

Adaptive Action Chunking at Inference-time for Vision-Language-Action Models

Supplementary Material

A. Minimum Action Magnitude

To further guarantee temporal consistency and computational efficiency, we impose a minimum action magnitude constraint on the optimal action chunk size, thereby defining a dynamic threshold ξ in Eq. (6):

$$\xi = \arg \min_l (m(l) > \alpha) \quad (6)$$

where the action magnitude $m(l)$ is defined as the sum of the component magnitudes of translation m_t , rotation m_r , and gripper motion m_g , as illustrated in Eq. (7). The parameter α denotes the minimum movement energy of the robot arm, which we set to 3 in our experiments.

$$m(l) = \sum_{i \in \{t,r,g\}} m_i(l) \quad (7)$$

Specifically, the translational action magnitude is defined as the Euclidean norm of the translation vector from the start point of an action chunk to the end point of a selected chunk size l , as illustrated in Eq. (8). The rotational action magnitude is obtained by accumulating the rotational offsets through sequential quaternion composition, as shown in Eq. (9). For the gripper action magnitude, we set it to 1 when the gripper state changes (e.g., from open to closed or vice versa), and to 0 otherwise, as presented in Eq. (10). Here, $\mathbf{1}$ denotes an indicator function that returns 1 if the condition is satisfied and 0 otherwise.

$$m_t(l) = \left\| \sum_l \Delta x, \sum_l \Delta y, \sum_l \Delta z \right\| \quad (8)$$

$$m_r(l) = \left\| \prod_l \Delta q \right\| \quad (9)$$

$$m_g(l) = \mathbf{1}_{\text{switch}} \quad (10)$$

B. Complete Experiment Results in RoboCasa

The complete experimental results for all 24 tasks in RoboCasa are presented in Tab. 6 and Tab. 7. On average, AAC demonstrates the best overall performance across these tasks. Nevertheless, there remains room for improvement in optimizing the chunk size selection for future work, as the optimal performance for each task has not yet been fully achieved.

Table 6. Success rates (%) on RoboCasa.

| Task Group | Task Name | GR00T | GR00T + AAC |
|--------------------|----------------------|-------|-------------|
| Relocation | Counter to Cab | 57.0 | 59.0 |
| | Counter to Stove | 41.0 | 40.0 |
| | Sink to Counter | 46.0 | 52.0 |
| | Stove to Counter | 60.0 | 63.0 |
| | Counter to Sink | 26.0 | 28.0 |
| | Counter to Microwave | 33.0 | 30.0 |
| | Cab to Counter | 26.0 | 25.0 |
| | Microwave to Counter | 27.0 | 36.0 |
| | Coffee Setup Mug | 38.0 | 39.0 |
| | Coffee Serve Mug | 67.0 | 72.0 |
| Container | Open Single Door | 62.0 | 73.0 |
| | Close Single Door | 94.0 | 92.0 |
| | Close Double Door | 56.0 | 62.0 |
| | Open Double Door | 89.0 | 88.0 |
| | Open Drawer | 81.0 | 80.0 |
| | Close Drawer | 100.0 | 98.0 |
| Rotation | Turn Sink Spout | 69.0 | 66.0 |
| | Turn on Sink facet | 85.0 | 91.0 |
| | Turn off Sink Facet | 74.0 | 80.0 |
| | Turn on Stove | 39.0 | 49.0 |
| | Turn off Stove | 21.0 | 21.0 |
| Button | Coffee Press Button | 94.0 | 93.0 |
| | Turn on Microwave | 66.0 | 68.0 |
| | Turn off Microwave | 81.0 | 83.0 |
| Relocation Average | | 42.1 | 44.4 |
| Container Average | | 80.3 | 82.2 |
| Rotation Average | | 57.6 | 61.4 |
| Button Average | | 80.3 | 81.3 |
| 24 Tasks Average | | 59.7 | 62.0 |

Table 7. Success rates (%) with Different Chunk Sizes.

| Task Group | Task Name | Fixed-2 | Fixed-4 | Fixed-8 | Fixed-12 | Fixed-16 |
|--------------------|----------------------|---------|---------|---------|----------|----------|
| Relocation | Counter to Cab | 51.0 | 68.0 | 61.0 | 57.0 | 57.0 |
| | Counter to Stove | 31.0 | 40.0 | 46.0 | 45.0 | 41.0 |
| | Sink to Counter | 35.0 | 44.0 | 56.0 | 50.0 | 46.0 |
| | Stove to Counter | 59.0 | 62.0 | 69.0 | 64.0 | 60.0 |
| | Counter to Sink | 6.0 | 10.0 | 15.0 | 19.0 | 26.0 |
| | Counter to Microwave | 7.0 | 12.0 | 29.0 | 23.0 | 33.0 |
| | Cab to Counter | 18.0 | 18.0 | 23.0 | 23.0 | 26.0 |
| | Microwave to Counter | 27.0 | 42.0 | 28.0 | 36.0 | 27.0 |
| | Coffee Setup Mug | 31.0 | 39.0 | 40.0 | 46.0 | 38.0 |
| | Coffee Serve Mug | 31.0 | 44.0 | 61.0 | 66.0 | 67.0 |
| Container | Open Single Door | 15.0 | 41.0 | 61.0 | 62.0 | 62.0 |
| | Close Single Door | 84.0 | 89.0 | 87.0 | 95.0 | 94.0 |
| | Close Double Door | 53.0 | 62.0 | 73.0 | 58.0 | 56.0 |
| | Open Double Door | 44.0 | 73.0 | 81.0 | 84.0 | 89.0 |
| | Open Drawer | 51.0 | 64.0 | 81.0 | 79.0 | 81.0 |
| | Close Drawer | 95.0 | 99.0 | 99.0 | 99.0 | 100.0 |
| Rotation | Turn Sink Spout | 70.0 | 69.0 | 69.0 | 67.0 | 69.0 |
| | Turn on Sink facet | 84.0 | 87.0 | 85.0 | 83.0 | 85.0 |
| | Turn off Sink Facet | 82.0 | 78.0 | 85.0 | 80.0 | 74.0 |
| | Turn on Stove | 42.0 | 52.0 | 52.0 | 47.0 | 39.0 |
| | Turn off Stove | 19.0 | 20.0 | 22.0 | 23.0 | 21.0 |
| Button | Coffee Press Button | 76.0 | 89.0 | 98.0 | 98.0 | 94.0 |
| | Turn on Microwave | 47.0 | 51.0 | 61.0 | 60.0 | 66.0 |
| | Turn off Microwave | 71.0 | 96.0 | 86.0 | 80.0 | 81.0 |
| Relocation Average | | 29.6 | 37.9 | 42.8 | 42.9 | 42.1 |
| Container Average | | 57.0 | 71.3 | 80.3 | 79.5 | 80.3 |
| Rotation Average | | 59.4 | 61.2 | 62.6 | 60.0 | 57.6 |
| Button Average | | 64.7 | 78.7 | 81.7 | 79.3 | 80.3 |
| 24 Tasks Average | | 47.0 | 56.2 | 61.2 | 60.2 | 59.7 |