Title
Visual Localization and Mapping with Multiple View Features

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Proposed Solution: Incorporate multiple views!

- Local image variability is modeled by a group deformation of the domain and a non-linear combination of basis elements (kernel principal components).

\[
\phi \circ I(x) = \sum_{i=1}^{k} \alpha_i \psi_i(Ax + b)
\]

- A kernel function computes dot products in the high dimensional space \( F \):

\[
x \in \Omega \quad \phi : \mathbb{R}^n \rightarrow \mathbb{R}^N \quad \psi : \mathbb{R}^n \rightarrow \mathbb{F}
\]

- Kernel principal component analysis is used to develop the descriptor.

\[
k(w, y) = \exp\left(-\frac{\|w - y\|^2}{2\sigma^2}\right)
\]

- Match quality is determined by the residual of the projection onto the principal components.

\[
\left\|\psi(y) - \sum_{i=1}^{K} \langle \psi(y), \phi_i \rangle \phi_i \right\|_2^2
\]

- Structure of a scene and motion of the camera are determined by an extended Kalman filter. The descriptors are developed at the same time.

- When matching scenes is required, the descriptors are used to establish correspondence and the geometric transformation is recovered.