

Buongiorno!

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Comparison of Workspace Analysis for **Different Spherical Parallel Mechanisms**

IFTOMM MEDER 2018

Introduction

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Decreasing Motive Power

STATIC BALANCING



MASS RELOCATION

3 actuators for 3-DOF wrist 1 actuators for 1-DOF elbow 3 actuators with capstan reduction Joints with for 3-DOF shoulder tension amplification mechanisms

Kim; IEEE Trans. Robot; 2017

SPMs!

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Agile Eye; Université LAVAL

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Desired Characteristics



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Modelling & Simulation



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CAD Models



S₅B





Full Workspace Simulation of 4-UU Mechanism



Full Workspace Simulation of S6B Mechanism

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Analyses



Workspace Analysis

• Platform Position - X,Y,Z Cartesian Coordinates

• Platform Orientation - Roll, Yaw, Pitch Angles



Workspace Analysis - Position - Gimbal



Workspace Analysis - Position - 4-UU



Workspace Analysis - Position - S5B



Workspace Analysis - Position - S6B



Workspace Analysis - Orientation - Gimbal



Workspace Analysis - Orientation - 4-UU



Workspace Analysis - Orientation - S5B



Workspace Analysis - Orientation - S6B





Isotropy Analysis

Conclusions





Mechanism behaviours are not symmetric, i.e., the plots are not centered with absolute zero. Workspace diverges towards the extremes. More evident in case of **4-UU**.



Platform posses undesired Roll motion in case of **4-UU**. Central gimbal prevents the same for S5B and S6B.



Mechanisms are not fully isotropic throughout the workspace. **S6B** best with $\Delta \ge 0.9$.





Pitch and yaw motions of the mechanisms are dependent of each other.





Post-Doc on "The design of better iCub Hands"



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Grazie!

Any questions?



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FINITO!