Lecture Comprehension, Rotation Matrices (Chapter 3.2.1, Part 1 of 2)

TOTAL POINTS 4

1. For the rotation matrix R_{ba} representing the frame {a} relative to {b}, — 1 / 1 point

- [ ] the rows are the x, y, z axes of {a} written in {b} coordinates.
- [x] the columns are the x, y, z axes of {a} written in {b} coordinates.
- [ ] the rows are the x, y, z axes of {b} written in {a} coordinates.
- [ ] the columns are the x, y, z axes of {b} written in {a} coordinates.

✓ **Correct**

2. The 3×3 rotation matrix is an implicit representation of spatial orientations consisting of 9 numbers subject to how many independent constraints? — 1 / 1 point

Preview
6

6

✓ **Correct**

The 6 constraints mean that the space of rotations is $9 - 6$ = 3-dimensional. The 6 constraints are that the three columns are unit vectors (3 constraints) that are orthogonal to each other (3 more constraints). We also require that the frame be right handed (determinant equal to 1), not left handed (determinant equal to -1), but this does not change the dimension of the space of rotations.

6

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3. The inverse of a rotation matrix R_{ab}, i.e., R_{ab}^{-1}, is (select all that apply):

1 / 1 point

- [ ] $-R_{ab}$
- [x] R_{ab}^{T}

Correct

The transpose of a rotation matrix is equal to its inverse.

- [ ] $R - I$
- [x] R_{ba}

Correct

Since R_{ab} represents {b} relative to {a}, R_{ba}, which represents {a} relative to {b}, is its inverse. $R_{ab}R_{ba} = R_{aa} = I$.

4. Multiplication of $SO(3)$ rotation matrices is (select all that apply):

1 / 1 point

- [x] associative.

Correct

$(R_1 R_2)R_3 = R_1(R_2 R_3)$

- [ ] commutative.