Continuation-Passing Style

Syntax

x identifiers

e, K	::=		terms
	|	t	
	|	s	
t	::=		trivial terms, *i.e.* values
	|	x	
	|	$\lambda x.e$ bind x in e	
s	::=		serious terms, *i.e.* computations
	|	$e_0\ e_1$	

Transformation

Call-by-value

$$
\begin{aligned}
\mathcal{E}[\![t]\!] &= \lambda k.\ k\ \mathcal{T}[\![t]\!] \\
\mathcal{E}[\![s]\!] &= \mathcal{S}[\![s]\!] \\
\mathcal{S}[\![t_0\ t_1]\!]\ K &= \mathcal{T}[\![t_0]\!]\ \mathcal{T}[\![t_1]\!]\ K \\
\mathcal{S}[\![t_0\ s_1]\!]\ K &= \mathcal{S}[\![s_1]\!]\ (\lambda x_1.\ \mathcal{T}[\![t_0]\!]\ x_1\ K) \\
\mathcal{S}[\![s_0\ t_1]\!]\ K &= \mathcal{S}[\![s_0]\!]\ (\lambda x_0.\ x_0\ \mathcal{T}[\![t_1]\!]\ K) \\
\mathcal{S}[\![s_0\ s_1]\!]\ K &= \mathcal{S}[\![s_0]\!]\ (\lambda x_0.\ \mathcal{S}[\![s_1]\!]\ (\lambda x_1.\ x_0\ x_1\ K)) \\
\mathcal{T}[\![x]\!] &= x \\
\mathcal{T}[\![\lambda x.\ e]\!] &= \lambda x.\ \mathcal{E}[\![e]\!]
\end{aligned}
$$

Call-by-name

$$
\begin{aligned}
\mathcal{E}[\![t]\!] &= \lambda k.\ k\ \mathcal{T}[\![t]\!] \\
\mathcal{E}[\![s]\!] &= \mathcal{S}[\![s]\!] \\
\mathcal{S}[\![t_0\ e_1]\!]\ K &= \mathcal{T}[\![t_0]\!]\ \mathcal{E}[\![e_1]\!]\ K \\
\mathcal{S}[\![s_0\ e_1]\!]\ K &= \mathcal{S}[\![s_0]\!]\ (\lambda x_0.\ x_0\ \mathcal{E}[\![e_1]\!]\ K) \\
\mathcal{T}[\![x]\!] &= x \\
\mathcal{T}[\![\lambda x.\ e]\!] &= \lambda x.\ \mathcal{E}[\![e]\!]
\end{aligned}
$$