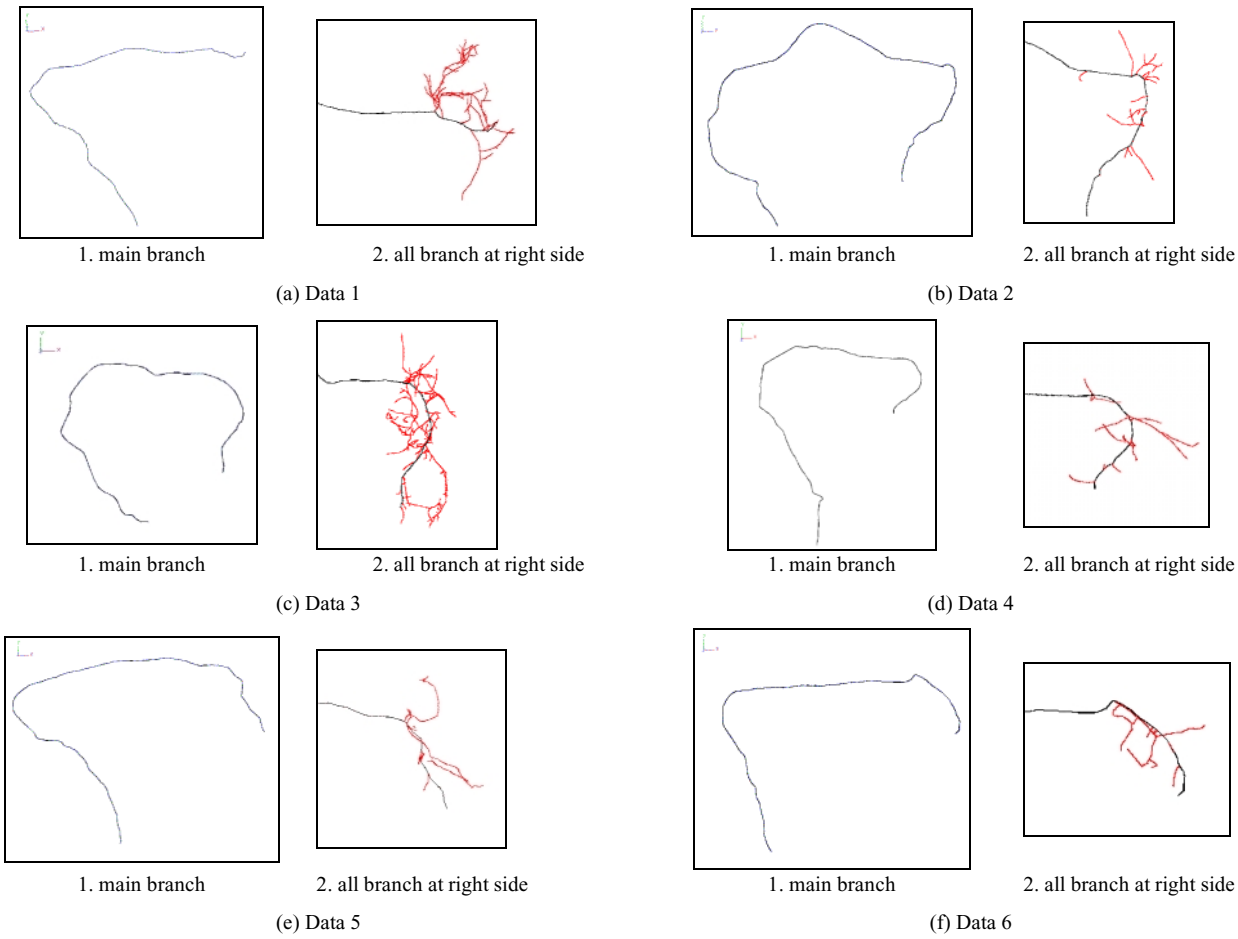

Fig. 19. Extraction result of form of premotor neurons using our interpolation method.

and Eqs. (12) and (13) mean covariance and average of x-coordinate and y-coordinate respectively. Therein n is the number of coordinates of nerve fibers. It is very difficult to identify the LAL region because the LAL region shows close similarity to the other surrounding regions. Then in this paper, LAL region is approximated by a region within d from origin; d is threshold of distance from origin and set empirically. Three eigenvalues are obtained from Eq. (10): λ_1, and λ_2, and λ_3 ($\lambda_1 \geq \lambda_2 \geq \lambda_3$). It is thought that λ_1 is the widest breadth of distribution and it means extensity of longitudinal direction. λ_2 represents a characteristics of Key point 2. Then λ_2 is set as Feature 4.

$$V = \begin{pmatrix} \sigma_{xx} & \sigma_{xy} & \sigma_{xz} \\ \sigma_{yx} & \sigma_{yy} & \sigma_{yz} \\ \sigma_{zx} & \sigma_{zy} & \sigma_{zz} \end{pmatrix}. \tag{10}$$

Where

$$\sigma_{xy} = \frac{1}{n}\sum_i (x_i - \bar{x})(y_i - \bar{y}) \tag{11}$$

$$\bar{x} = \frac{1}{n}\sum_i^n x_i \tag{12}$$

$$\bar{y} = \frac{1}{n}\sum_i^n y_i. \tag{13}$$

Table 4. Physiological response results and experimental data.

Physiological response	Data	Type
Flip-Flop	Data 1	Type A
Long-lasting inhibition	Data 2 and Data 3	Type B
	Data 4, Data 5, and Data 6	Type C

[Feature 5]

Nerve fibers of each type tend to extend in a characteristic manner, respectively (Key point 3). Then, an angle between the main branch and sub-branch is calculated with Eq. (15) as indicated in Fig. 17 in order to represent direction sub-branch extend. Therefore variation and mean of this angle are set as Feature 5. Feature 5 is obtained with Eqs. (14), (15), and (16).

$$f_{5-1} = \bar{\theta} = \frac{1}{m}\sum_{i=1}^{m} \theta_i. \tag{14}$$

Where

$$\theta_i = \cos^{-1}\left(\frac{\overrightarrow{a_i} \cdot \overrightarrow{b_i}}{\| \overrightarrow{a_i} \| \| \overrightarrow{b_i} \|}\right) \tag{15}$$

$$f_{5-2} = v_\theta = \frac{1}{m}\sum_{i=1}^{m} (\theta_i - \bar{\theta})^2. \tag{16}$$