Detecting and Restoring Non-Standard Hands in Stable Diffusion Generated Images

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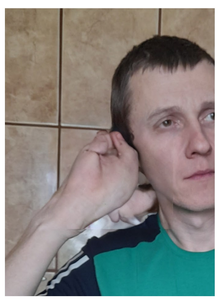
COMP 8755

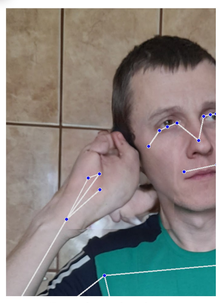
Overview

We introduce a pipeline using a fine-tuned YOLO, MediaPipe, ControlNet and fine-tuned Instruct-Pix2Pix model to detect and restore non-standard hands in stable diffusion generated images. Finally, we used FID to verify the effectiveness of the pipeline.


Non-standard hand

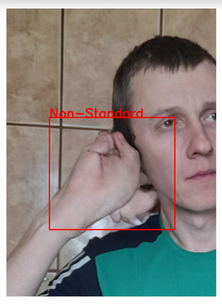
#2 Body Pose Estimation

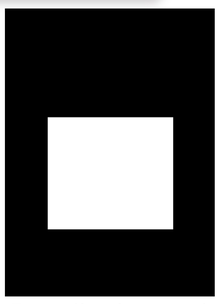
MediaPipe offers advanced vision-based machine learning techniques, detecting full human skeletons and specifically identifying three hand landmarks. This enables reliable hand size, position, and gesture recognition, even in blurred images, and distinguishes palm orientation.


Body skeleton

#1 Non-Standard Hand Detection

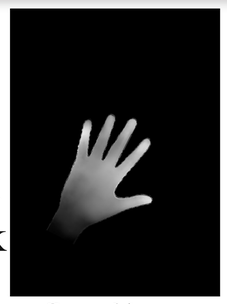
We use a fine-tuned YOLOv8 to detect both standard and non-standard hands. Then standard hands are transformed into a mask called "bounding box mask" for future processing.

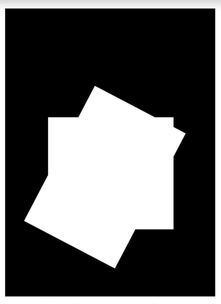

Bounding box

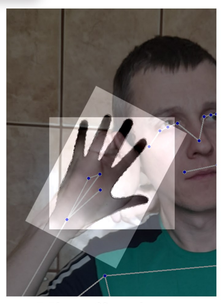

Bounding box mask

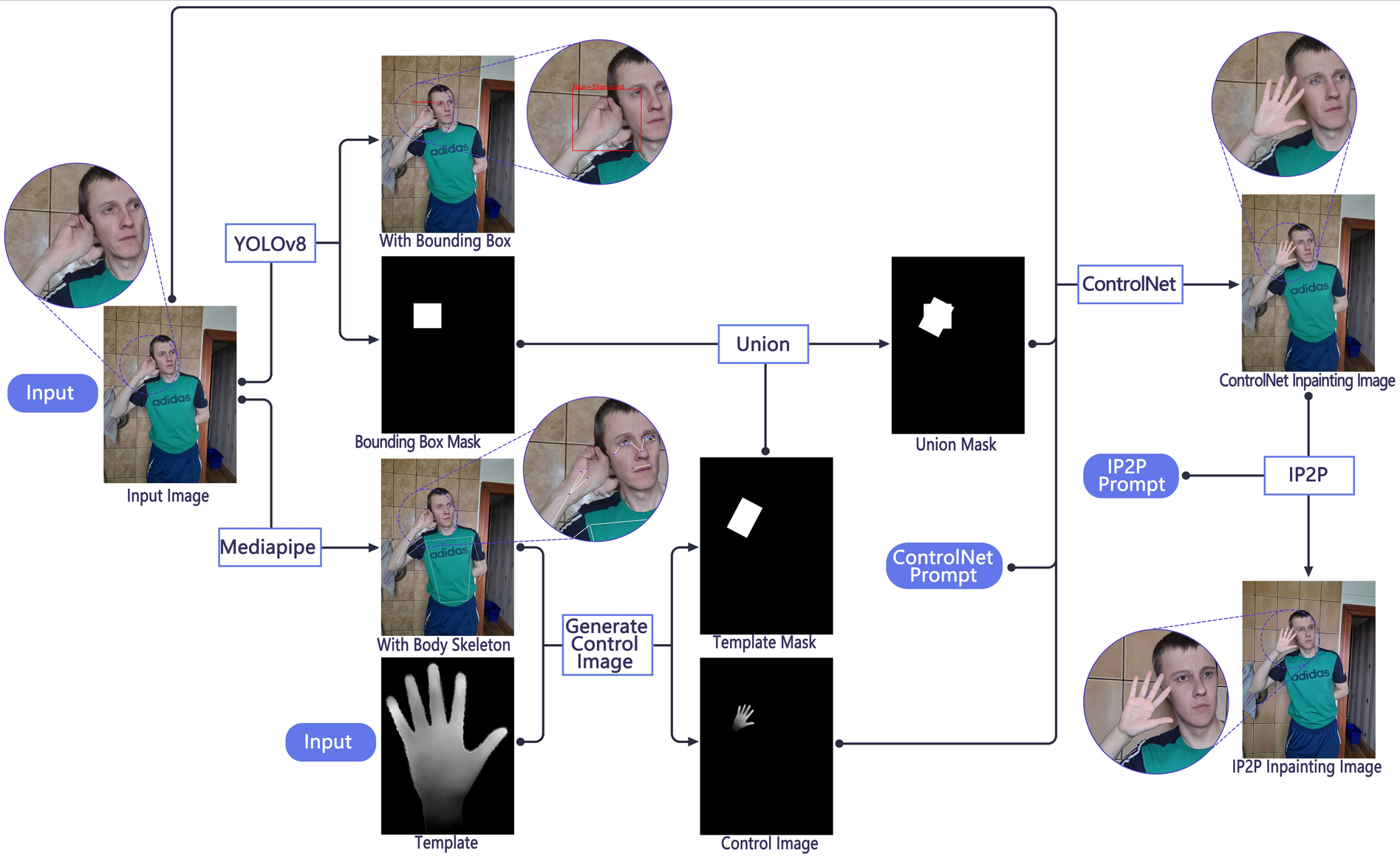
#3 Control Image Generation

Apply MediaPipe and YOLO to produce control image. Take the union of template mask and bounding box mask to get the union mask.


Control image

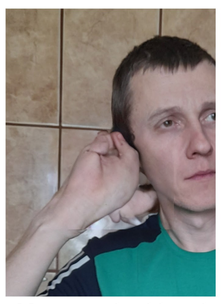

Union mask


Visualization



#4 ControlNet

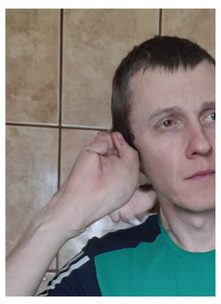
We use ControlNet with the union mask to target specific regions in the image. The control image guides hand positioning and gestures.

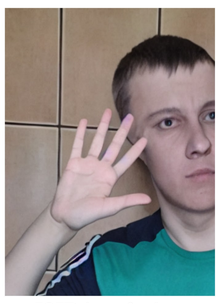

Non-standard hand


ControlNet inpainting

#5 IP2P

We fine-tuned the IP2P model for image enhancement. This process results in a more lifelike and high-fidelity hand texture.


Non-standard hand


I2IP inpainting

#6 Result

We use FID (Frechet Inception Distance) to evaluate our restored results. A lower FID represents a more realistic image. The following results show our method is effective.

FID with standard hand	FID
Non-standard hand	52.92
ControlNet inpainting	41.19
IP2P inpainting	33.23

SCAN AND TRY

http://gradio.yiqun.io

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