Conference | 3–6 December 2024
Exhibition | 4–6 December 2024
Venue | Tokyo International Forum, Japan

Hyperstroke: A Novel High-quality Stroke Representation for Assistive Artistic Drawing

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Sponsored by acm
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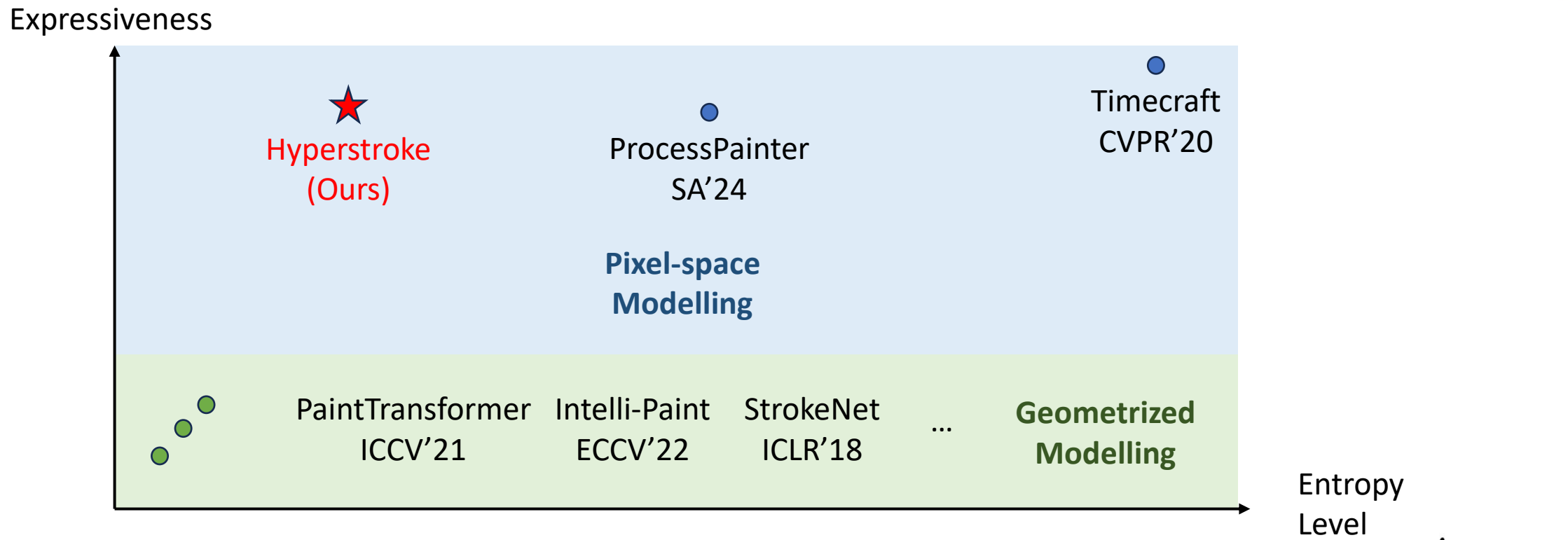
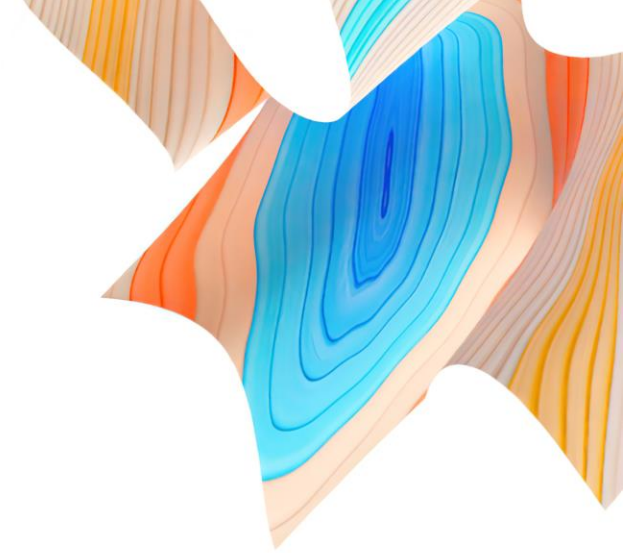
Motivation – Assistive Artistic Drawing

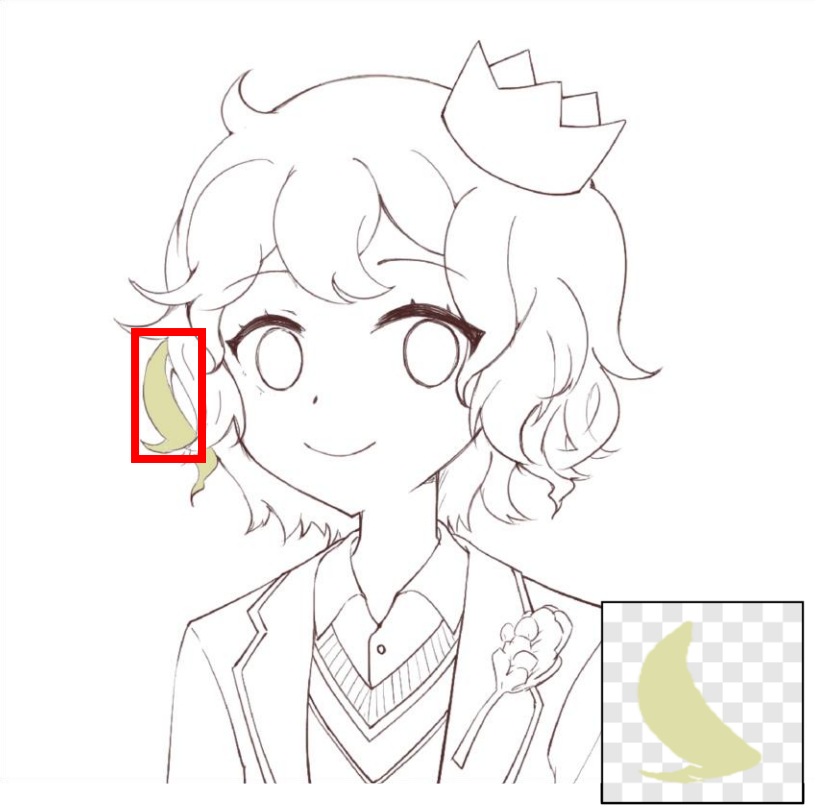
- Artists draw stroke-by-stroke instead of 1-pass generation
- Copilot-style tool, assist drawing in a suggest-then-accept manner
- Possible to be seamlessly integrated into existing artistic workflows

Stroke Modelling Landscape

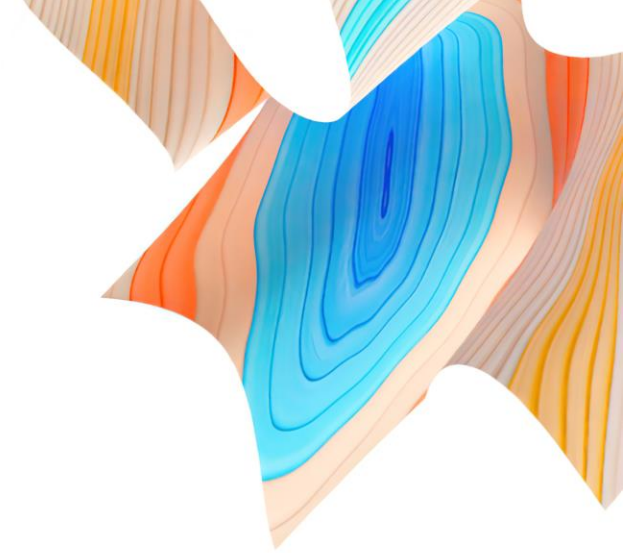




Property #1 – Strokes are additive



Stroke-based drawing process. Artwork © Linda Wei



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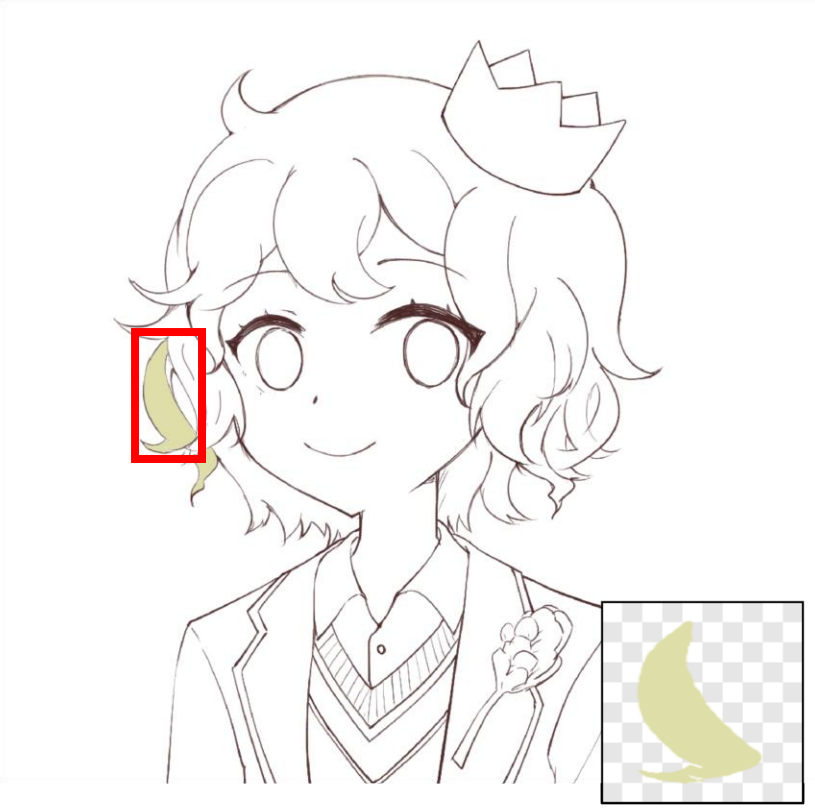


- Different strokes are independent
- Each stroke should be independent from canvas
- New stroke alpha-blended to existing canvas
- **Independence in representation**

Stroke-based drawing process. Artwork © Linda Wei

Property #2 – Strokes are Spatially Sparse

- Regardless of canvas size
- Small but detailed / Large but coarse
- Consistent amount of low-scale information
- **Compression**

Stroke-based drawing process. Artwork © Linda Wei

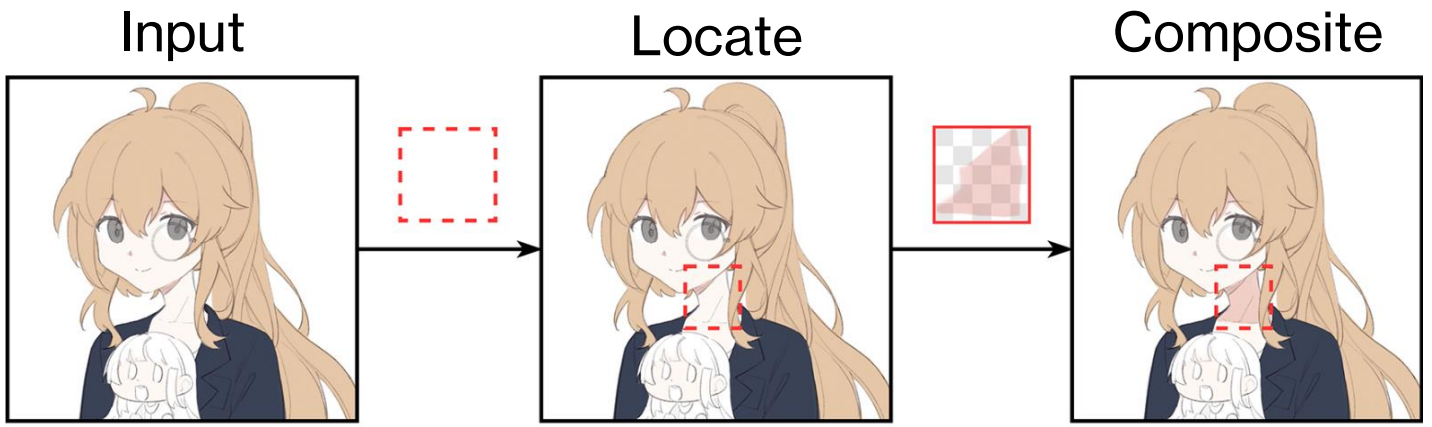
Stroke Formulation

Bounding box $\mathcal{B} = (x_1, y_1, x_2, y_2)$

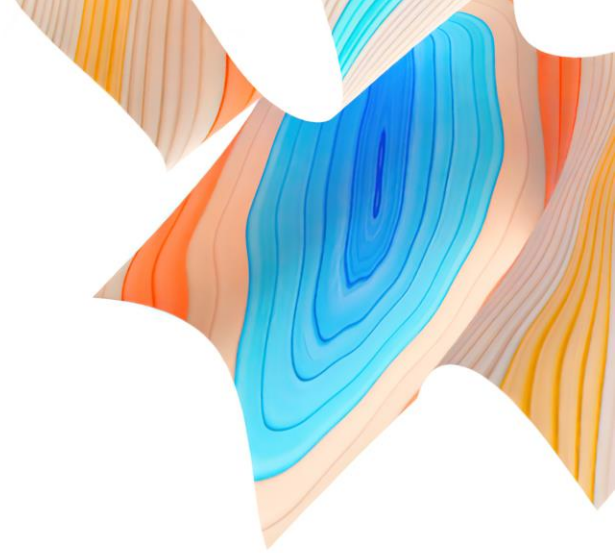
Stroke with alpha $\mathcal{I} = (I, \alpha)$

$$(A \circ \mathcal{S})(x, y) = \begin{cases} (I \cdot \alpha + A \cdot (1 - \alpha))\,(x, y) & x_1 \le x < x_2 \\ & y_1 \le y < y_2 \\ A(x, y). & \text{otherwise} \end{cases}$$

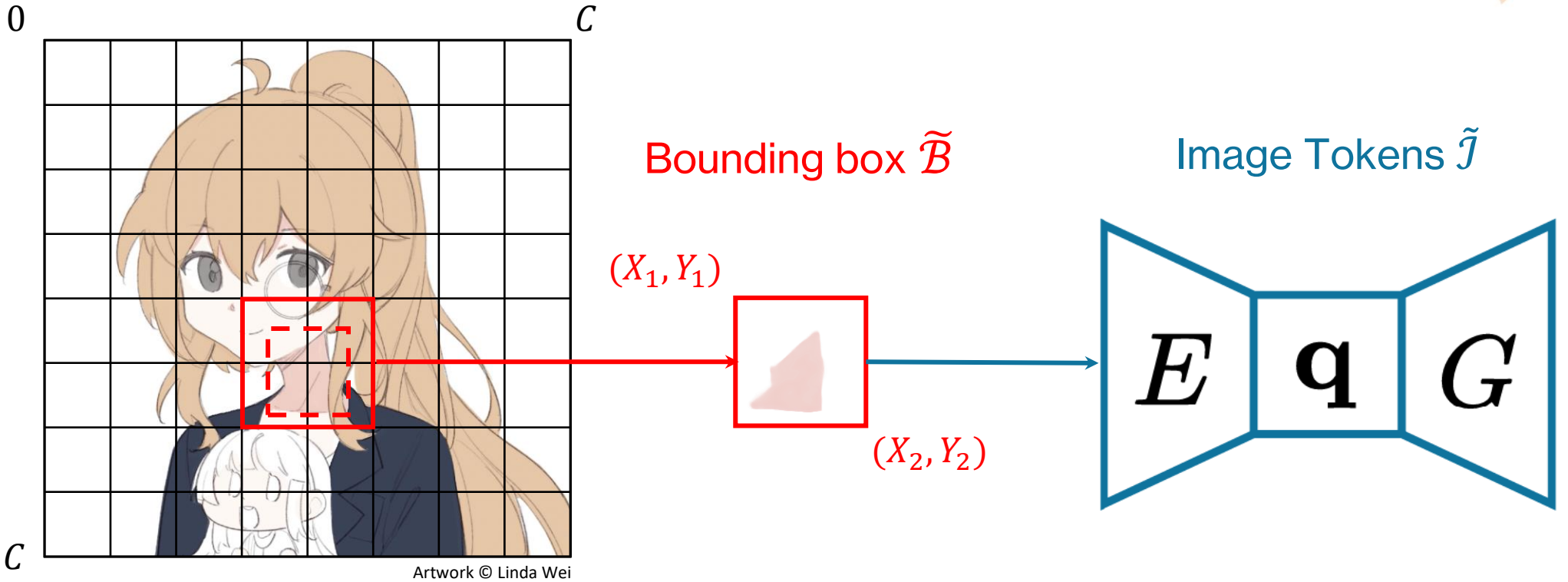
$$\mathcal{S} = \langle \mathcal{B}, \mathcal{I} \rangle$$



Artwork © Linda Wei



Hyperstroke Tokens

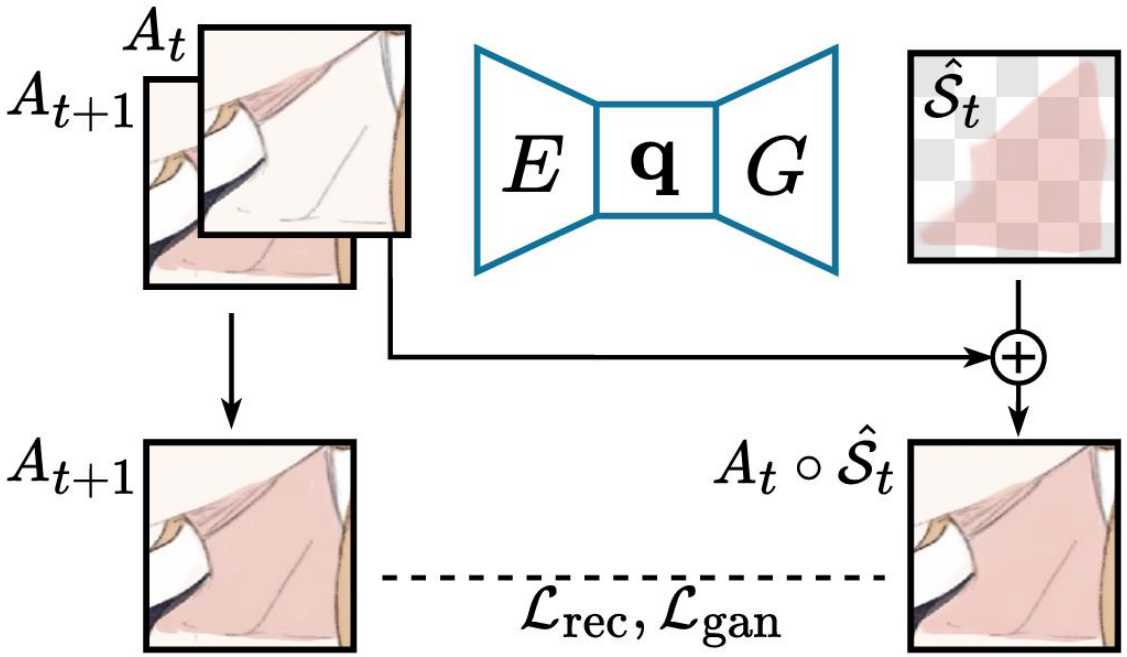


Artwork © Linda Wei

Learning Hyperstroke

- Alpha stroke data is scarce in the wild
- Synthesizing would overcomplicate the representation
- **Learning from timelapse videos**

Learning from Real-life Incremental Drawing



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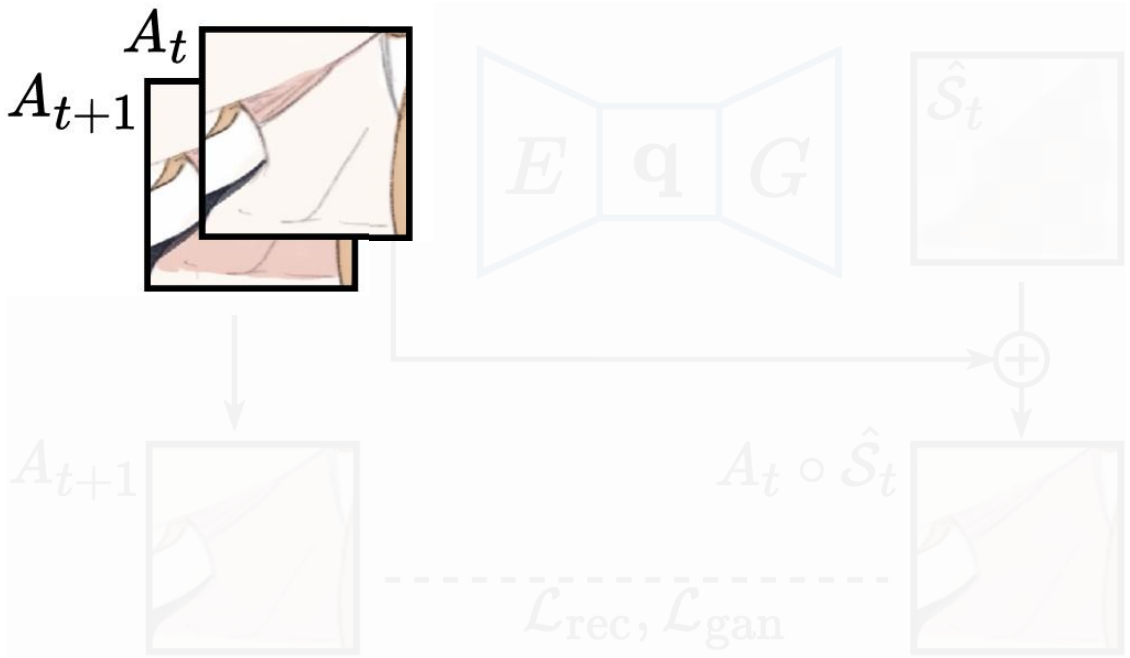

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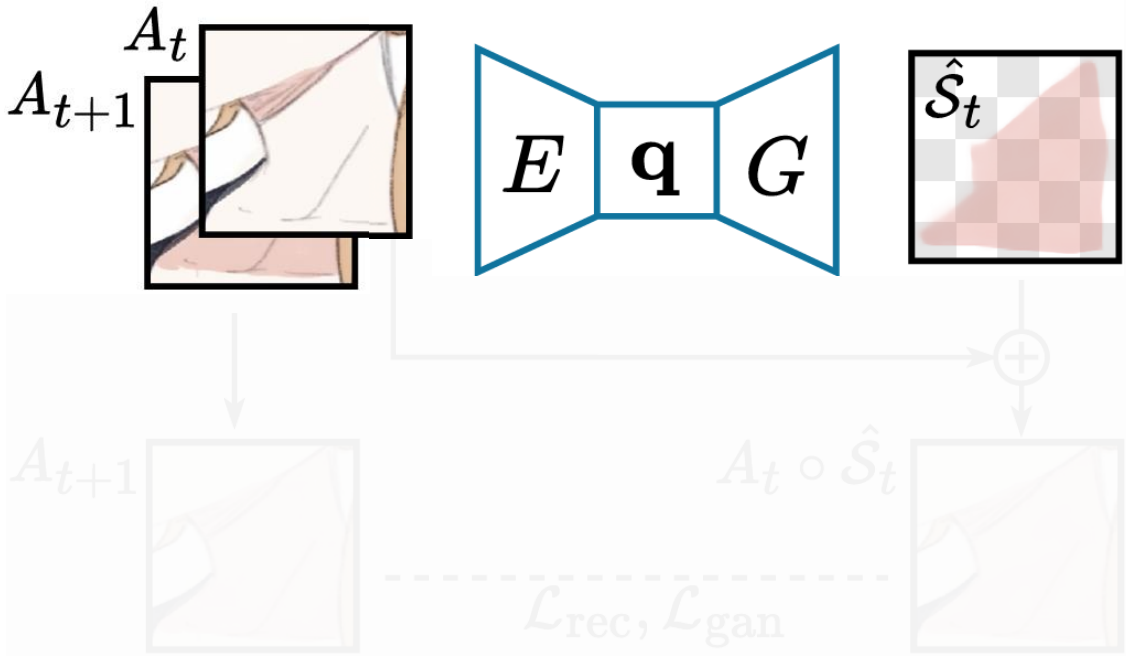

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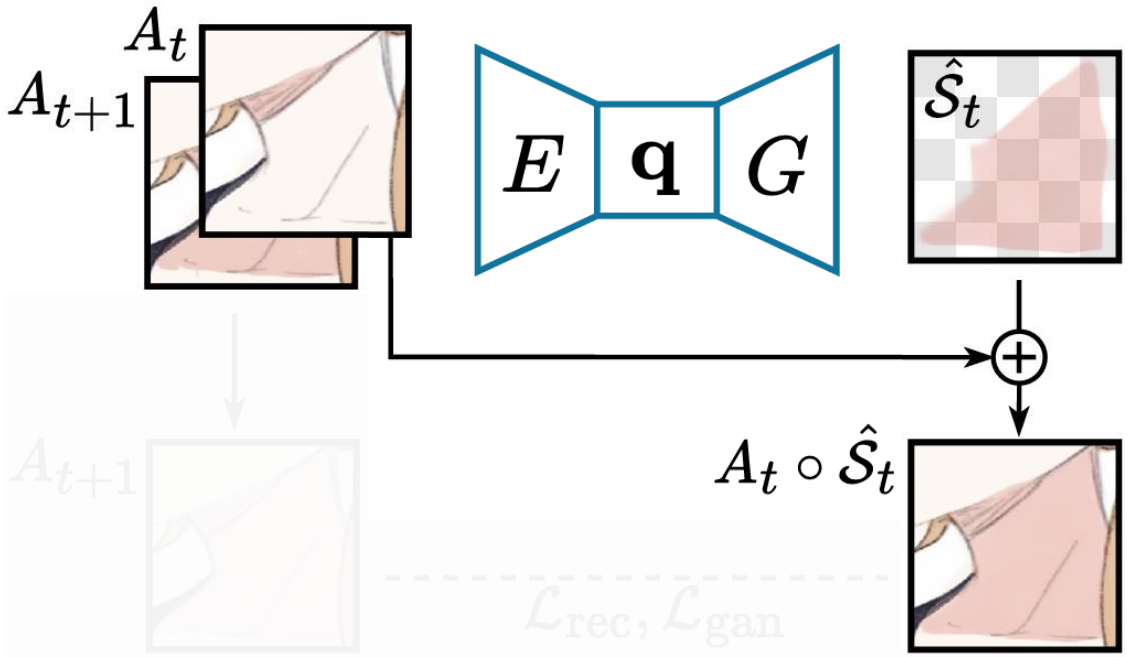

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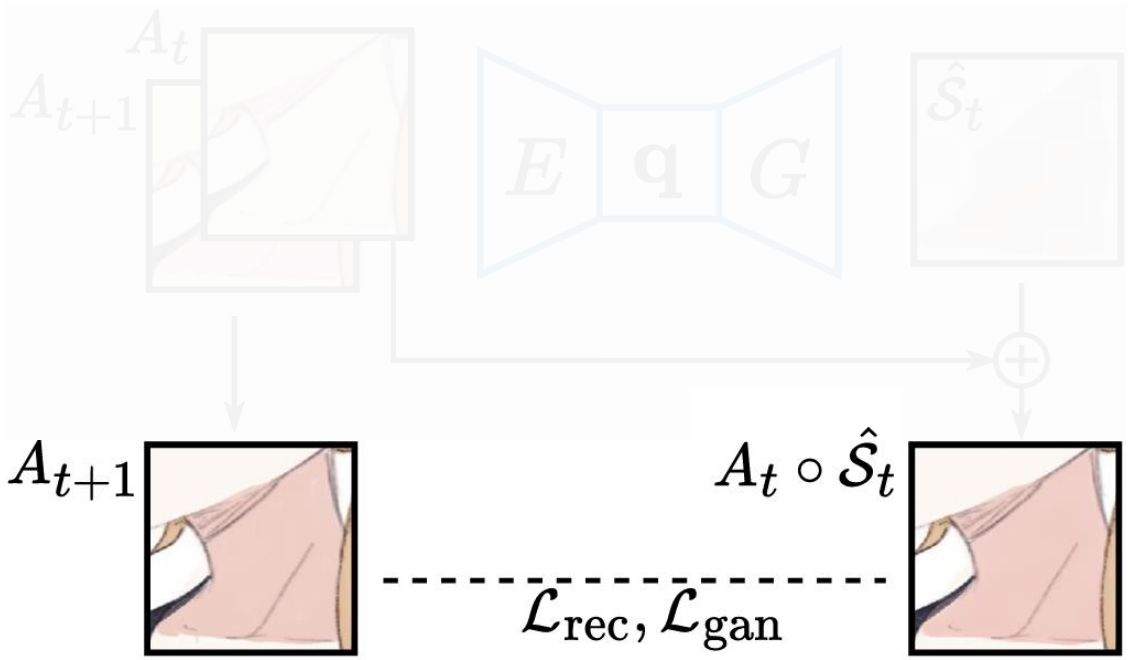

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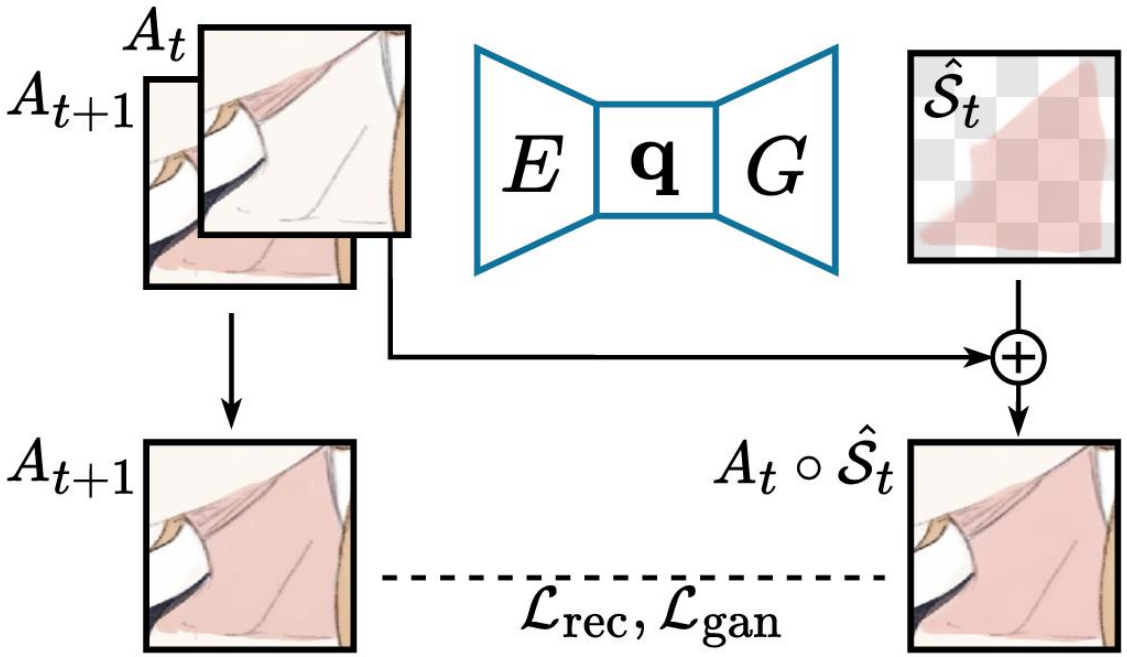
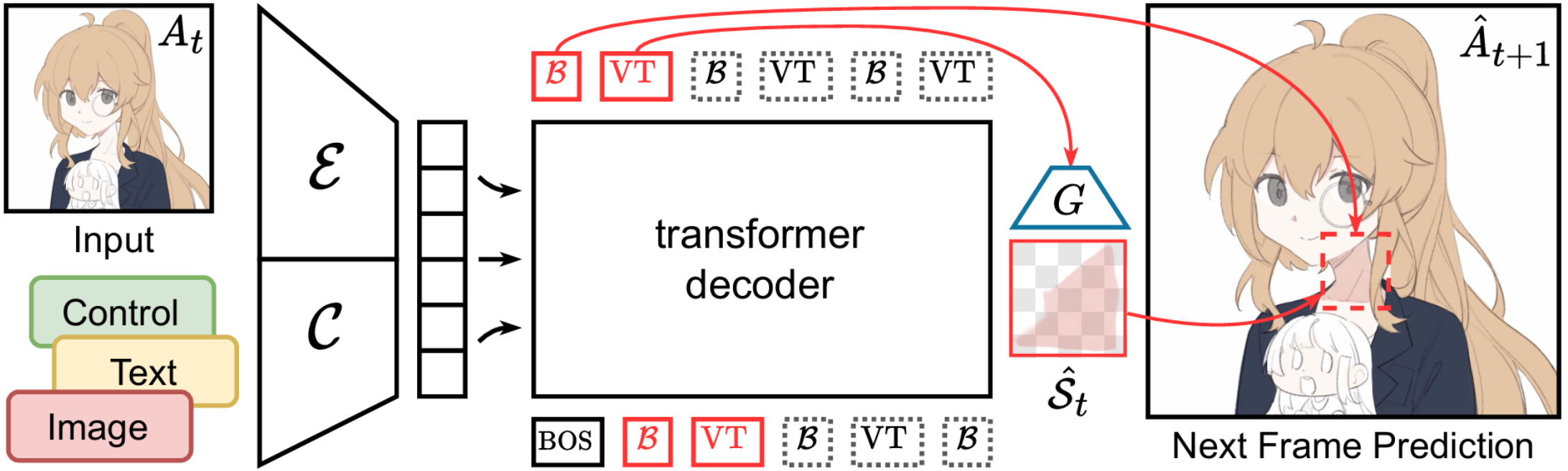


Application
Predictive Incremental Drawing



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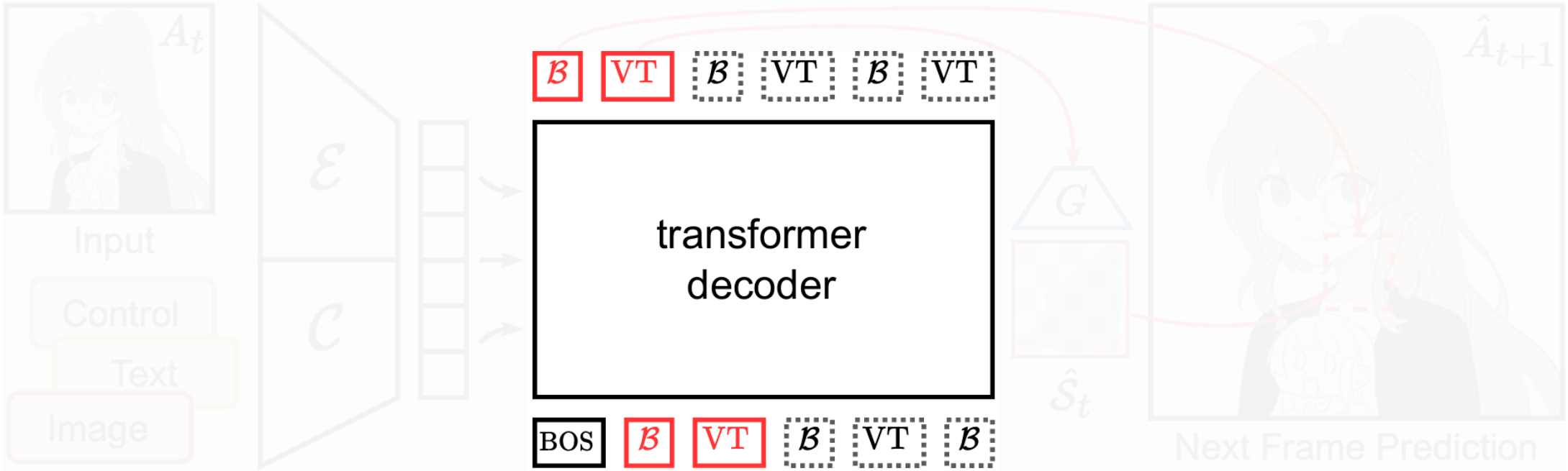

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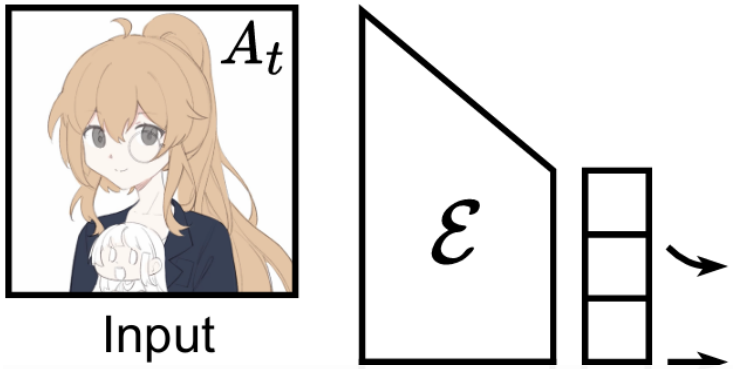

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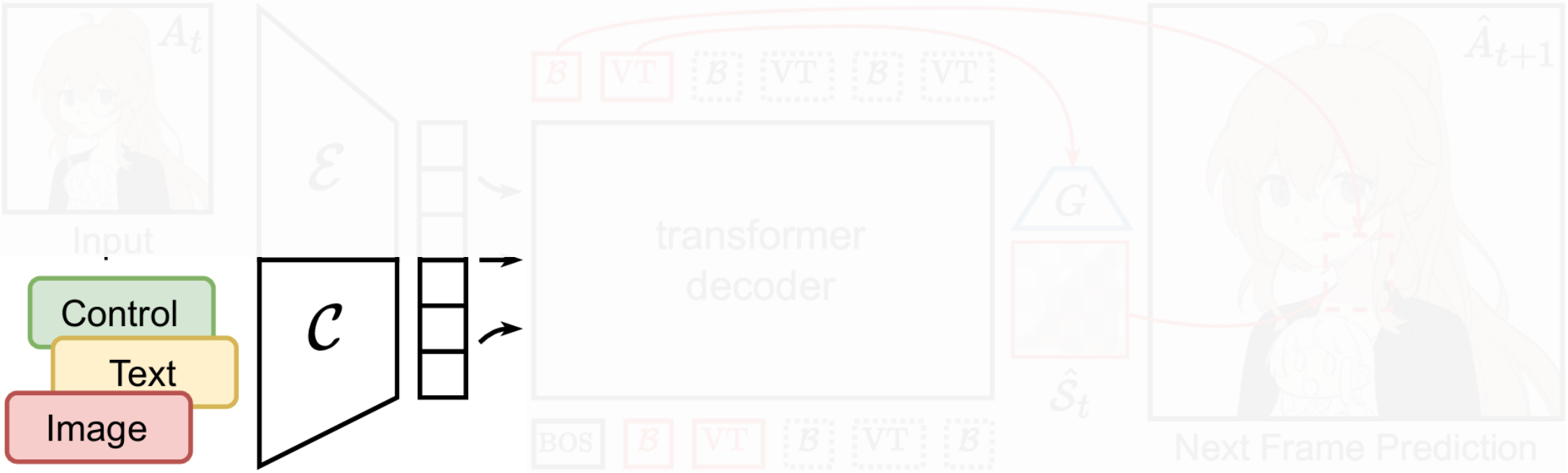

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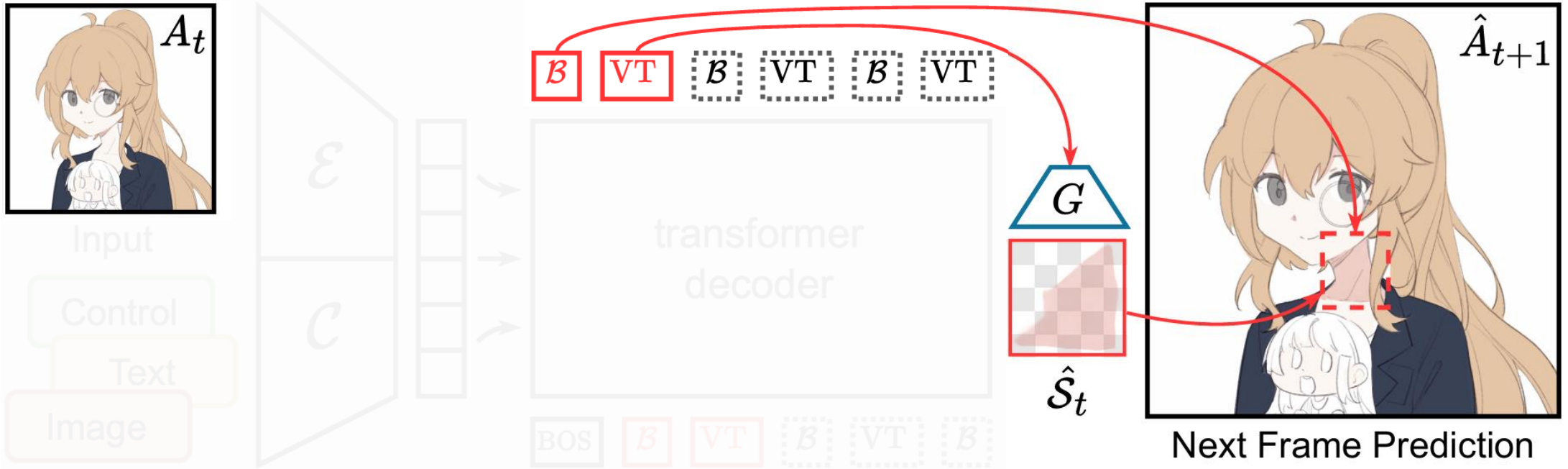

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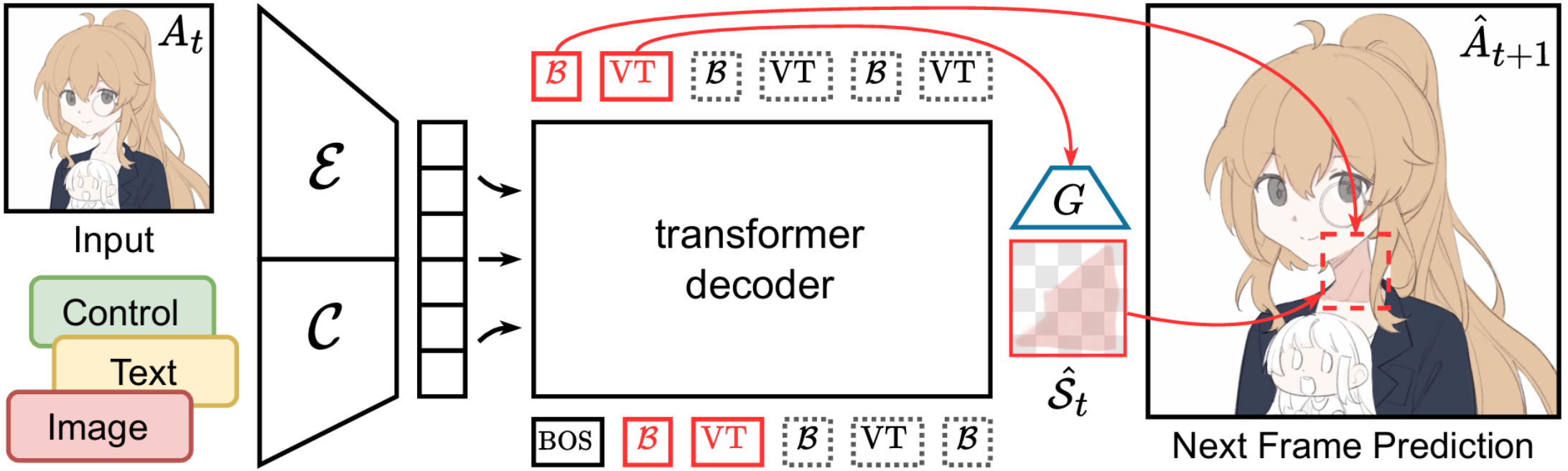
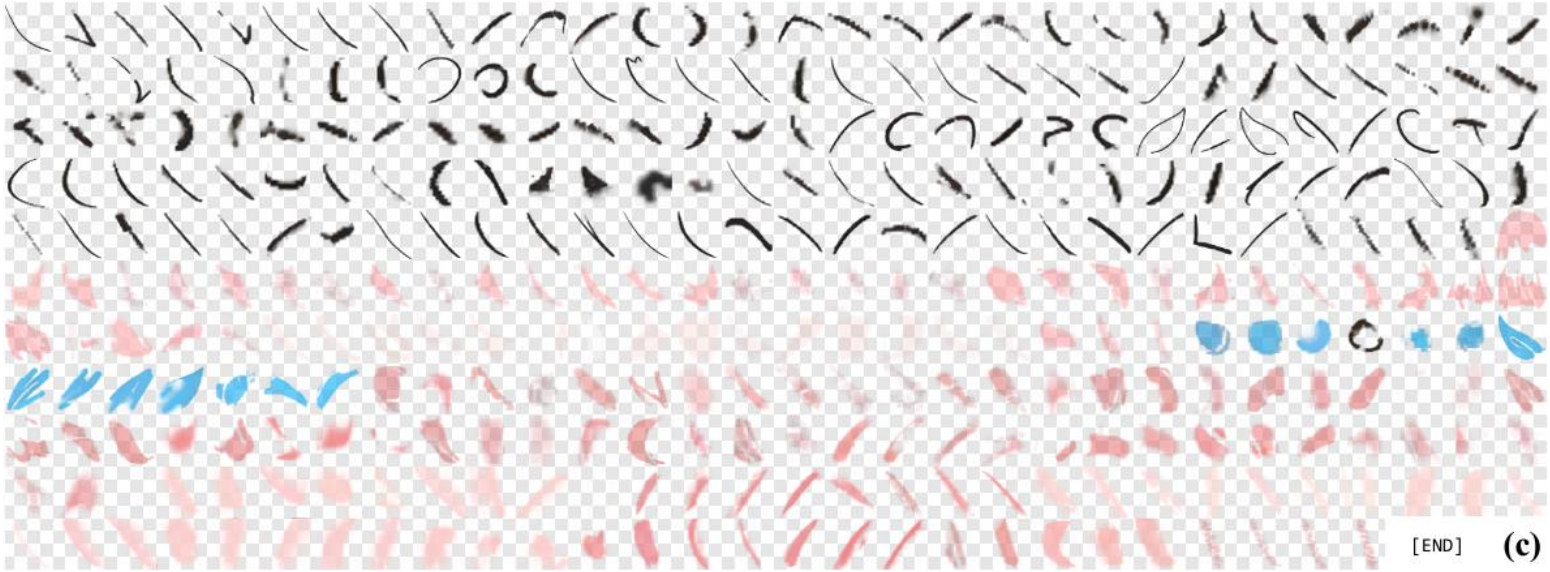


Results – Stroke Reconstruction

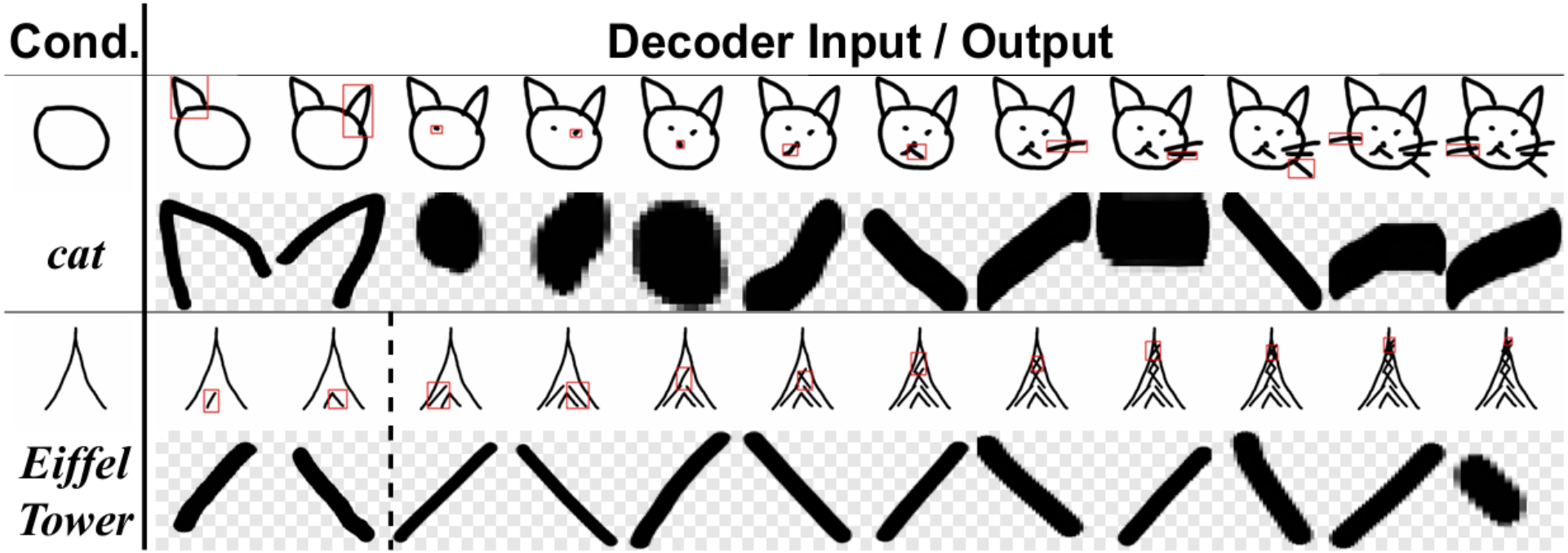
Artwork © Hao Chen



Timelapse Video

Reconstruction of strokes extracted from timelapse video

Results – Predictive Incremental Drawing



Future Works

- Scale up to real-life assistive drawing
- Generative model-assisted drawing software

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Thanks!