

Solution 2 :

Predicates:

(onLeft x) : x is on the left

(onRight x) : x is on the right

(isChild x) : x is child

(isAdult x) : x is an adult

(isBoat x) : x is boat

Constants:

adult_1, adult_2, child_1, child_2 : Adults and Children that involved in the problem

boat : boat in the problem

Actions:

1. Action: carry_one_right(x, y)

Precond: (onLeft x), (onLeft y), (isBoat x)

Effects: (onRight x), (onRight y), (not (onLeft x)), (not (onLeft y))

2. Action: carry_one_left(x, y)

Precond: (onRight x), (onRight y), (isBoat x)

Effects: (onLeft x), (onLeft y), (not (onRight x)), (not (onRight y))

3. Action: carry_two_right(x, y, z)

Precond: (onLeft x), (onLeft y), (onLeft z), (isChild y), (isChild z), (isBoat x)

Effects: (onRight x), (onRight y), (onRight z), (not (onLeft x)), (not (onLeft y)), (not (onLeft z))

4. Action: carry_two_left(x, y, z)

Precond: (onRight x), (onRight y), (onRight z), (isChild y), (isChild z), (isBoat x)

Effects: (onLeft x), (onLeft y), (onLeft z), (not (onRight x)), (not (onRight y)), (not (onRight z))

Initial State:

(onLeft adult_1), (onLeft adult_2), (onLeft child_1), (onLeft child_2), (onLeft boat)

(isAdult adult_1), (isAdult adult_2), (isChild child_1), (isChild child_2), (isBoat boat)

Goal State:

(onRight adult_1), (onRight adult_2), (onRight child_1), (onRight child_2)

Solution 3:

(A ttt1)

(B ttt1)

(C ttt1)

(ppp1 B C)

(ppp2 A)

(ppp2 B)

(ppp3 C)

(eee1 A C)

(eee3 A)

(eee1 B C)

(eee2 B)

Solution 4:

We have 4 predicates where each predicate takes at most 3 arguments.
We also have 5 constants.

For predicate with single argument we can have $5 \times 4 = 20$ possibilities

Therefore:

$$\text{possible_states} = \sum_{x=0}^{20} ({}^{20}C_x) = 2^{20} \text{ possible_states}$$

Each predicate can take max three arguments, we can have $5^3 \times 4 = 500$ possibilities

$$\text{possible_states} = \sum_{x=0}^{500} ({}^{500}C_x) = 2^{500} \text{ possible_states}$$