Pose Interpolation with Dual Quaternion Series

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Intermediate Presentation
Goal of the project

• Implement algorithm for smooth interpolation of pose (rotation and translation) using dual quaternions

Interpolation based on four measurements [1]

Background and Motivation

• Real-time tracking systems benefits from interpolation
  - animation
  - multi-modal sensor

• Quaternions
  - robust
  - fast
  - efficient

• Dual quaternion for rigid-body motions
Existing solutions

• Linear interpolation of Euler angles or rotation matrices
• Quaternions:
  - Linear interpolation
  - SLERP

• Dual quaternions:
  - Screw linear upsampling
  - Dual quaternion linear upsampling

Existing solutions. Examples

Spherical linear interpolation VS Linear interpolation
**Existing solutions. Examples**

- Linear interpolation for dual quaternions
Methods and materials

- Cumulative basis [3]:
  - Bezier curve
  - Quadric Bezier curves (QB) [1]
  - Hermite curves
  - B-spline curves

- Aitken [1]

\[ p(t) = \sum_{i=0}^{n} p_i B_i(t) \]


Experiments. Aitken interpolation

51 poses, based on 3 measurements
0.028 sec
Experiments. QB interpolation

51 poses, based on 3 measurements

0.006 sec
Work Packages and Milestones

Gantt Chart [4]

[4] Created by smartsheets.com
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**Prototype**
- mathematical model
- Interface to FRAMOS OTS
- Intermediate presentation

**Medical application**
- Medical adaptation
- Compare results

**Verification**
- Final presentation

**Project management**
- Time planning

[4] Created by smartsheets.com
Project risks

• Schedule risks
  - incorrect time management
  - lack of time

• Technical risks
  - integration with external system
  - not real-time performance
Activity Diagram

- Get data from OTS
- Have enough data?
  - Yes: Convert data, Interpolate, Send data to application
  - No: Wait for next data
- No: Wait for next data