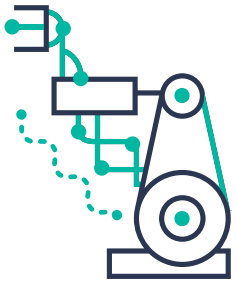
PICKNIK

TrackPose Technical Spec

Pose Interpolation Library

picknik.ai/products

PickNik's TrackPose library provides 6 degree of freedom Cartesian trajectories to target arm states which guarantee jerk, acceleration, and velocity constraint enforcement & elimination of discontinuities in acceleration and velocity.



Algorithm Overview

Input

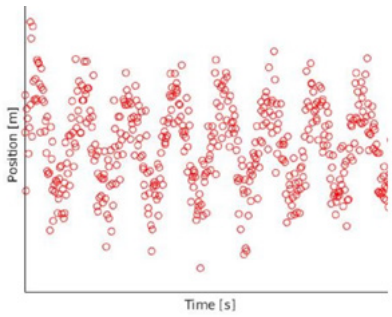
- The current state (current pose, velocity, and acceleration of the end effector)
- The target state (desired pose, velocity, and acceleration at the end effector)
- The desired time to reach the target state
- The maximum acceptable time to reach the target state [1]
- The maximum velocity, acceleration, and jerk for each Cartesian dimension
- The period of the robot controller

Output

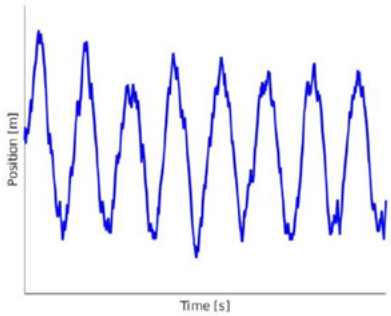
- A smooth, jerk-limited 6DoF Cartesian trajectory
- Waypoints spaced at the desired control frequency
- The calculated time to reach the target state[1]

[1] If a trajectory obeying maximum limits exists, the returned trajectory's time will equal desired time

Non-Jerk Limited Trajectory Generation



TrackPose Smoothed Trajectory



Smoothed trajectory reduces hardware oscillation & wear

Performance

Algorithm runtime [2]	less than 1 ms
Algorithm completeness	If a solution exists for the provided input a solution is returned
Algorithm optimality [3]	Within 10% of optimal
Trajectory density	1 waypoint per controller timestep
End effector jerk	Does not exceed per-dimension limits
End effector acceleration	Does not exceed per-dimension limits, is continuous
End effector velocity	Does not exceed per-dimension limits, is continuous

[2] See case studies below for details

[3] If desired time is not possible and is increased

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Algorithm Integration

Recommended robot controller rate	1000 Hz
Licensing	Per robot perpetual license
Distribution format	.so .dll ^5 [5]
Integration support	Available [6]

[4] Larger trajectories are possible but require longer algorithm runtime [5] Contact for dll library details [6] Additional costs apply

Technical Scenario 1 - Planning a Small Motion at High Control Rate

In this case study, TrackPose rapidly smooths a small motion command, as if from streaming sensor data.

Input

Current state	Pose = origin Velocity = 1 cm/s Acceleration = 0 cm/s²
Target state	Pose = 5cm translation Velocity = 2 cm/s Acceleration = 0 cm/s²
Desired duration	10 ms
Constraints	Max vel (linear dimensions) = 1 m/s Max accel (linear dimensions) = 10 m/s² Max jerk (linear dimensions) = 1000 m/s³
Robot controller period	10 ms

System Configuration

CPU Specs	Intel i7-7700HQ, 2.8GHz, non-realtime kernel

TrackPose Performance

TrackPose planning time	1.00 ms (1 kHz)
Calculated duration	79 ms
Number of waypoints	79

Technical Scenario 2 - Planning A Large Translation with Roll

In this case study, TrackPose rapidly smooths a small motion command, as if from streaming sensor data.

Input

Current state	Pose = origin Velocity = zero Acceleration = zero
Target state	Pose = 1.25 m translation, 3° roll Velocity = zero Acceleration = zero
Desired duration	1.25 s
Constraints	Max vel (linear dimensions) = 1 m/s Max accel (linear dimensions) = 8 m/s² Max jerk (linear dimensions) = 20 m/s³ Max vel (angular dimensions) = 1 rad/s Max accel (angular dimensions) = 1 rad/s² Max jerk (angular dimensions) = 1 rad/s³
Robot controller period	10 ms

System Configuration

CPU Specs	Intel i7-7700HQ, 2.8GHz, non-realtime kernel

TrackPose Performance

TrackPose planning time	1.00 ms (1 kHz)
Calculated duration	2.516 s
Number of waypoints	629