Use a Descriptive Title

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April 28, 2020

Version	*Date*	*Comments*
0.1	April 28, 2020	Initial writing

Abstract

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1 Definitions

Use what you need in the symbols and functions defined in Table 1, Table 2, and Table 3. Stay consistent with the lab's notation and your own symbols.

Table 1: General symbol definitions.

Symbol	*Explanation*
a	A scalar
$\boldsymbol{v}$	A vector of D dimensions, $\boldsymbol{v} = [v_1, v_2, \cdots, v_d]^T$
$\mathcal{S}$	A set of vectors with N elements in it, $\mathcal{S} = \{\boldsymbol{v}_1, \boldsymbol{v}_1, \cdots, \boldsymbol{v}_n\}$
$\boldsymbol{S}$	Matrix representation of a set $\mathcal{S}$ of size $D \times N$, $\boldsymbol{S} = [\boldsymbol{v}_1, \boldsymbol{v}_1, \cdots, \boldsymbol{v}_n]$
$\boldsymbol{a} \cdot \boldsymbol{b} = c$	Dot product of two vectors, also known as inner product
$\boldsymbol{a}^T \boldsymbol{b} = c$	Inner product of two vectors, also known as dot product
$\mathrm{f}(\cdot)$	A function, short version of function$(\cdot)$, same font as log, exp, arg min
$\lVert\boldsymbol{v}\rVert_2$	Euclidian distance or ℓ^2-distance, $\lVert\boldsymbol{v}\rVert_2 = \sqrt{\boldsymbol{v}^T\boldsymbol{v}}$

Table 2: Symbol definitions for point clouds and registration.

Symbol	*Explanation*
d	Indices used for the dimension of both the point clouds with $d = \{1, 2, \cdots, D\}$
i	Indices used for a point in the reading (moving) point cloud with $i = \{1, 2, \cdots, I\}$
$\boldsymbol{p}_i$	A point in the reading point cloud, $\boldsymbol{p} = [x, y, z]^T$ for a 3D point
$\mathcal{P}$	A set of discrete sample points representing the reading (moving) point cloud, $\mathcal{P} = \{\boldsymbol{p}_1, \boldsymbol{p}_1, \cdots, \boldsymbol{p}_i\}$
$\boldsymbol{P}$	Matrix version of $\mathcal{P}$ with a size of $D \times I$
$j, q_j, \mathcal{Q}, \boldsymbol{Q}$	Same definitions but for the reference (static) point cloud
k	Indices used when points are matched (points in $\boldsymbol{p}$ matched to $\boldsymbol{q}$) with $k = \{1, 2, \cdots, K\}$
$\boldsymbol{e}_k$	Matched error between two points, $\boldsymbol{e}_k = \boldsymbol{p}'_i - \boldsymbol{q}_j$
$\mathcal{E}, \boldsymbol{E}$	Set and its matrix version of size $D \times K$ containing all matched error
$\boldsymbol{x}$	States of the robot
$\boldsymbol{x}_k$	States of the robot at the same time as the point $\boldsymbol{p}_k$
$\boldsymbol{p}'_k$	Moved reading point cloud as $\boldsymbol{p}'_k = \mathrm{T}(\boldsymbol{x}, \boldsymbol{p})$
$\boldsymbol{R}$	Rotation matrix of size $D \times D$
$\boldsymbol{T}$	Rigid transformation matrix of size $(D+1) \times (D+1)$
$\boldsymbol{n}_{q_k}$	Normal vector representing a plane at $\boldsymbol{p}_k$
$\boldsymbol{W}_{\boldsymbol{q}_k}$	Covariance matrix of size $D \times D$ expressed in the reference frame of $\boldsymbol{q}_k$

Table 3: Function Definitions.

Function	*Explanation*
$\mathrm{T}(\boldsymbol{x}, \boldsymbol{p})$	Function transforming moving the reading point cloud
$\mathrm{T}(\boldsymbol{x}, \boldsymbol{p}_k)$	Rigid transformation with all points in the reading using the same states
$\mathrm{T}(\boldsymbol{x}_k, \boldsymbol{p}_k)$	Flexible transformation with each point moved by their own states
$\mathrm{R}(\boldsymbol{x})$	Function building a rotation matrix from the states
$\mathrm{J}(\boldsymbol{x}) = a$	Objective function also known as error function, loss function, cost function
$\mathrm{match}(\mathcal{P}, \mathcal{Q}) = \mathcal{E}$	Matching function generating a set of error vectors $\mathcal{E}$ with K elements in it

2 Your Technical Content 1

Here some examples of references **Pomerleau2013**, **Pomerleau2014**. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

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