Advanced Dynamics
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Lecture - 44
Kinematics of Rotation - IV

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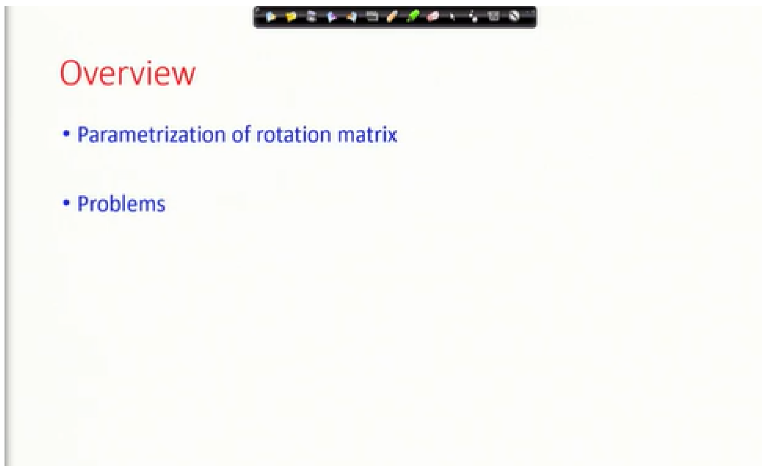

In this lecture we will continue our discussions on kinematics of rotation. We will start by looking at parameterization of rotation matrix. We have looked at parametrization of rotation using yaw pitch roll. We are going to look at a few more of these parameterizations.

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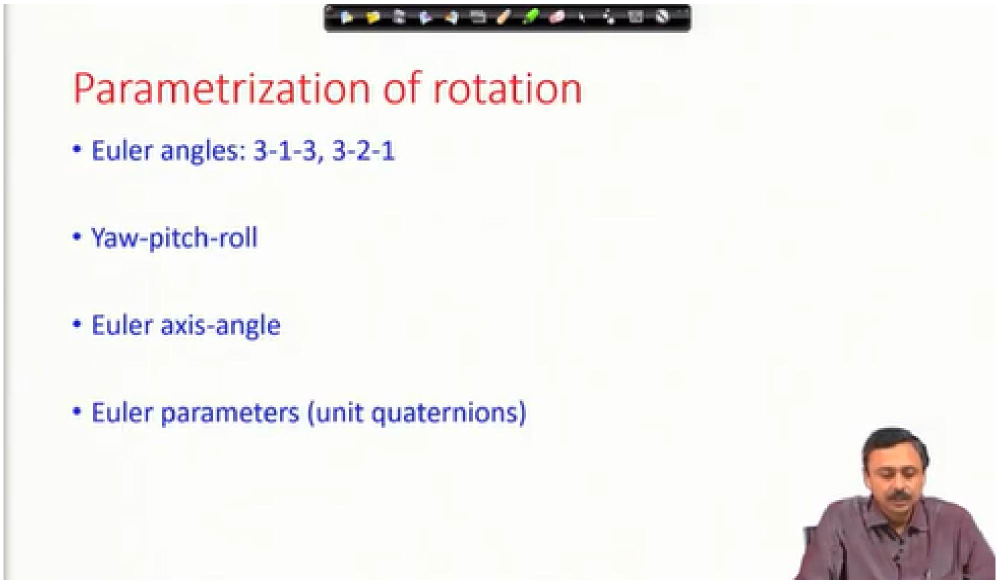

Various approaches to parametrizing rotation is presented in the slide above.

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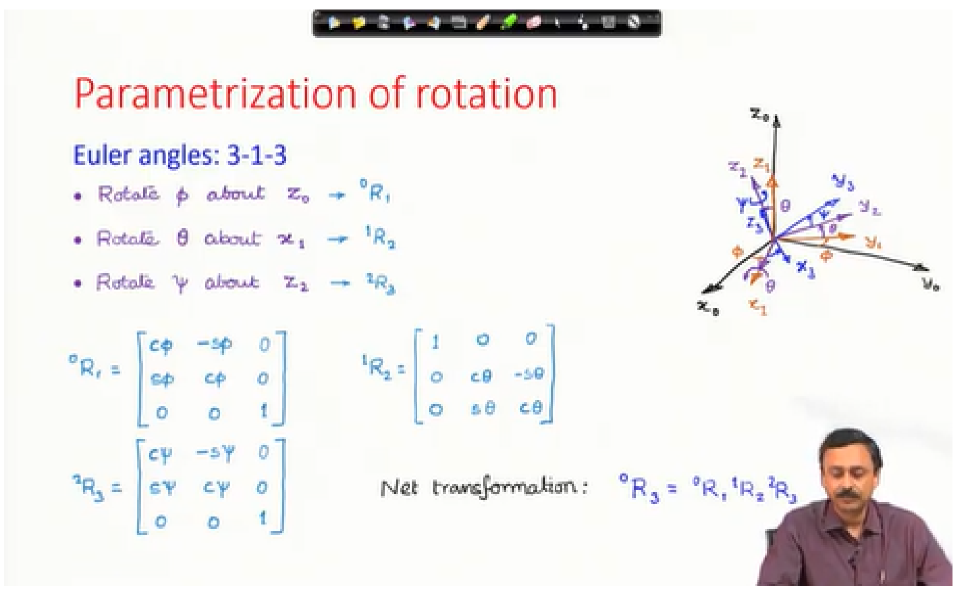

The construction of the rotation matrix using the Euler angles 3 1 3 is presented above.

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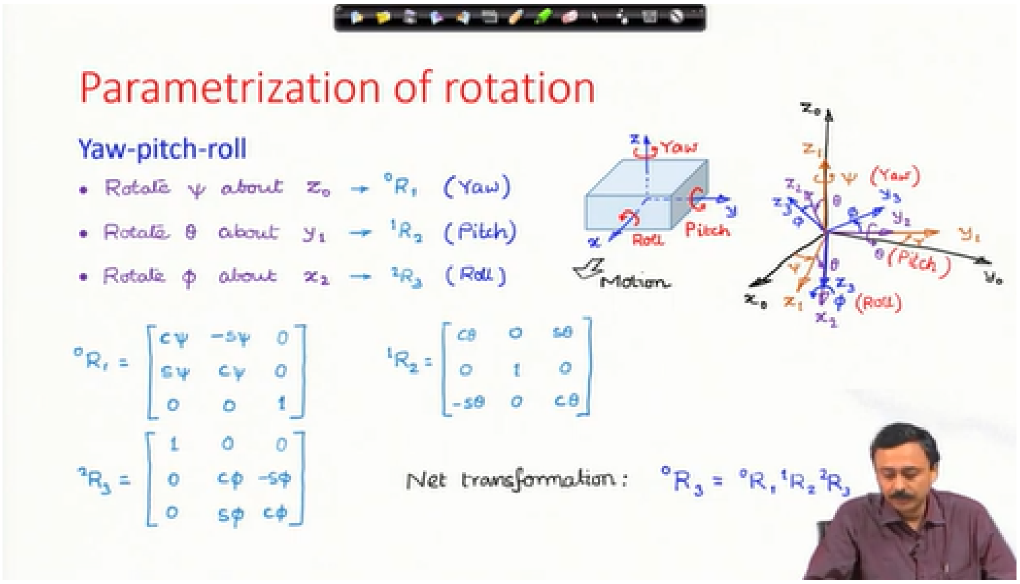

Yaw pitch roll parametrization in presented in the above slide.

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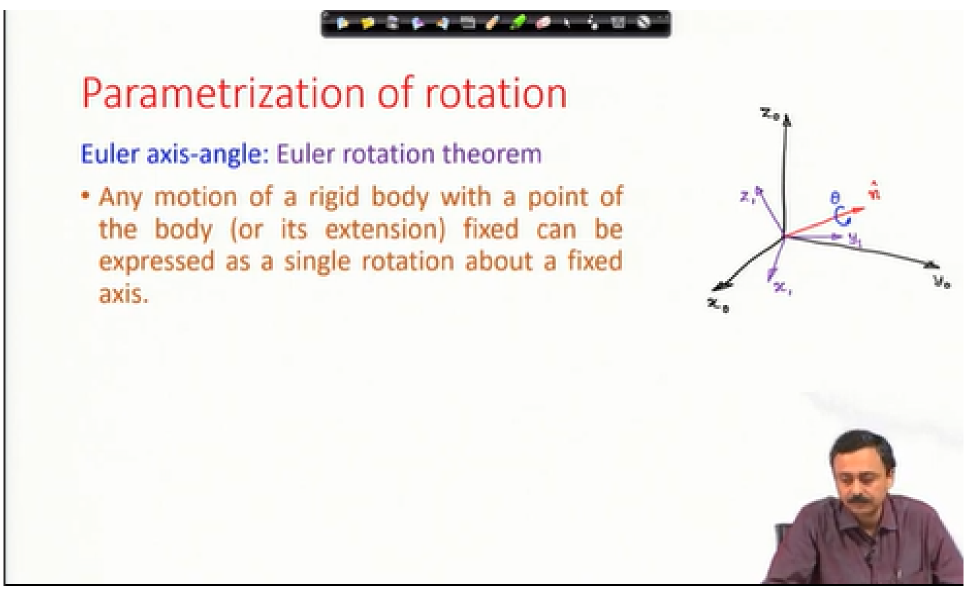

Now we come to the Euler axis angle parameterization. For this, we first look at the Euler rotation theorem as presented above. The Euler rotation theorem says any motion of a rigid body with a point of the body or its extension fixed can be expressed as a single rotation about a fixed axis.

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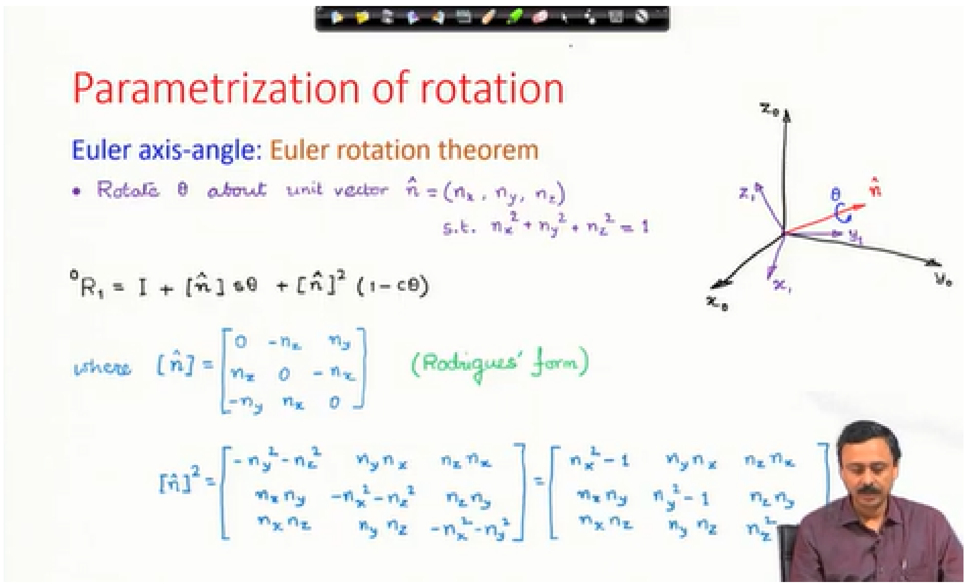

The above slide gives the representation of the rotation matrix in terms of rotation about an axis.

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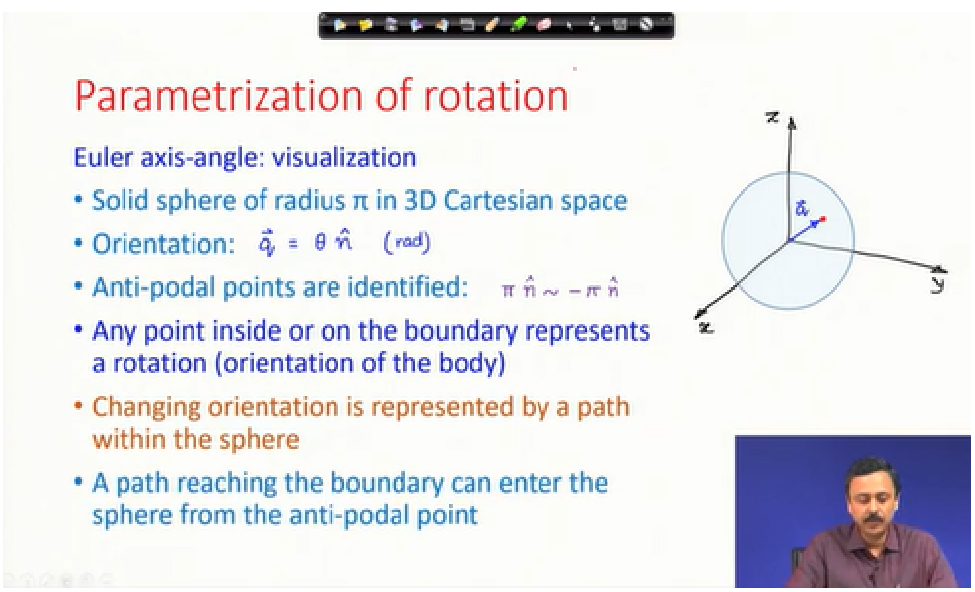

Now let us look at the visualization of Euler axis angle as presented above. The orientation of a rigid body can be thought of as a point inside a solid sphere of radius π in three dimensional Cartesian space. The antipodal (diametrically opposite) points of this sphere are identified (represent the same orientation). Change in orientation are paths traversed inside the sphere.

We consider the following problem.

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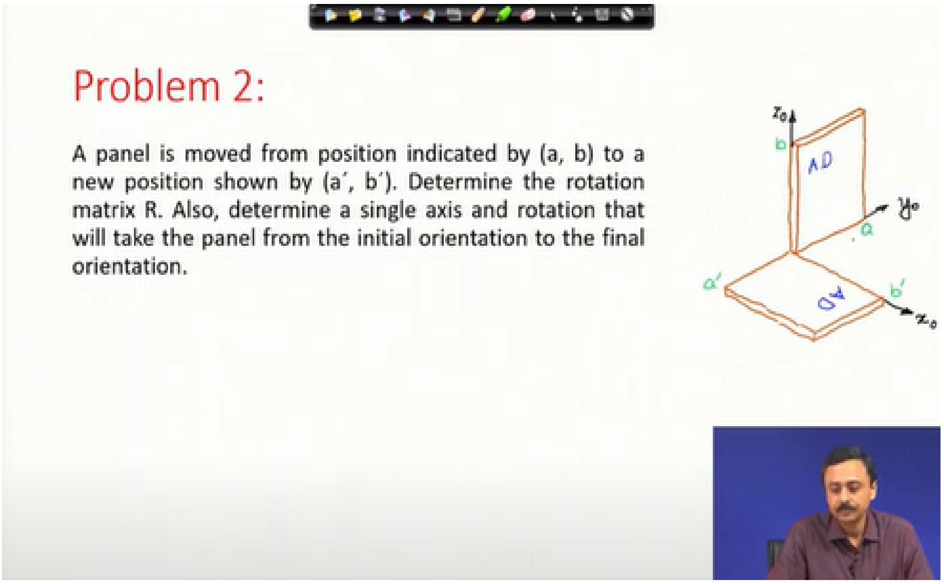

The solution is presented in the slide below.

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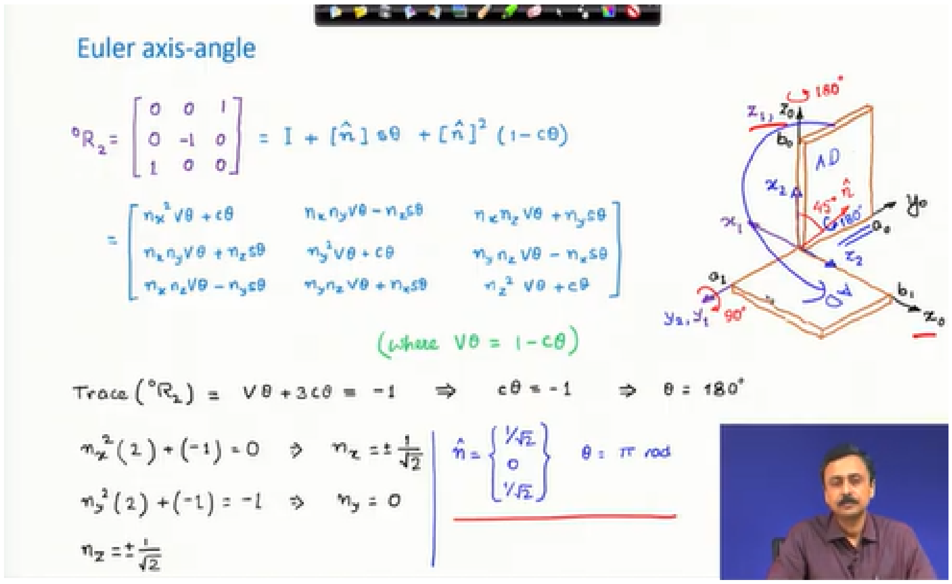

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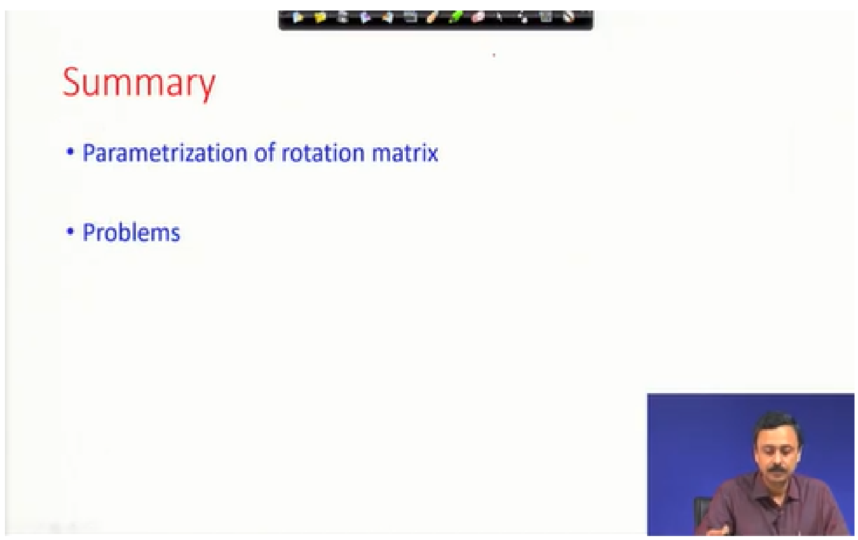

The above slide summarizes the discussions.