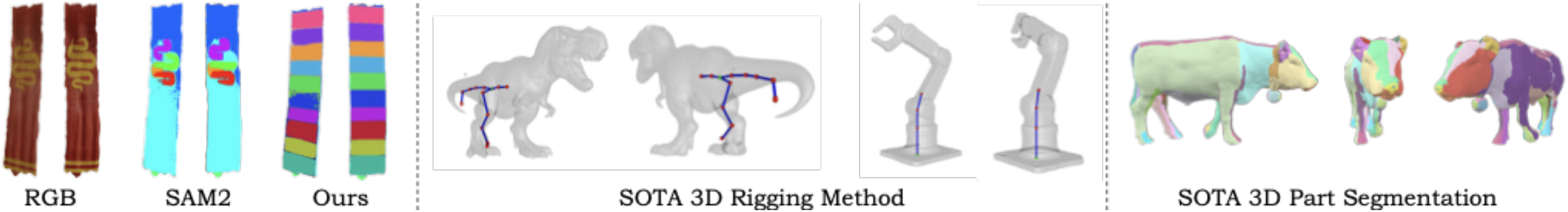
Stable Part Diffusion 4D: Multi-View RGB and Kinematic Parts Video Generation

stability.ai

ILLINOIS

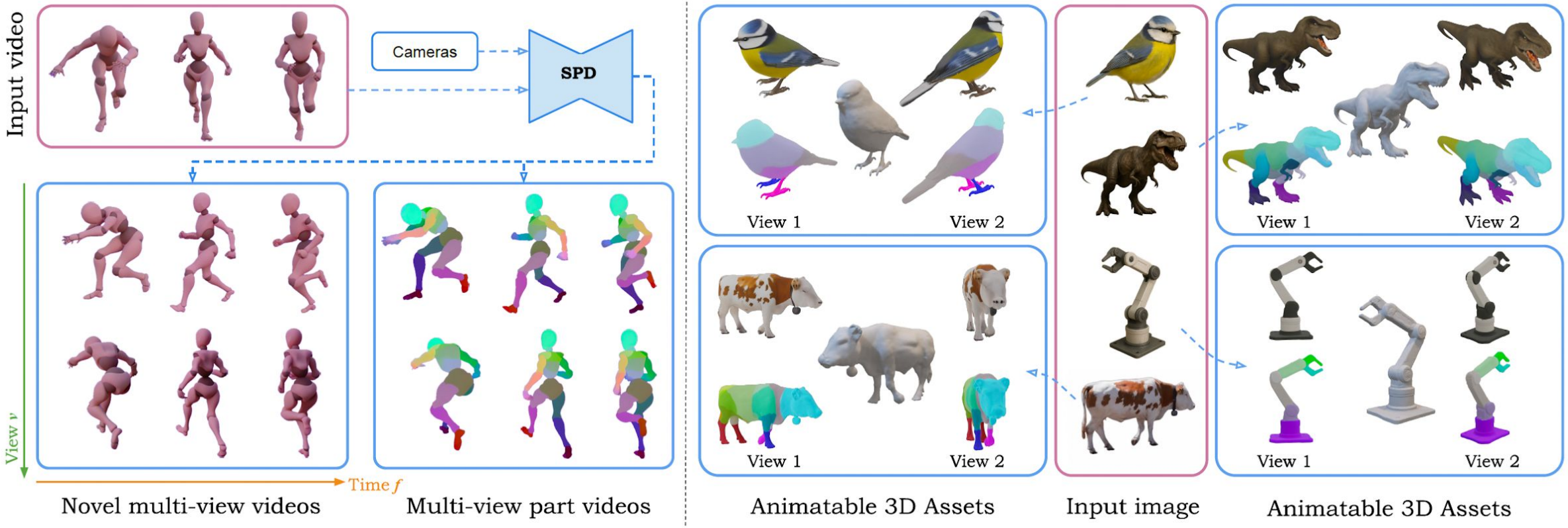
Motivation:



- **Why Not Semantic Parts?**
  Traditional segmentation (e.g., “leg”, “tail”) ignores how objects **actually move**.
  👉 *SP4D captures physically meaningful **kinematic parts*** — crucial for animation.

- **Why Not Existing 3D Rigging Methods?**
  Most rely on **small datasets**, limiting generalization.
  👉 *SP4D learns directly from **large-scale videos and images*** — scalable and robust.

Stable Part Diffusion:

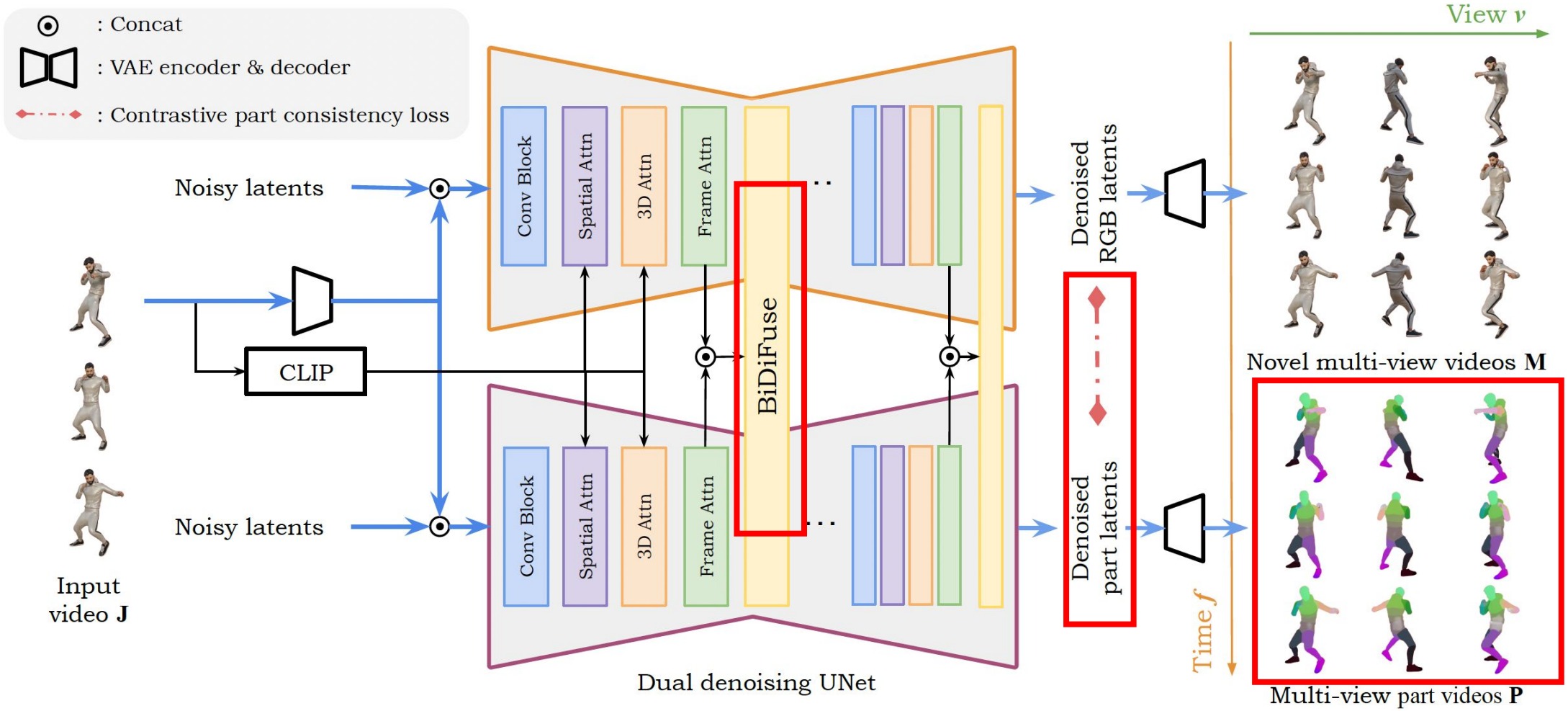


Input: Single image or monocular video

Output:

- Multi-frame, multi-view **RGB videos**
- Matching **kinematic part segmentation maps**

Stable Part Diffusion:

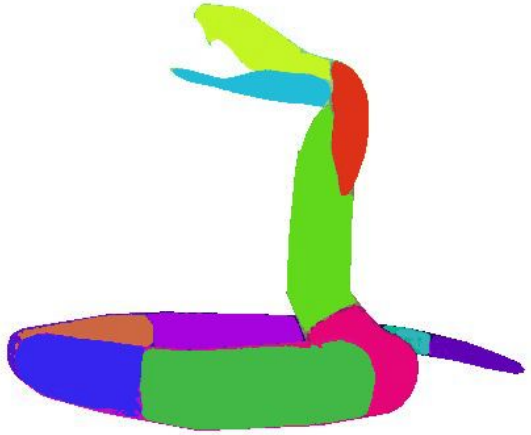


Results:

- Fixed-view Cross-frame Tracking

the RGB video is provided as input and the corresponding Part Video is generated.

RGB



Parts

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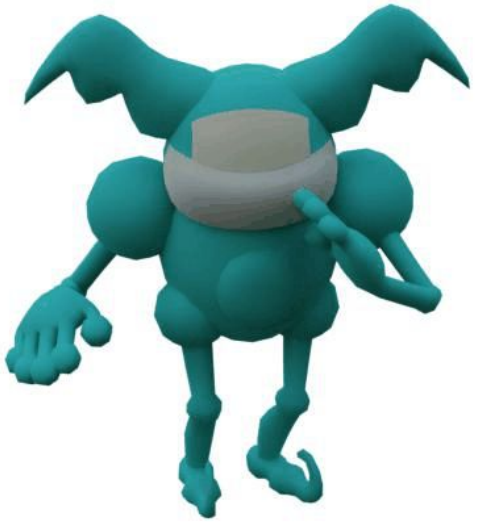

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  the first frame of the RGB video serves as the input, while the remaining frames and the entire Part Video are generated.

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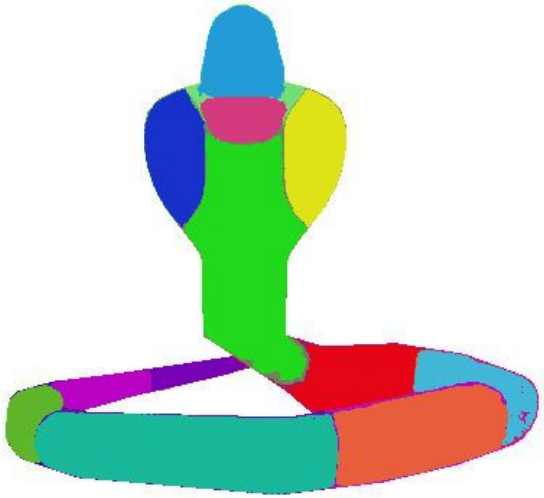

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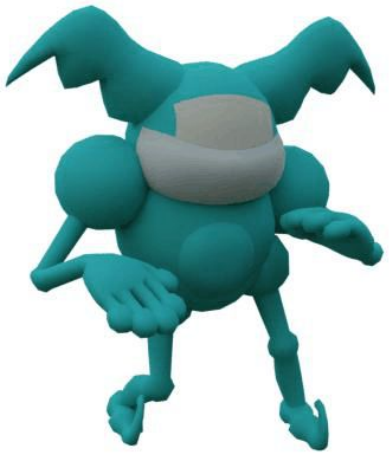

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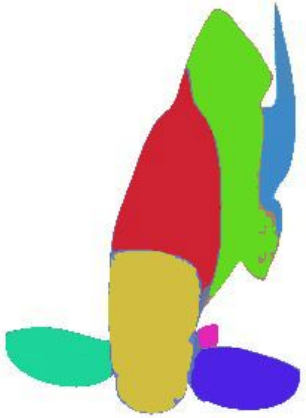

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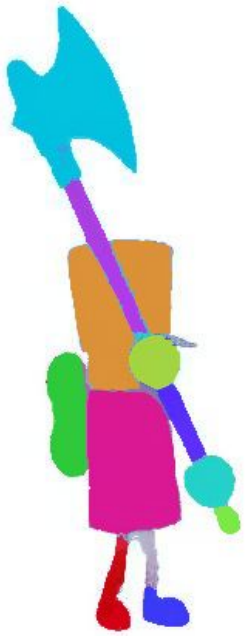
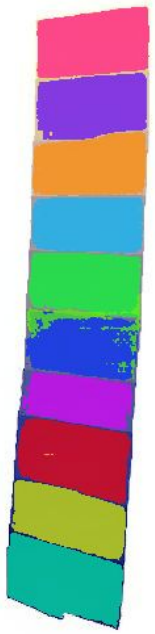


Parts

RGB



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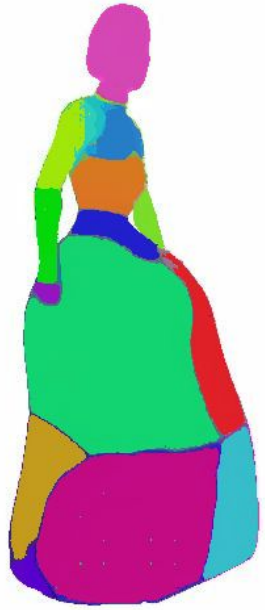
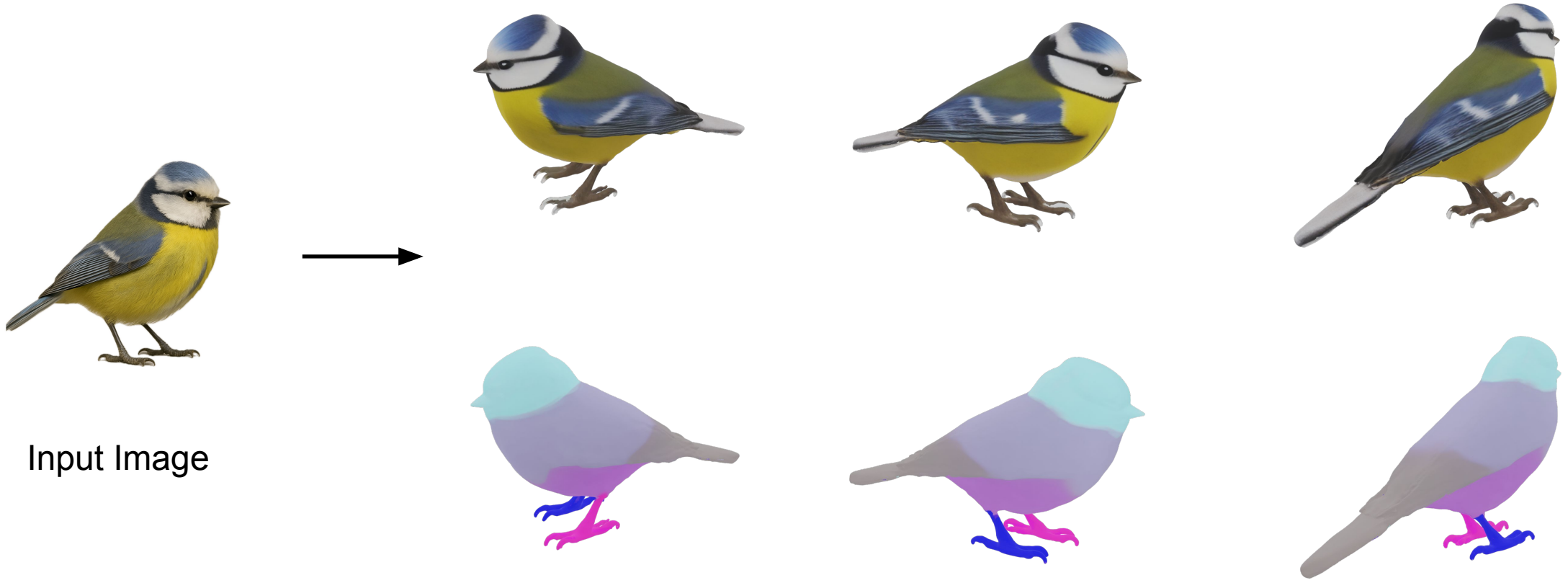


Parts

Results:

- 3D Part Decomposition for zero-shot input image



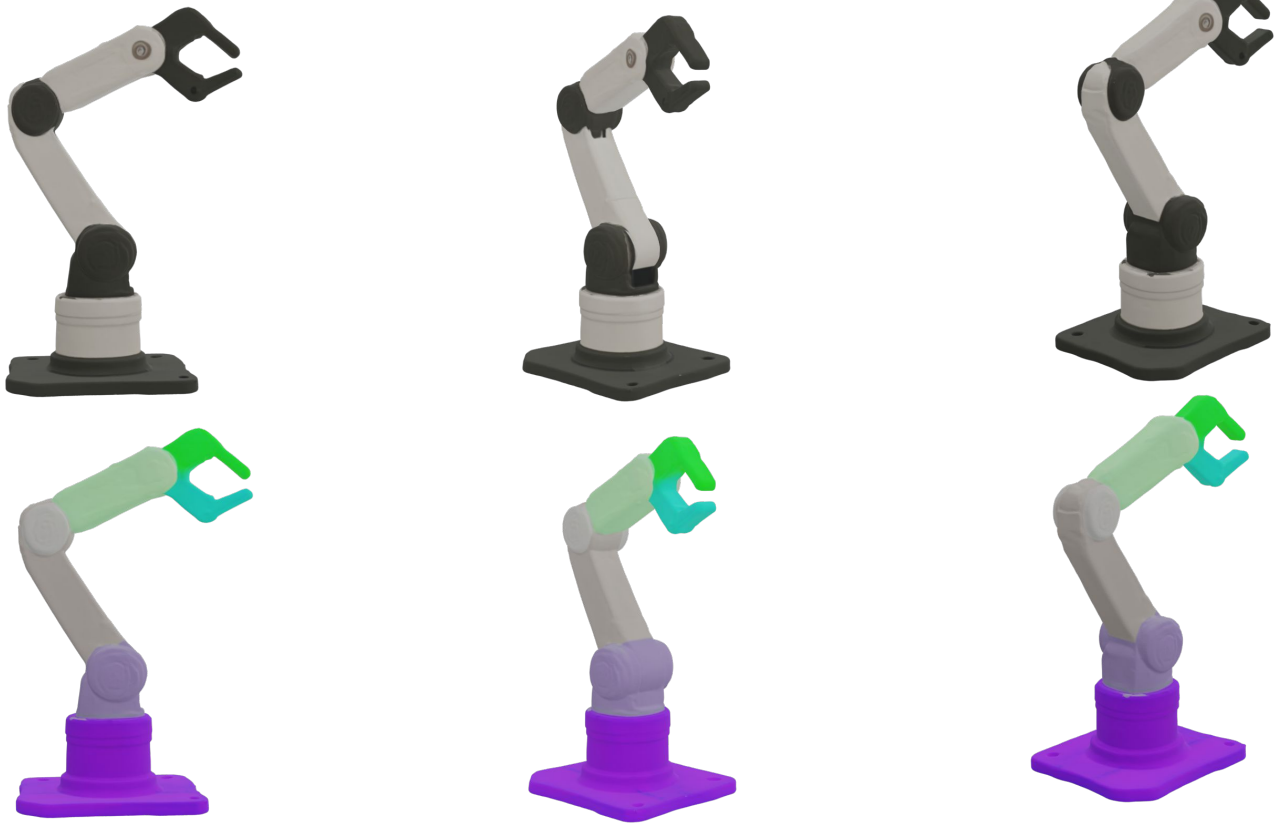
Input Image

Generated 3D object with part decomposition

Results:

- 3D Part Decomposition for zero-shot input image

Input Image



Generated 3D object with part decomposition

Results:

- 3D Part Decomposition for zero-shot input image

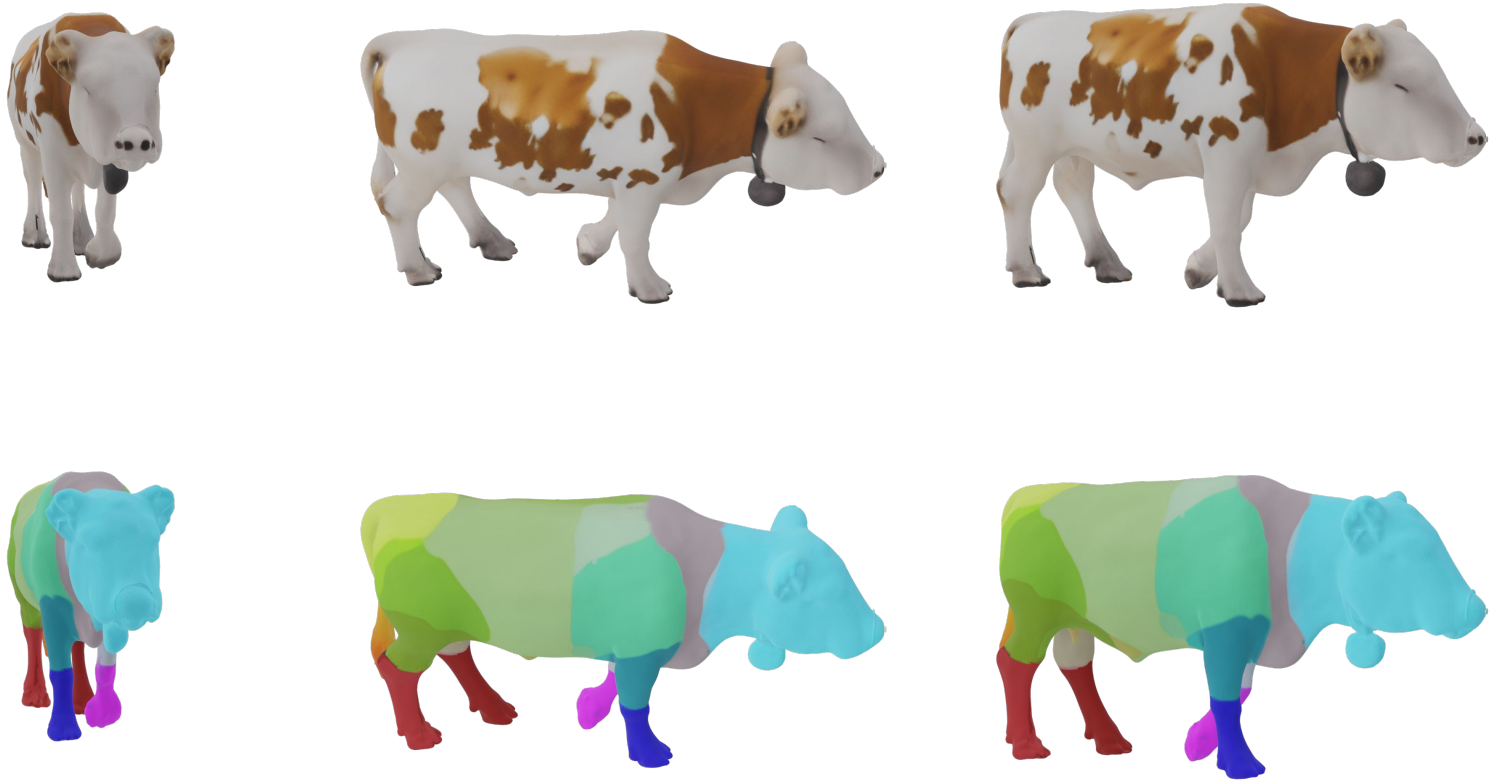
Input Image

Generated 3D object with part decomposition

Results:

- 3D Part Decomposition for real-world input image

Input Image

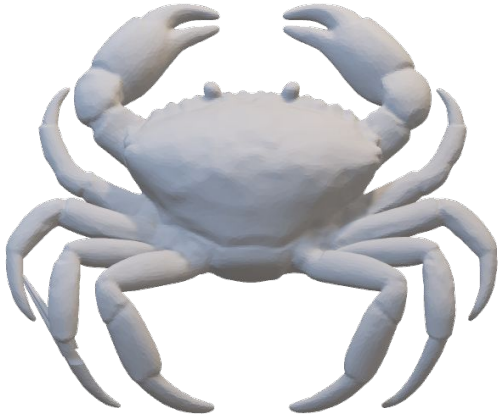


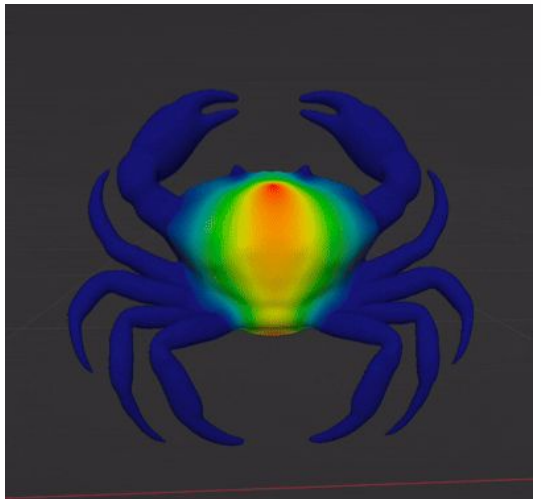
Generated 3D object with part decomposition

Results:

- 3D Part Decomposition and rigging for zero-shot input image

Input Image





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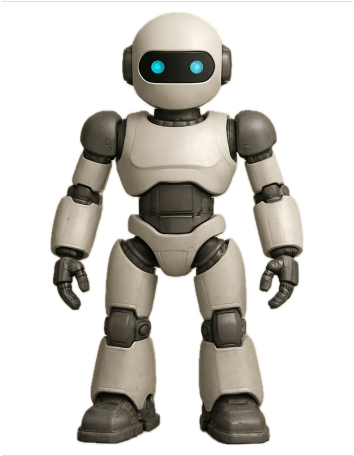
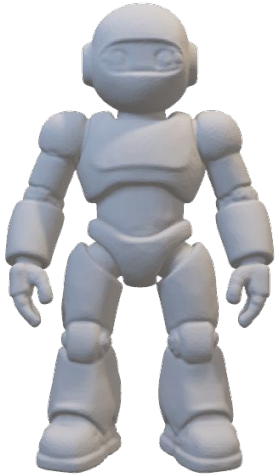
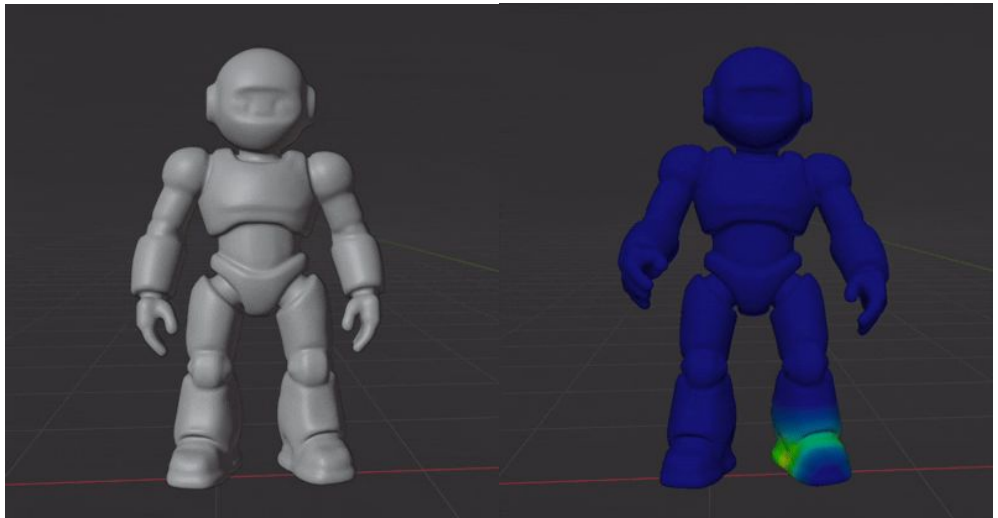


Input Image





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