This file contains all of the hypothesis spaces (set of available actions) learned by all of the DQNs in all of the test PMSIs from our paper, arranged in the following order: the multi-domain PMSI, the language queries PMSI, the mathematics PMSI, and the robot planning PMSI.

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Here are the hypothesis spaces learned by our test PMSI after it trained on all domains at once. Useful primitives for the Language Queries, Equation Solving, and Robot Planning domains have been colored orange, blue, and green, respectively. Notice how PMSI has learned generally useful macros that mostly group primitives from the same domain. We did not explicitly tell it to do this.

DQN #6 (lowest level)

1. (after_to_before)

2. (in-back-of_to_in-front-of)

3. (because_to_before)

4. (chain_before_relations)

5. (in-front-of_to_before)

6. (years_to_after)

7. (check_if_solution_is_explicit)

8. (simplify_products)

9. (simplify_fractions)

10. (add_like_terms)

11. (divide_by_relevant_multiple)

12. (apply_quadratic_formula)

13. (update_innerese_world_representation)

14. (attempt_to_place_x_on_y)

15. (unstack_item_above_x_to_reach_x)

16. (unstack_item_above_y_to_make_room_for_x)

DQN #5

1. (in-back-of_to_in-front-of)

2. (because_to_before)

3. (simplify_fractions)

4. (unstack_item_above_y_to_make_room_for_x => update_innerese_world_representation)

5. (add_like_terms => divide_by_relevant_multiple => check_if_solution_is_explicit)

6. (in-front-of_to_before => chain_before_relations)

7. (unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y)

8. (unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y)

9. (apply_quadratic_formula => check_if_solution_is_explicit)

10. (simplify_products => add_like_terms)

11. (after_to_before => chain_before_relations)

12. (years_to_after => after_to_before)

DQN #4

1. (in-front-of_to_before => chain_before_relations)

2. (after_to_before => chain_before_relations)

3. (years_to_after => after_to_before)

4. (simplify_products => add_like_terms => apply_quadratic_formula => check_if_solution_is_explicit)

5. (unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => update_innerese_world_representation => because_to_before)

6. (unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y)

7. (simplify_fractions => simplify_products => add_like_terms)

8. (attempt_to_place_x_on_y => in-back-of_to_in-front-of => because_to_before)

9. (simplify_fractions => add_like_terms => divide_by_relevant_multiple => check_if_solution_is_explicit)

DQN #3

1. (years_to_after => after_to_before)

2. (simplify_products => add_like_terms => apply_quadratic_formula => check_if_solution_is_explicit)

3. (unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => update_innerese_world_representation => because_to_before)

4. (attempt_to_place_x_on_y => in-back-of_to_in-front-of => because_to_before => in-front-of_to_before => chain_before_relations)

5. (simplify_fractions => simplify_products => add_like_terms => simplify_fractions => add_like_terms => divide_by_relevant_multiple => check_if_solution_is_explicit)

6. (unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y)

7. (attempt_to_place_x_on_y => in-back-of_to_in-front-of => because_to_before => after_to_before => chain_before_relations)

DQN. #2

1. (simplify_products => add_like_terms => apply_quadratic_formula => check_if_solution_is_explicit)

2. (unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => update_innerese_world_representation => because_to_before)

3. (simplify_fractions => simplify_products => add_like_terms => simplify_fractions => add_like_terms => divide_by_relevant_multiple => check_if_solution_is_explicit)

4. (attempt_to_place_x_on_y => in-back-of_to_in-front-of => because_to_before => after_to_before => chain_before_relations)

5. (years_to_after => after_to_before => attempt_to_place_x_on_y => in-back-of_to_in-front-of => because_to_before => in-front-of_to_before => chain_before_relations)

6. (unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y)

DQN #1 (top level)

1. (simplify_products => add_like_terms => apply_quadratic_formula => check_if_solution_is_explicit)

2. (simplify_fractions => simplify_products => add_like_terms => simplify_fractions => add_like_terms => divide_by_relevant_multiple => check_if_solution_is_explicit)

3. (attempt_to_place_x_on_y => in-back-of_to_in-front-of => because_to_before => after_to_before => chain_before_relations)

4. (years_to_after => after_to_before => attempt_to_place_x_on_y => in-back-of_to_in-front-of => because_to_before => in-front-of_to_before => chain_before_relations)

5. (unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => update_innerese_world_representation => because_to_before => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y)

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Here are the hypothesis spaces learned by our test PMSI for the Language Queries domain.

DQN #4 (lowest level)

1. (years_to_after)
2. (after_to_before)
3. (because_to_before)
4. (in-back-of_to_in-front-of)
5. (in-front-of_to_before)
6. (chain_before_relations)

DQN #3

1. (in-front-of_to_before => chain_before_relations)
2. (because_to_before => chain_before_relations)
3. (after_to_before => chain_before_relations)
4. (years_to_after)
5. (in-back-of_to_in-front-of)

DQN# 2

1. (in-back-of_to_in-front-of => in-front-of_to_before => chain_before_relations)
2. (chain_before_relations => because_to_before => chain_before_relations)
3. (after_to_before => chain_before_relations)
4. (years_to_after)

DQN #1 (top level)

1. (in-back-of_to_in-front-of => in-front-of_to_before => chain_before_relations)
2. (chain_before_relations => because_to_before => chain_before_relations)
3. (years_to_after => after_to_before => chain_before_relations)

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Here are the hypothesis spaces learned by our test PMSI for the Equation Solving domain.

DQN #2 (lowest level)

1. (add_like_terms)
2. (simplify_fractions)
3. (simplify_products)
4. (apply_quadratic_formula)
5. (divide_by_relevant_multiple)
6. (check_if_solution_is_explicit)

DQN #1 (top level)

1. (divide_by_relevant_multiple => check_if_solution_is_explicit)
2. (apply_quadratic_formula => check_if_solution_is_explicit)
3. (simplify_fractions => simplify_products)
4. (add_like_terms)

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Here are the hypothesis spaces learned by our test PMSI for the Robot Planning domain.

DQN #4 (lowest level)

1. (attempt_to_place_x_on_y)
2. (unstack_item_above_x_to_reach_x)
3. (unstack_item_above_y_to_make_room_for_x)
4. (update_innerese_world_representation)

DQN #3

1. (unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y)

2. (unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y)

3. (unstack_item_above_y_to_make_room_for_x => unstack_item_above_x_to_reach_x)

4. (update_innerese_world_representation)

DQN #2

1. (unstack_item_above_y_to_make_room_for_x => unstack_item_above_x_to_reach_x => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y)

2. (unstack_item_above_y_to_make_room_for_x => unstack_item_above_x_to_reach_x => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y)

3. (update_innerese_world_representation)

DQN #1 (top level)

1. (unstack_item_above_y_to_make_room_for_x => unstack_item_above_x_to_reach_x => unstack_item_above_y_to_make_room_for_x => attempt_to_place_x_on_y => unstack_item_above_y_to_make_room_for_x => unstack_item_above_x_to_reach_x)

2. (unstack_item_above_y_to_make_room_for_x => unstack_item_above_x_to_reach_x => unstack_item_above_x_to_reach_x => attempt_to_place_x_on_y)

3. (update_innerese_world_representation)