Targeted Muscle Reinnervation
Bionics

• Fusion of man and machine
• Nerves still exist after amputation
• How to detect the weak signal for each nerve fiber?
Myoelectric Control

- Partial hand loss (below elbow)
- Sensors detect electrical signals when muscles above the wrist are used
- Skywalker hand
TMR

- Above-elbow amputees
- Reattaching hand nerves to chest muscles
TMR

- Muscles amplify electrical signals – easier detection
- Thinking about the arm moves chest muscles
- 3-6 months for the nerves to “grow into” chest muscles
Arms

• Basic arms
  – 3 degrees of Freedom – elbow, wrist, hand

• More advanced arms
  – Up to ten 10 degrees of freedom
  – Expensive and/or military
Touch sense

- Sensors in arms
- Pressure plates for feeling grip strength
- Stimulating electrodes for feeling texture
Future challenges

• “Real-estate problems”
  – micro sensors and electrodes implants
• Finer control
• More advanced arms in “budget” sector
If time permits

• [http://www.youtube.com/watch?v=-u8KkvZvVVI](http://www.youtube.com/watch?v=-u8KkvZvVVI)
Sources

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• Michael Linehan, Dylan Dufour. (2013) NEURALLY CONTROLLED PROSTHETIC ARMS: USING TARGETED MUSCLE REINNERVATION

• http://armdynamics.com/pages/tmr