hat{\sigma_1}}.\hat{\sigma_2}$	functor signature
		|	$(\!\|\!)$	empty signature hole
		|	$(\!\|\hat{\sigma}\|\!)$	nonempty signature hole

module	$\hat{\mu}$	::=	m	module variable
		|	$\{sbnds\}$	structure
		|	$\lambda m <:> \hat{\sigma}.\hat{\mu}$	functor
		|	$\hat{\mu_1}\ \hat{\mu_2}$	functor application
		|	$\hat{\mu}.lab$	submodule projection
		|	$(\!\|\!)$	empty module hole
		|	$(\!\|\hat{\mu}\|\!)$	nonempty module hole

signature declarations	$sdecs$	::=	$\cdot$
		|	$sdec, sdecs$

signature declaration	$sdec$	::=	$\texttt{type}\ lab$
		|	$\texttt{type}\ lab = \hat{\tau}$
		|	$\texttt{val}\ lab : \hat{\tau}$
		|	$\texttt{module}\ lab <:> \hat{\sigma}$
		|	$\texttt{functor}\ lab <:> \hat{\sigma}$

structure bindings	$sbnds$	::=	$\cdot$
		|	$sbnd, sbnds$

$$\text{structure binding} \quad sbnd ::= \texttt{type}\ t = \hat{\tau} \mid \texttt{let}\ x : \hat{\tau} = \hat{\delta} \mid \texttt{module}\ m = \hat{\mu} \mid \texttt{module}\ m \mathrel{<:>} s = \hat{\mu} \mid \texttt{functor}\ m \mathrel{<:>} s = \hat{\mu}$$

contexts

$\Gamma, x : \hat{\tau}; \Phi, t :: \kappa; \Xi, m \mathrel{<:>} \hat{\sigma}; \Delta, ?$

statics

$\boxed{\Delta; \Phi \vdash \kappa_1 \lesssim \kappa_2}$ κ_1 is a consistent subkind of κ_2

KCSubsumption

$$\frac{test}{test}$$

elab

$\boxed{\Gamma; \Phi; \Xi \vdash \delta \Rightarrow \tau \rightsquigarrow \hat{\delta} \dashv \Delta}$ δ synthesizes type τ and elaborates to $\hat{\delta}$ with hole context Δ

SynElabLetMod

$$\frac{\Gamma; \Phi; \Xi \vdash \mu \Rightarrow \sigma \rightsquigarrow \hat{\mu} \dashv \Delta_1 \qquad \Gamma; \Phi; \Xi, m \mathrel{<:>} \sigma \vdash \delta \Rightarrow \tau \rightsquigarrow \hat{\delta} \dashv \Delta_2}{\Gamma; \Phi; \Xi \vdash \texttt{module}\ m = \mu\ \texttt{in}\ \delta \Rightarrow \tau \rightsquigarrow \texttt{module}\ m = \hat{\mu}\ \texttt{in}\ \hat{\delta} \dashv \Delta_1 \cup \Delta_2}$$

$\boxed{\Gamma; \Phi; \Xi \vdash \mu \Rightarrow \sigma \rightsquigarrow \hat{\mu} \dashv \Delta}$ μ synthesizes signature σ and elaborates to $\hat{\mu}$ with hole context Δ

SynElabModVar

$$\frac{m \mathrel{<:>} \hat{\sigma} \in \Xi}{\Gamma; \Phi; \Xi \vdash m \Rightarrow \sigma \rightsquigarrow m \dashv \cdot}$$

SynElabModVarFail

$$\frac{m \notin \mathsf{dom}(\Xi)}{\Gamma; \Phi; \Xi \vdash m \Rightarrow (\!|\,|\!) \rightsquigarrow (\!|m|\!)^u \dashv u \mathrel{<:>} (\!|\,|\!)}$$

SynElabStruct

$$\frac{\Gamma; \Phi; \Xi \vdash sbnd \Rightarrow sdec \rightsquigarrow sbnd \dashv \Delta_1 \quad \Gamma, \mathsf{val}(sdec); \Phi, \mathsf{type}(sdec); \Xi, \mathsf{submodule}(sdec) \vdash sbnds \Rightarrow sdecs \rightsquigarrow sbnds \dashv \Delta_2}{\Gamma; \Phi; \Xi \vdash \{sbnd, sbnds\} \Rightarrow \{sdec, sdecs\} \rightsquigarrow \{sbnd, sbnds\} \dashv \Delta_1 \cup \Delta_2}$$