

The Art of Robotics: Toward A Holistic Approach

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Master of Science in Robotics
Thesis Defense
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Talk Agenda

1. Background How I ended up here.
2. Other Things Warm up the crowd with a quick review of some other things I've done.
3. The Big Picture Cover the central themes of this talk.
4. A Unifying Framework An old framework, revived.
5. Brushless PMSM Motors Operating limits, thermal management, liquid cooling.
6. Touching Robots Tactile sensing, contact modeling, whiskers, robot pain.
7. Conclusions Review key points and propose some future work.
8. Questions *"Please clap..."*

Background

How I Ended Up Here

Other Things

Teaching with CMU's Gelfand Outreach Center

Carnegie Mellon University



- Introduction to Robotics with the Finch Platform
 - ❖ Each session is 5 days, 3 hrs/day
 - ❖ 4th and 5th graders
 - ❖ 1 session Summer 2017 + 2 sessions Summer 2018

Teaching with CMU's Gelfand Outreach Center

Carnegie Mellon University



- ❖ Saturday Series LEGO WeDo Robotics
 - ❖ 3 hour course
 - ❖ 2nd and 3rd graders
 - ❖ 1 session Spring 2018

Robotics Institute Meme Facebook Page



Robotics Institute Meme Facebook Page

- Some statistics:
 - ❖ The RI's first and only meme page
 - ❖ Formed in March 2018
 - ❖ 170 members
 - ❖ 30 memes, 23 original contributions!



The Big Picture

Breadth First

1.

Tangential Projects

Kruskal count + quadruped gaits



A Unifying Framework

The Port-Hamiltonian Framework

- ❖ Port-based Analysis
- ❖ Hamiltonian Dynamics
- ❖
- ❖

Bond Graphs

Hamiltonian Dynamics

Putting it All Together

Brushless PMSM Motors

???

Touching Robots

The Most Important Sensory Modality

Contact Models

Terminator 2 Got It Right

Closing Thoughts

Closing Thoughts

✦ Woo, Beamer!



Questions?

Backup slide 1

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