

Anime Sketch Colorization by Component-based Matching using Deep Appearance Features and Graph Representation

Thien Do*, Van Pham, Anh Nguyen, Trung Dang, Quoc Nguyen, Bach Hoang, Giao Nguyen

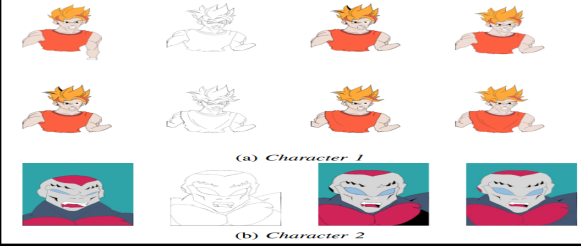
Problem

- The cost of colorization is expensive.
- The artists need to color the image although it does not change too much, so time-consuming.

Results

Model	Acc-component	Acc-pixel
GAN	13.52%	95.96%
Ours	63.14%	96.30%

Outputs



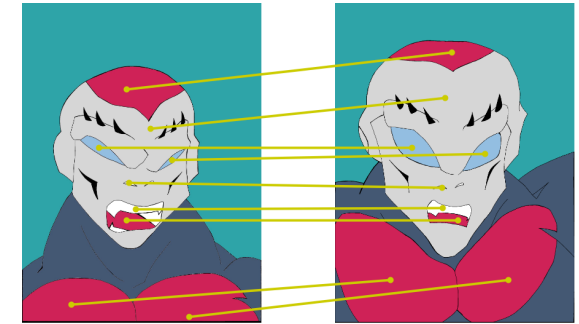
(a) Reference selection

(b) Component extraction

(c) CNN-based matching

(d) Graph-based matching

(e) Color propagation



CNN-based matching

$$j^* = \arg \min_j \frac{\|f_{t_i} - f_{r_j}\|_2^2}{\max(\|f_{r_i}\|_2^2, \|f_{t_j}\|_2^2)} \quad (1)$$

$$\text{subject to} \begin{cases} D(\text{center}_i, \text{center}_j) < t_d \\ t_{a_{\min}} \leq A(\text{area}_i, \text{area}_j) \leq t_{a_{\max}} \\ \frac{\|f_{t_i} - f_{r_j}\|_2^2}{\max(\|f_{r_i}\|_2^2, \|f_{t_j}\|_2^2)} < t_f \end{cases} \quad (2)$$

Graph-based matching

$$Q_{\text{node}}(i_1, i_2, j_1, j_2) = Q_{\text{shape}}(i_1, j_1) \cdot Q_{\text{shape}}(i_2, j_2) \quad (6)$$

$$Q_{\text{shape}}(i_1, j_1) = \exp \left(-\frac{\gamma}{2} \frac{\|f_{t_{i_1}} - f_{r_{j_1}}\|_2^2}{\max(\|f_{t_{i_1}}\|_2^2, \|f_{r_{j_1}}\|_2^2)} \right) \quad (7)$$

$$Q_{\text{shape}}(i_2, j_2) = \exp \left(-\frac{\gamma}{2} \frac{\|f_{t_{i_2}} - f_{r_{j_2}}\|_2^2}{\max(\|f_{t_{i_2}}\|_2^2, \|f_{r_{j_2}}\|_2^2)} \right) \quad (8)$$

Optimize

$$Q(i_1, i_2, j_1, j_2) = Q_{\text{edge}}(i_1, i_2, j_1, j_2) \times Q_{\text{edge}}(i_1, i_2, j_1, j_2)$$