Complex Handwriting Trajectory Recovery: Evaluation Metrics and Algorithm (Supplementary Material)

1 Simulation implementation details

In this section, we describe the simulation implementation details of the errors and the changes mentioned in Section 3.3. We simulate a series of common trajectory recovery errors, including stroke insertion, stroke deletion, trajectory point-level, and stroke-level drift from the ground-truth trajectories, as illustrated in Fig. 1.

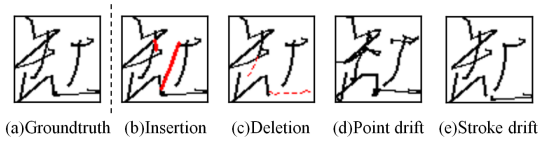

Fig. 1. Common errors of trajectory recovery.

Insertion error. Extra strokes and/or stroke segments may be added by mistake to the predicted trajectories, which results in insertion errors. To simulate these errors, we first extract samples with more than 3 strokes from the testing dataset, since the error occurrence frequency increases along with the character's stroke number. After that, for each sample, we randomly pick two consecutive strokes from its stroke sequence and connect them by one or half a stroke (denoted as $s = 1.0$ and $s = 0.5$, respectively). Totally, we pick three pairs of consecutive strokes for the insertion. As shown in Fig. 2(a), the error magnitude is determined by the number of inserted strokes $s \in \{0, 0.5, ..., 3.0\}$.
Deletion error. There is the stroke missing phenomenon in recovered trajectories. To simulate this deletion error, we follow the same data selection process as the insertion error mentioned above. Instead of inserting a stroke, we randomly pick a stroke and delete it, in whole or in part. Totally, we pick three strokes for the deletion. As shown in Fig. 2(b), the error magnitude is determined by the number of deleted strokes $s \in \{0, 0.5, ..., 3.0\}$.
Trajectory point-level and stroke-level drifting error. To simulate these two kinds of errors, we randomly pick half of the total trajectory points or strokes from a sample, and shift them by a same distance but to different directions. As shown in Fig. 2(c)(d), the error magnitude is determined by the drifting distance $d \in \{0, ..., 6\}$.

Furthermore, the impacts of **stroke width** and **total trajectory point number** changes are also analyzed. Specifically, as shown in Fig. 2(e), to simulate the former change, we generate a series of bitmaps from a ground-truth trajectory with different stroke widths $w \in \{1, ..., 7\}$. As shown in Fig. 3, as for the latter change, we resample a ground-truth trajectory through different resampling rates $r \in \{1.0, 1.5, ..., 4.5\}$.

2 Statistics of multiple scripts datasets

Statistics of datasets mentioned in Section 5.1 are given as follows.

Table 1. Statistics of multiple scripts datasets

datasets	Training			Testing		
	samples	writers	classes	samples	writers	classes
Chinese	898,573	240	3,755	224,559	60	3,755
English	42,413	816	52	10,598	204	52
Japanese	1,695,689	163	4,438	1,291,896	108	3,356
Indic	50,683	117	156	26,926	52	156

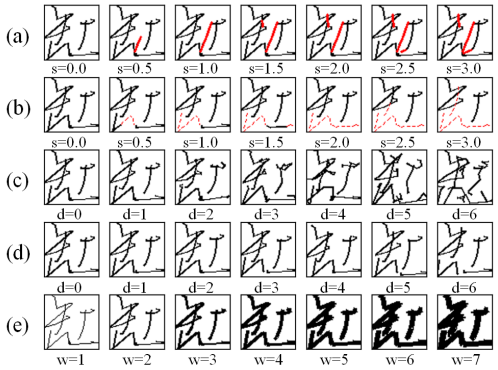

Fig. 2. Visualization of simulated errors and changes: (a) insertion error, (b) deletion error, (c) point-level drift error, (d) stroke-level drift error and (e) stroke width change, where s denotes the number of strokes in the error, d the drifting distance, and w the stroke width.

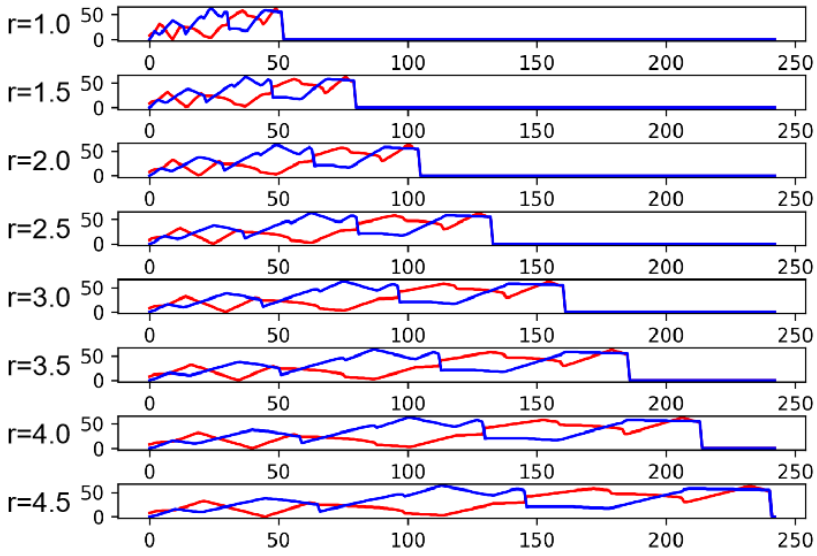

Fig. 3. Coordinate sequences (the coordinate changes over time steps) of different sampling rates. Coordinates of X and Y axis are illustrated in red and blue respectively, and r is the sample rate.