



A Taxonomy for Commercially Available Myoelectric Terminal Devices

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INTRODUCTION

- The number of myoelectric prostheses available commercially has grown rapidly in the past decade
- These devices display a wide range of design philosophies and capabilities
- Terms such as “myoelectric prosthesis,” “bionic hand,” or “multifunction prosthesis” fail to account for the different capabilities of these prosthetic designs

OBJECTIVES

Propose a myoelectric prosthesis terminal device taxonomy which describes the full span of prosthetic designs

METHODS

Thematic analysis provided a foundation for the taxonomy, aiming to account for prosthetic hooks, simple hands, and multifunction hands

Non-Handlike Terminal Devices

- Prostheses which do not seek to emulate the appearance or function of the human hands
- Three categories:
 - Twin opposition: two opposing surfaces grasp objects
 - Multiple opposition: three or more opposing surfaces grasp objects
 - Non-opposition: objects are handled without opposition

Handlike Terminal Devices

- First taxon: thumb adduction (3 categories)
 - No thumb adduction
 - Manual thumb adduction
 - Powered thumb adduction
- Second taxon: finger flexion (2 categories)
 - Coupled fingers: some or all fingers are mechanically coupled and cannot be actuated independently
 - Isolated fingers: all five fingers are mechanically independent

RESULTS

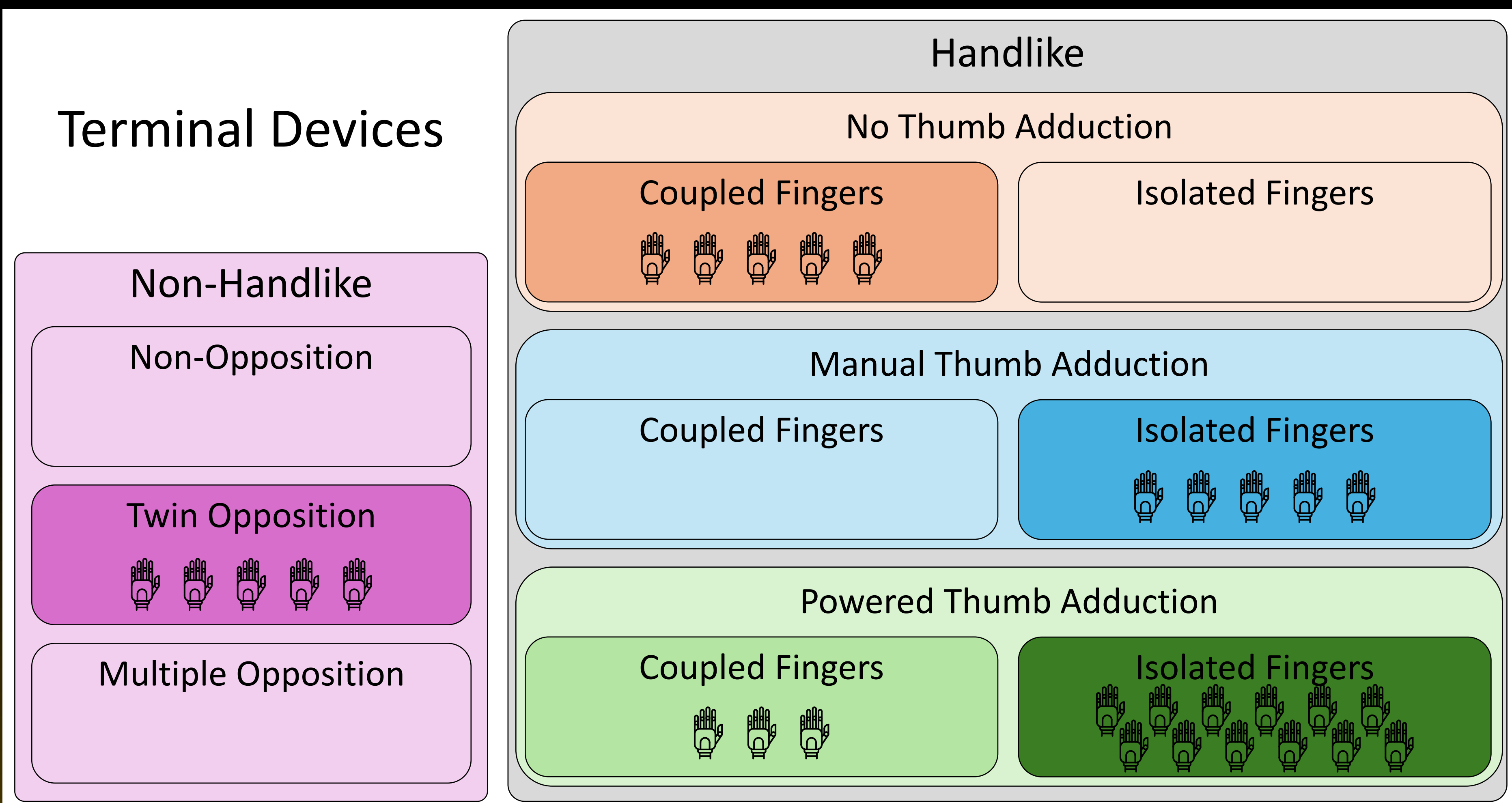
- 30 commercially available prosthetic terminal devices identified
- Majority (25) are handlike in design
- Half (15) feature powered thumb adduction
 - Most of these (12) feature isolated finger actuation
 - A subset (3) feature coupled fingers
- Every hand with no thumb adduction (5) had coupled fingers
- Every hand with manual thumb adduction (5) had isolated fingers
- Overall, we identified five prosthetic categories represented commercially:
 - Non-handlike terminal device
 - Hands without thumb adduction
 - Hands with manual thumb adduction
 - Hands with powered thumb adduction and coupled fingers
 - Hands with powered thumb adduction and isolated fingers

Non-Handlike Terminal Devices

Fillauer MC Standard ETD	Twin opposition
Fillauer ProPlus MC ETD	Twin opposition
Fillauer ProPlus MC ETD2	Twin opposition
Ottobock AxonHook	Twin opposition
Ottobock Greifer	Twin opposition

Handlike Terminal Devices

	Thumb Adduction	Finger Coupling
Aether Biomedical Zeus Hand	Manual	Isolated
Atom Limbs Atom Touch	Powered	Isolated
BionIT Labs Adam's Hand	Powered	Isolated
BrainRobotics Prosthetic Hand	Powered	Isolated
COVI Nexus Hand	Powered	Isolated
Fillauer MC ProPlus Hand	None	Coupled
Makers Hive KalArm	Manual	Isolated
MaxBionic MeHand	Powered	Isolated
Mobius Bionics Luke Arm	Powered	Coupled
Motorica Manifesto Hand	Powered	Isolated
Open Bionics Hero Arm	Powered	Isolated
Össur i-Limb Access	Manual	Isolated
Össur i-Limb Ultra	Powered	Isolated
Össur i-Limb Quantum	Powered	Isolated
Ottobock bebionic Hand	Manual	Isolated
Ottobock Michelangelo Hand	Powered	Coupled
Ottobock MyoHand VariPlus Speed	None	Coupled
Ottobock SensorHand Speed	None	Coupled
OYMotion OHand	Manual	Isolated
Prensilia MiaHand	Powered	Coupled
Psyonic AbilityHand	Powered	Isolated
Robo Bionics Grippy	None	Coupled
TASKA Hand Gen2	Powered	Isolated
Unlimited Tomorrow TrueLimb	None	Coupled
Vincent Systems Vincent Evolution	Powered	Isolated



DISCUSSION

- One aspect not considered in this taxonomy is the method used to control the prosthesis
- The taxa for coupled and isolated fingers represent the capability for function, not use in practice

PAPER

