# $\mu\tilde{\mu}$

Roshan P. James Amr Sabry

March 31, 2012

**Abstract**

# 1 Krivine Machine / Call by Name

## 1.1 CBName

$$\begin{array}{rcl} M, N & = & x \mid \lambda x.M \mid M\ N \\ E & = & \Box \mid M.E \end{array}$$

$$\begin{array}{rcl} \langle M\ N, E\rangle & \mapsto & \langle M, N.E\rangle \\ \langle \lambda x.M, N.E\rangle & \mapsto & \langle M[N/x], E\rangle \end{array}$$

Reduction

$$M\ N = E \mapsto \langle M, N.E\rangle$$

As a binder

$$M\ N = \mu\beta.\langle M, N.\beta\rangle$$

## 1.2 CBName with Felleisen's $\mathcal{C}$

Abstract Machine Style

$$\begin{array}{rcl} M, N & = & x \mid \lambda x.M \mid M\ N \\ & \mid & \mathcal{C}(M) \mid \ulcorner E \urcorner \\ E & = & \Box \mid M.E \end{array}$$

$$\begin{array}{rcrcl} \langle M\ N, & E\rangle & \mapsto & \langle M, & N.E\rangle \\ \langle \lambda x.M, & N.E\rangle & \mapsto & \langle M[N/x], & E\rangle \\ \langle \mathcal{C}(M), & E\rangle & \mapsto & \langle M, & \ulcorner E \urcorner.\Box\rangle \\ \langle \ulcorner E \urcorner, & M.E'\rangle & \mapsto & \langle M, & E\rangle \end{array}$$

Evaluation Context Style

$$\begin{array}{rcl} e & = & x \mid \lambda x.e \mid e_1\ e_2 \\ & \mid & \mathcal{C}\ e \mid \mathcal{A}\ e \\ E & = & E\ e \end{array}$$

$$\begin{array}{rcl} E[(\lambda x.e_1)\ e_2] & \mapsto & E[e_1[e_2/x]] \\ E[\mathcal{C}\ e] & \mapsto & [e\ \lambda x.(\mathcal{A}\ E[x])] \\ E[\mathcal{A}\ e] & \mapsto & e \end{array}$$

Reduction

$$\begin{array}{rcl} M\ N & = & E \mapsto \langle M, N.E\rangle \\ \mathcal{C}(M) & = & E \mapsto \langle M, \ulcorner E \urcorner.\Box\rangle \\ \ulcorner E \urcorner & = & M, E' \mapsto \langle M, E\rangle \end{array}$$

As a binder

$$\begin{array}{rcl} M\ N & = & \mu\beta.\langle M, N.\beta\rangle \\ \mathcal{C}(M) & = & \mu\beta.\langle M, \ulcorner \beta \urcorner.\Box\rangle \\ \ulcorner E \urcorner & = & \lambda x.\mu\alpha.\langle x, E\rangle \end{array}$$

## 2 Call By Value

Abstract Machine Style

$$\begin{array}{rcl} M, N & = & x \mid \lambda x.M \mid M\ N \\ & \mid & \mathcal{C}(M) \mid \ulcorner E \urcorner \\ V & = & x \mid \lambda x.M \mid \ulcorner E \urcorner \\ E & = & \Box \mid M.E \mid M \circ E \end{array}$$

$$\begin{array}{rlcl} \langle M\ N, & E\rangle & \mapsto & \langle N, \quad M \circ E\rangle \\ \langle V, & M \circ E\rangle & \mapsto & \langle M, \quad V.E\rangle \\ \langle \lambda x.M, & N.E\rangle & \mapsto & \langle M[N/x], \quad E\rangle \\ \langle \mathcal{C}(M), & E\rangle & \mapsto & \langle M, \quad \ulcorner E \urcorner.\Box\rangle \\ \langle \ulcorner E \urcorner, & M.E'\rangle & \mapsto & \langle M, \quad E\rangle \end{array}$$

## 3 Conclusion

## References