err not a fun

$$E[\text{err}_1] \longrightarrow \text{err}_1$$

Handler — ISWIM

(throw b)

(catch M_1 with $\lambda X_1 M_2$)

code that may   handler
throw
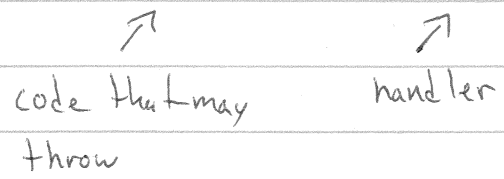
$$E[(\text{throw } b)] \longrightarrow (\text{throw } b)$$

suppose $E = (\text{catch } [] \text{ with } \lambda X_1 M_2)$

want $((\lambda X_1 M_2) b)$

F is a "catch"-less evaluation context

$$F = [] \mid (V\ F) \mid (F\ M) \mid (o^n\ V \ldots F\ M \ldots)$$
$$E = [] \mid (V\ E) \mid (E\ M) \mid (o^n\ V \ldots E\ M \ldots)$$
$$(\text{catch } E \text{ with } \lambda X_1 M)$$

$$E[((\lambda X_1 m)\ V] \longrightarrow E[M[x \leftarrow v]]$$
$$E[(\text{catch } V \text{ with } \lambda X_1 m)] \longrightarrow E[V]$$
$$E[(\text{cathc } (\text{throw } b) \text{ with } \lambda X_1 M)] \longrightarrow E[((\lambda X_1 m)\ b)]$$

(catch $(+ 5\ (\text{throw } 7))$ with $\lambda X_1 m$)
$$F = (+ 5\ [])$$

$$E[(\text{catch } F[(\text{throw } b)] \text{ with } \lambda X_1 m)] \qquad F \neq []$$
$$\longrightarrow E[(\text{catch } (\text{throw } b) \text{ with } \lambda X_1 m)]$$

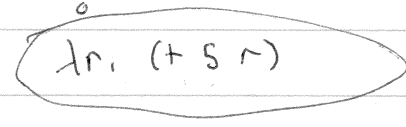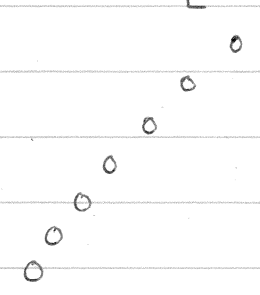CC machine < CODE, CONTEXT>

$$< (M \ N) , E > \longmapsto < M , E[([] \ N)] >$$

CHC machine < CODE, HANDLER, CONTEXT >

$$< (throw \ b) , <U, F'>H, F >$$
$$\longmapsto < (U \ b) , H , F' >$$

$$< (M \ N) , H , F >$$
$$\longmapsto < M , H , F[([] \ N)] >$$

$$< (catch \ M \ with \ \lambda x.N) , H , F >$$
$$\longmapsto < M , <(\lambda x.N), F> H , [] >$$

$$< V , <U, F'> H , [] >$$
$$\longmapsto < V , H , F' >$$

Recoverable Errors

(throw b)

(catch M_1 with $\lambda X R . M_2$)

$$E[(catch \ F[(throw \ b)] \ with \ \lambda X R . M)] \qquad \text{~~~~~~~}$$
$$\longmapsto E[((\lambda X R . m) \ b \ (\lambda r . F[r]))]$$

$\lambda r . (+ \ 5 \ r)$ (circled)

$$(-\lambda r . (catch \ F[r] \ with \ \lambda X R . m))$$

Total - ISWIM
$\downarrow$
total)
control

$$(\lambda X R . (+ \ (R \ X) \ \cancel{(R X)}))$$
$$(R \ (+ \ X \ 1))$$

$$E[(call/cc \ V)] \longmapsto E[(V \ (\lambda X . E[X]))]$$

call-with-current-continuation   a continuation