

Goal Stack planning

A B C A
B
C

Stack
 $\{ \text{on}(A, B), \text{on}(B, C) \}$

~~on(A, B)~~

~~on(B, C)~~

~~stack(A, B)~~

$\{ \text{holding}(B), \text{clear}(C) \}$

~~holding(B)~~

~~clear(C)~~

~~pickup(B)~~

$\{ \text{put}(B), \text{clear}(B), \text{AE} \}$

~~put(B)~~

~~clear(B)~~

~~AE~~

Stack(A, B)

$\{ \text{holding}(A), \text{clear}(B) \}$

~~holding(A)~~
~~clear(B)~~

~~pickup(A)~~

$\{ \text{put}(A), \text{clear}(A), \text{AE} \}$
~~put(A)~~
~~clear(A)~~
~~AE~~

plan

$\pi: \langle \text{pickup}(B), \text{stack}(B, C), \text{pickup}(A), \text{stack}(A, B) \rangle$

B

A C

A B
C

A

B
C

A
B
C

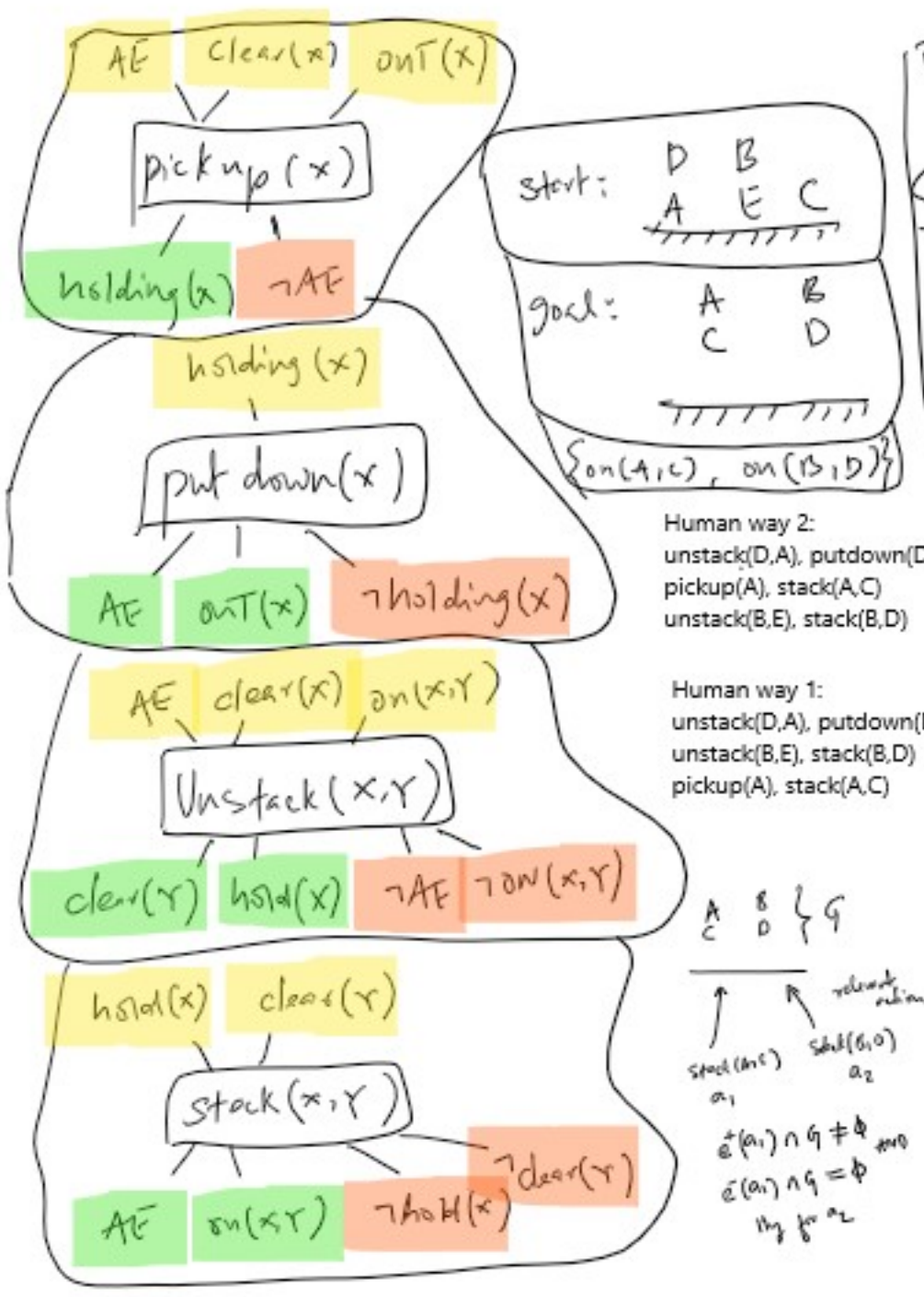
slides

$\frac{D}{A} \quad \frac{B}{A \ E \ C} \quad \frac{B}{A \ E \ C \ D} \quad \frac{B \ A}{E \ C \ D} \quad \frac{A}{E \ C \ D} \quad \frac{A \ B}{E \ C \ D}$
 $\pi: \langle \text{Unstack}(D, A), \text{putdown}(D), \text{pick}(A), \text{stack}(A, C), \text{Unstack}(B, E), \text{stack}(B, D) \rangle$

$\{ \text{on}(B, D), \text{on}(A, C) \}$
 $\text{on}(B, D)$
 $\text{on}(A, C)$
 $\text{pick}(A)$
 $\{ \text{AE}, \text{clear}(A), \text{on}(A) \}$
 AE
 $\text{clear}(A)$
 $\text{on}(A)$
 $\text{Unstack}(D, A)$
 $\{ \text{AE}, \text{clear}(D), \text{on}(D, A) \}$
 AE
 $\text{clear}(D)$
 $\text{on}(D, A)$
 $\text{putdown}(D)$
 $\{ \text{hold}(D) \}$
 $\text{hold}(D)$

$\text{stack}(B, D)$
 $\{ \text{hold}(B), \text{clear}(D) \}$
 $\text{hold}(B)$
 $\text{clear}(D)$
 $\text{Unstack}(B, E)$
 $\{ \text{AE}, \text{clear}(B), \text{on}(B, E) \}$
 AE
 $\text{clear}(B)$
 $\text{on}(B, E)$
 $\text{stack}(A, C)$
 $\{ \text{hold}(A), \text{clear}(C) \}$
 $\text{hold}(A)$
 $\text{clear}(C)$

Human way 2



$\pi: \langle \text{Unstack}(B, E), \text{stack}(B, D), \text{unstack}(B, D), \text{putdown}(D), \text{unstack}(D, A), \text{putdown}(D), \text{pickup}(A), \text{stack}(A, C), \text{pick}(B), \text{stack}(B, D) \rangle$

stack
 $\{ \text{on}(A, C), \text{on}(B, D) \}$
 $\text{on}(A, C)$
 $\text{on}(B, D)$
 $\text{stack}(B, D)$
 $\{ \text{hold}(B), \text{clear}(D) \}$
 $\text{hold}(B)$
 $\text{clear}(D)$
 $\text{Unstack}(B, E)$
 $\{ \text{AE}, \text{clear}(B), \text{on}(B, E) \}$
 AE
 $\text{clear}(B)$
 $\text{on}(B, E)$
 $\text{stack}(A, C)$
 $\{ \text{hold}(A), \text{clear}(C) \}$
 $\text{hold}(A)$
 $\text{clear}(C)$

$\text{clear}(C)$
 $\text{pickup}(A)$
 $\{ \text{AE}, \text{clear}(A), \text{on}(A) \}$
 AE
 $\text{clear}(A)$
 $\text{on}(A)$
 $\text{Unstack}(D, A)$
 $\{ \text{AE}, \text{clear}(D), \text{on}(D, A) \}$
 AE
 $\text{clear}(D)$
 $\text{on}(D, A)$
 $\text{Unstack}(B, D)$
 $\{ \text{AE}, \text{clear}(B), \text{on}(B, D) \}$
 AE
 $\text{clear}(B)$
 $\text{on}(B, D)$

$\text{putdown}(B)$
 $\{ \text{hold}(B) \}$
 $\text{hold}(B)$
 $\text{putdown}(D)$
 $\{ \text{hold}(D) \}$
 $\text{hold}(D)$
 $\{ \text{on}(A, C), \text{on}(B, D) \}$
 $\text{on}(A, C)$
 $\text{on}(B, D)$
 $\text{pick}(B)$
 $\{ \text{AE}, \text{clear}(B), \text{on}(B) \}$
 AE
 $\text{clear}(B)$
 $\text{on}(B)$

$\text{stack}(B, D)$
 $\{ \text{hold}(B), \text{clear}(D) \}$
 $\text{hold}(B)$
 $\text{clear}(D)$

GSP

Correct order
 ↓
 optimal

Not correct order
 ↓
 Not optimal

not guaranteed

Non serializable (whatever order → no optimal (Sussman anomaly))