defined a smoothing spline functional with sampling measure weights. The equivalent number of parameters dened on this functional does not depend on the distri butions of samples. The approximation of the equivalent number of parameters is derived when the number of samples becomes infinity. This approximation greatly reduced the calculation time needed to estimate the optimal smoothing. The smoothing spline calculation cost was so high that new algorithms (FMM fast multipole method) were introduced and we developed the smoothing engine which was applied to practical problems. The engine generated clear surfaces and was robust to vari

$$f\left(x_M^{(i)}, y_M^{(i)}\right) + \frac{\gamma}{\omega_M^{(i)}} d_M^{(i)} = z_M^{(i)} \quad \left(i = 1, \cdots, m\right)$$

A_M γ ${}_M$ ${}^{-1}$ P_M $\{d_M\}$ $\{z_M\}$

^{T} P_M $O_{3\times 3}$ $\{c\}$ $\{O_3\}$

$$k_A(\gamma) = \frac{\Omega}{8}\gamma^{-\frac{1}{2}}$$

Figure 1

Fig. 2

5. Plate Surface Estimation by Using LIDAR and Smoothing TPS with Sampling Measure Weights

Figure 2

$$BIC_A = m \quad \sum_{i=1}^{m} \omega_M^{(i)} \; z_M^{(i)} - f\left(x_M^{(i)}, y_M^{(i)}\right) \quad ^2$$

$$m \quad m \quad 1 \quad \frac{k_A}{m} \quad ^2$$

REFERENCES