Baxter’s limb endpoint is defined by its pose, twist and wrench.

Screw theory is the algebra and calculus of pairs of vectors, such as forces and moments and angular and linear velocity, that arise in the kinematics and dynamics of rigid bodies.[1][2] The mathematical framework was developed by Sir Robert Stawell Ball in 1876 for application in kinematics and statics of mechanisms (rigid body mechanics).[3]

In computer vision and in robotics, a typical task is to identify specific objects in an image and to determine each object's position and orientation relative to some coordinate system. This information can then be used, for example, to allow a robot to manipulate an object or to avoid moving into the object. The pose can be described by means of a rotation and translation transformation which brings the object from a reference pose to the observed pose. This rotation transformation can be represented in different ways, e.g., as a rotation matrix or a quaternion.

http://en.wikipedia.org/wiki/Pose_(computer_vision)

http://en.wikipedia.org/wiki/Quaternion

Definitions of screw, twist, and wrench

http://en.wikipedia.org/wiki/Screw_theory

Screw[edit]

A screw is a six-dimensional vector constructed from a pair of three-dimensional vectors, such as forces and torques and linear and angular velocity, that arise in the study of spatial rigid body movement. The components of the screw define the Plücker coordinates of a line in space and the magnitudes of the vector along the line and moment about this line.

Wrench[edit]

The force and torque vectors that arise in applying Newton's laws to a rigid body can be assembled into a screw called a **wrench**. A force has a point of application and a line of action, therefore it defines the Plücker coordinates of a line in space and has zero pitch. A torque, on the other hand, is a pure moment that is not bound to a line in space and is an infinite pitch screw. The ratio of these two magnitudes defines the pitch of the screw.

Twist[edit]

A **twist** represents the velocity of a rigid body as an angular velocity around an axis and a linear velocity along this axis. All points in the body have the same component of the velocity along the axis, however the greater the distance from the axis the greater the velocity in the plane perpendicular to this axis. Thus, the helicoidal field formed by the velocity vectors in a moving rigid body flattens out the further the points are radially from the twist axis.

The points in a body undergoing a constant screw motion trace helices in the fixed frame. If this screw motion has zero pitch then the trajectories trace circles, and the movement is a pure rotation. If the screw motion has infinite pitch then the trajectories are all straight lines in the same direction.

Quaternions

Maths - Rotations using quaternions - Samples in 90 degree steps

http://www.euclideanspace.com/maths/algebra/realNormedAlgebra/quaternions/transforms/examples/index.htm

Maths - Euler to Quaternion - Sample Orientations

http://www.euclideanspace.com/maths/geometry/rotations/conversions/eulerToQuaternion/steps/index.htm

3D Game Engine Programming – a pictorial view of quaternions

http://3dgep.com/understanding-quaternions/

Kinematics In Detail - Stanford Series of Lectures

Lecture 1 | Introduction to Robotics  **Stanford**
https://www.youtube.com/watch?v=0yD3uBshJB0

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Lecture 7 | Introduction to Robotic https://www.youtube.com/watch?v=6SRTAoyzC6A