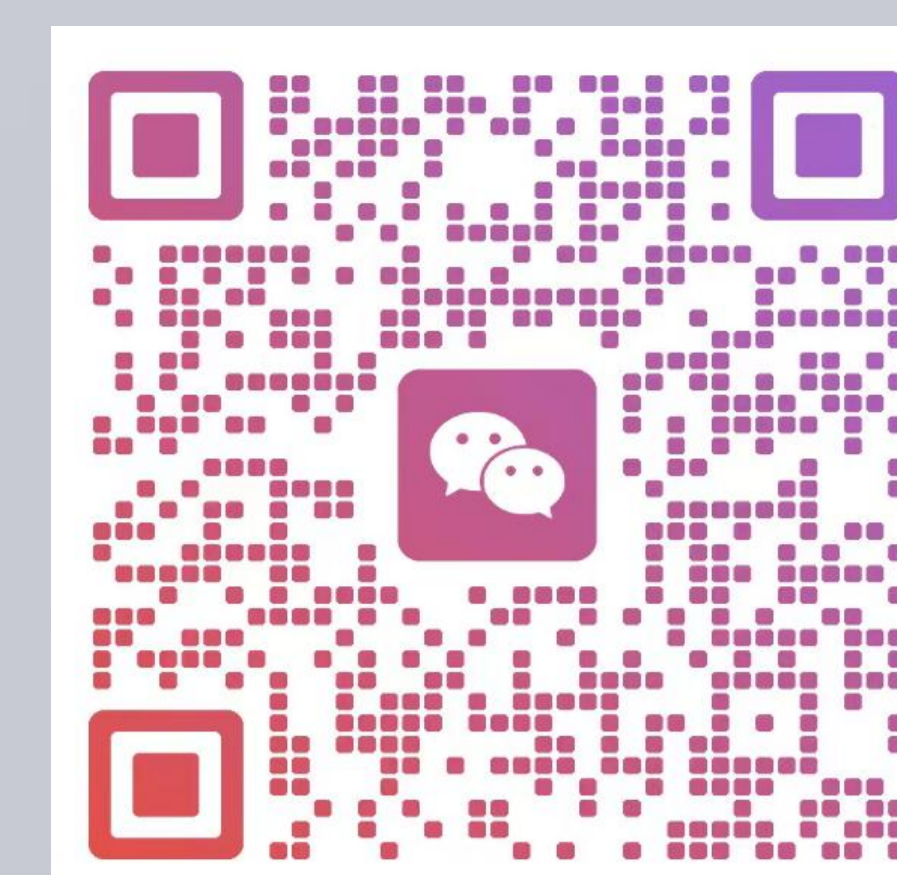




Ego3S: Select, Strengthen, and Synchronize for Efficient Egocentric Reasoning

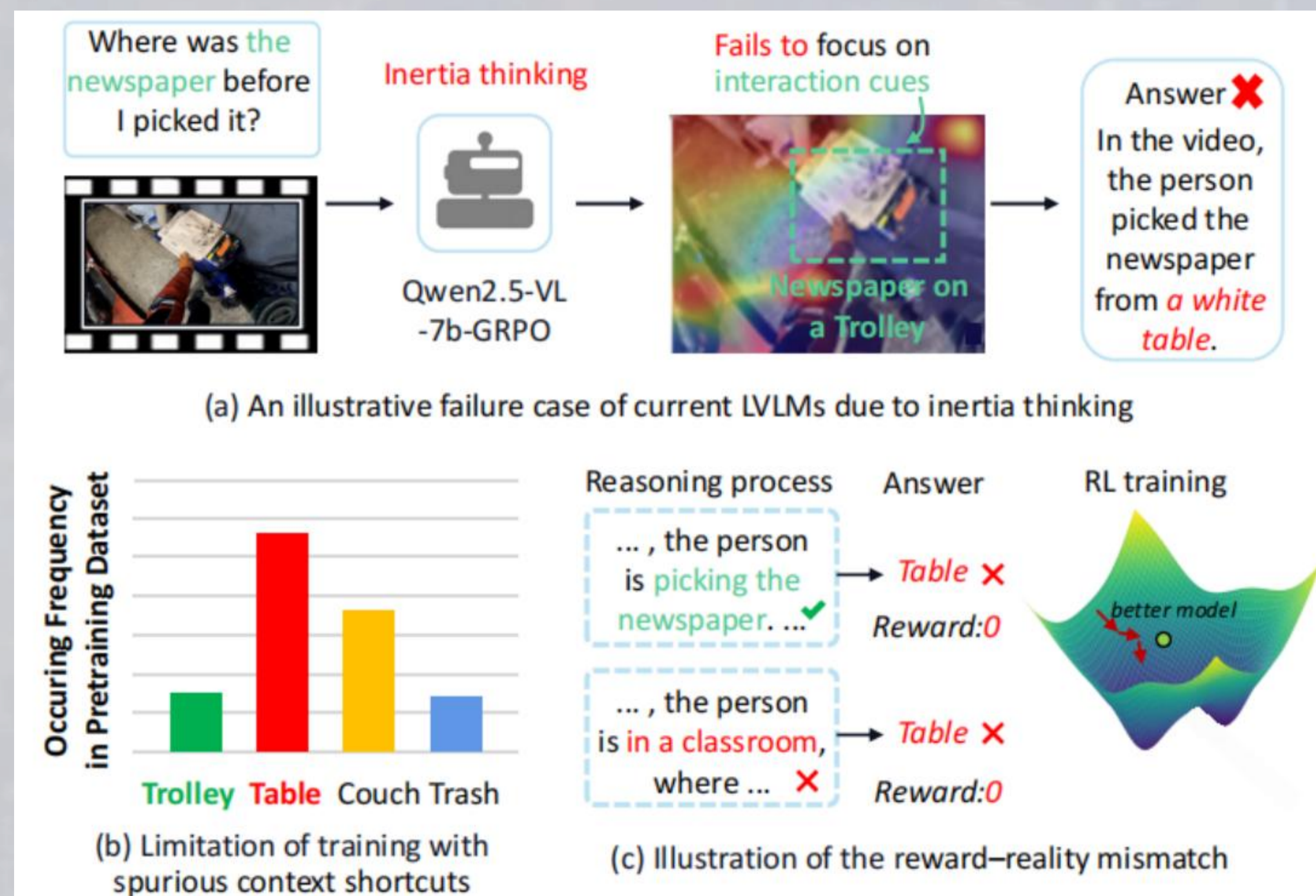
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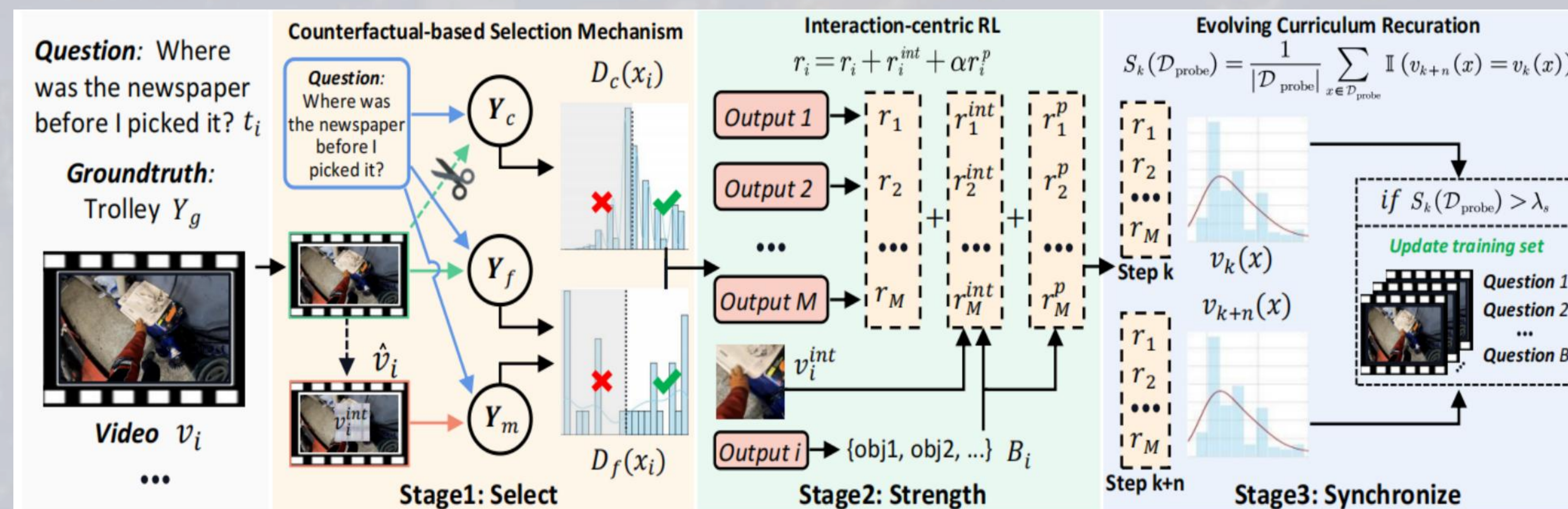
Introduction:

Typical Failure Case and Motivation



- Existing methods exhibit an over-reliance on pre-trained linguistic and contextual priors, leading them to hallucinate plausible predictions based on generic context rather than attending to the actual visual evidence. Such a drawback can be attributed to two aspects: 1) Spurious context shortcuts and 2) Reward-reality mismatch.

Our Proposed Method: Ego3S



Ego3S: Select, Strengthen, and Synchronize

- We propose a **Counterfactual-based Selection Mechanism (CSM)** that filters out samples solvable by language or context shortcuts, yielding a high-value dataset that explicitly requires reasoning by interaction cues.
- We develop an **Interaction-centric Reinforcement Learning (IRL)** objective with an interaction-aware reward, bridging the gap between linguistic priors and visual evidence to strengthen egocentric reasoning.
- We introduce an **Evolving Curriculum Recuration (ECR)** that dynamically refreshes training data based on reward variance, preventing learning stagnation and continuously raising the reasoning upper bound.

Experiments:

Overall Comparisons

| Method | Time ↓ | Egoplan2 | QAEgo4D | EgoTextVQA | EgoSchema | Egothink |
|-----------------------------------|-------------|--------------|--------------|--------------|--------------|--------------|
| Qwen2.5-VL-7b-Full | 60.5 | 30.43 | 63.80 | 20.30 | 47.60 | 56.57 |
| Qwen2.5-VL-7b-s1 (2025) | 52.3 | 29.97 | 64.40 | 19.80 | 47.90 | 56.32 |
| Qwen2.5-VL-7b-LIMO (2025) | 53.7 | 30.59 | 64.20 | 20.20 | 47.40 | 56.27 |
| Qwen2.5-VL-7b-LIMR (2025) | 103.2 | 31.46 | 65.20 | 20.60 | 48.20 | 56.93 |
| Qwen2.5-VL-7b-CSM (Ours) | 29.7 | 33.76 | 65.80 | 21.40 | 48.60 | 57.23 |
| Qwen2.5-VL-7b-GRPO (2025) | 60.5 | 30.43 | 63.80 | 20.30 | 47.60 | 56.57 |
| Qwen2.5-VL-7b-RLOO (2025) | 70.8 | 30.19 | 63.20 | 19.40 | 46.90 | 55.49 |
| Qwen2.5-VL-7b-DAPO (2025) | 62.4 | 30.87 | 64.60 | 20.60 | 47.40 | 57.24 |
| Qwen2.5-VL-7b-IRL (Ours) | 62.1 | 35.42 | 66.40 | 21.80 | 48.80 | 58.22 |
| Qwen2.5-VL-7b-Ego3S (Ours) | 32.6 | 36.83 | 66.80 | 22.40 | 49.20 | 58.71 |

Further Analysis:

