

Printable, wearable human interface devices for robotic manipulation

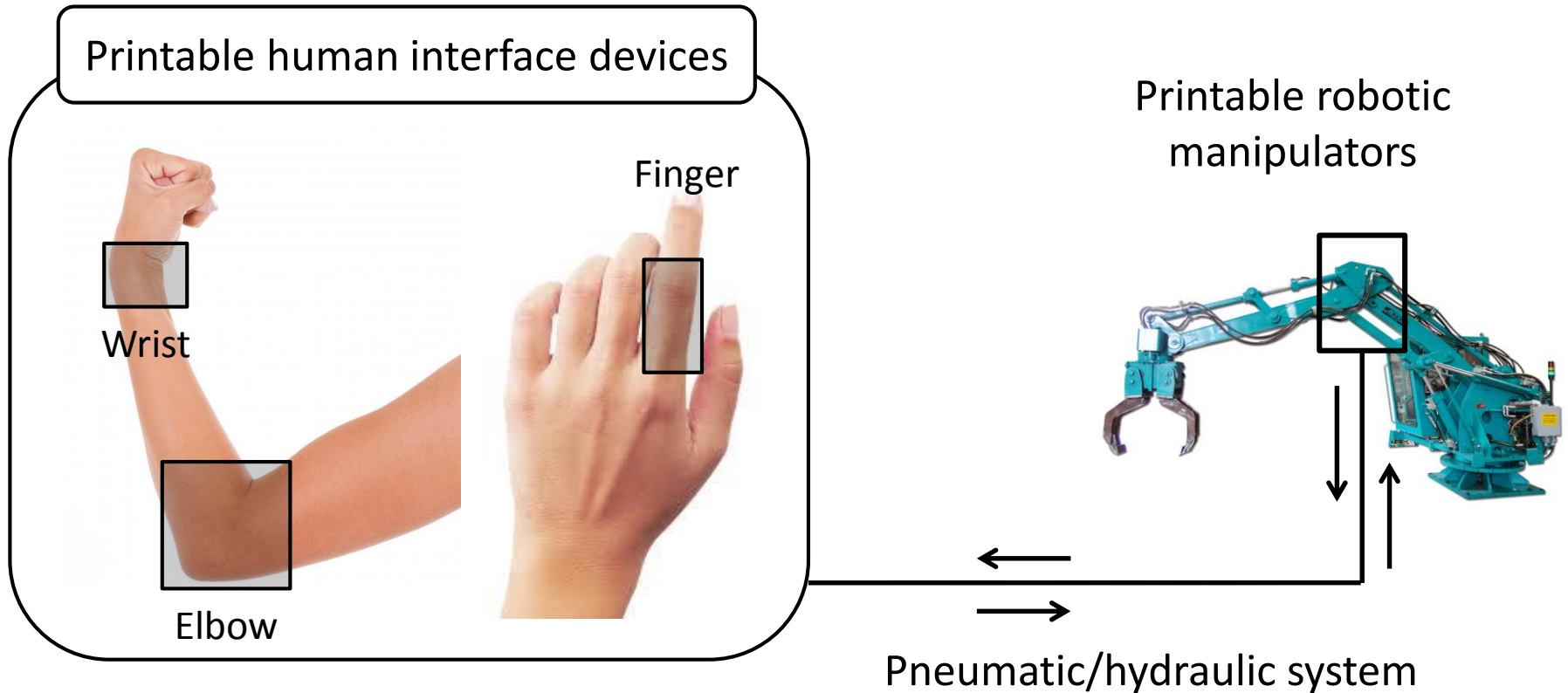
Sehyuk Yim (Postdoc) and Sangbae Kim

May 19, 2014

PPR meeting



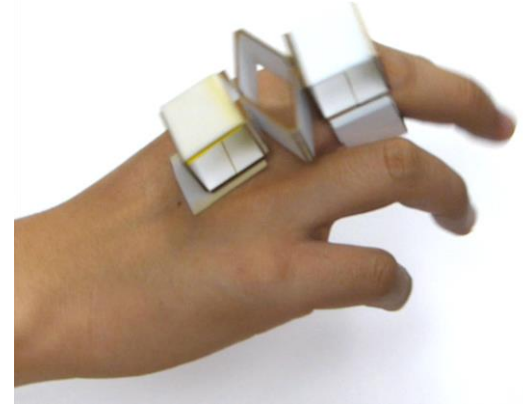
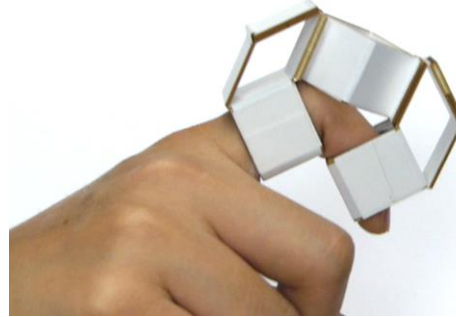
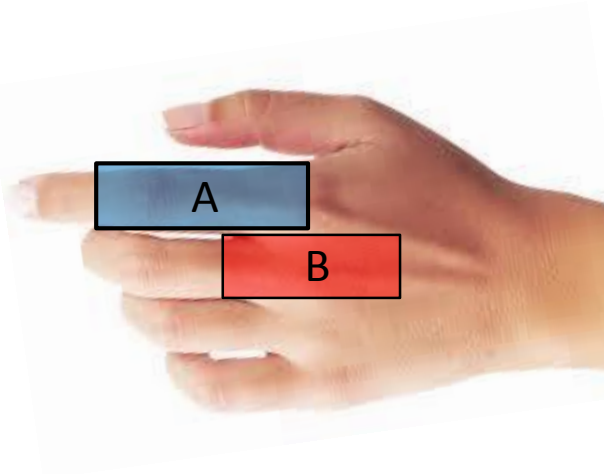
OVERVIEW



Goal: developing wearable human interface devices and robotic manipulators which have printable 2-D structures and mechanical components

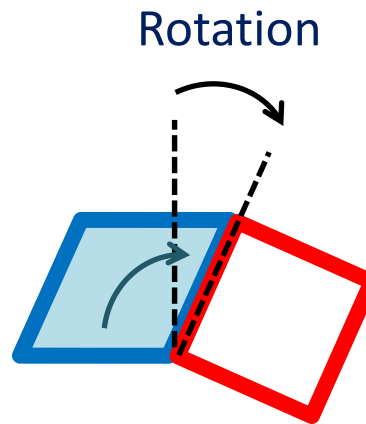
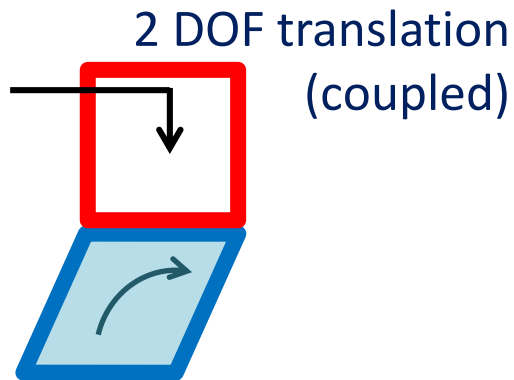
1. Developing printable exo-fingers and manipulators.
2. Implementing mechanical force transmission
3. Showing practical applications

PRINTABLE, WEARABLE HUMAN INTERFACE DEVICE

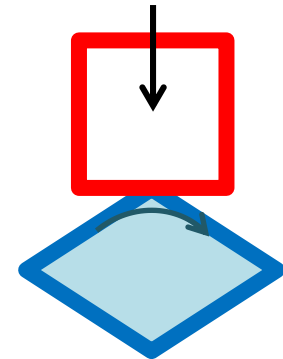


Exoskeleton fingers

Slanting modular structure

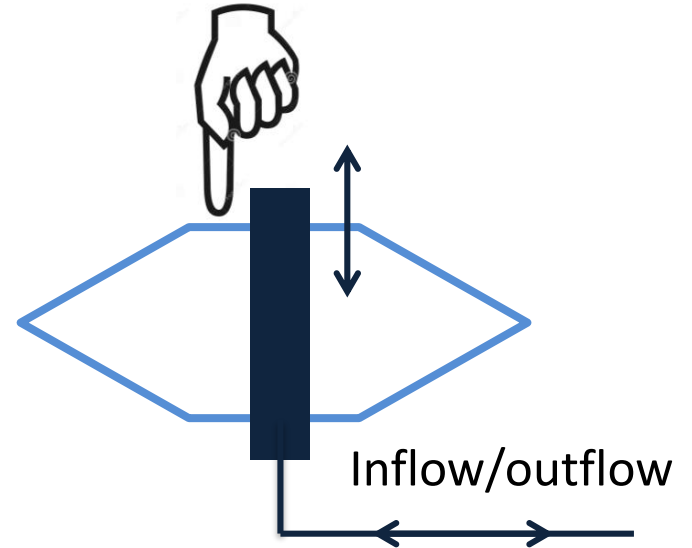
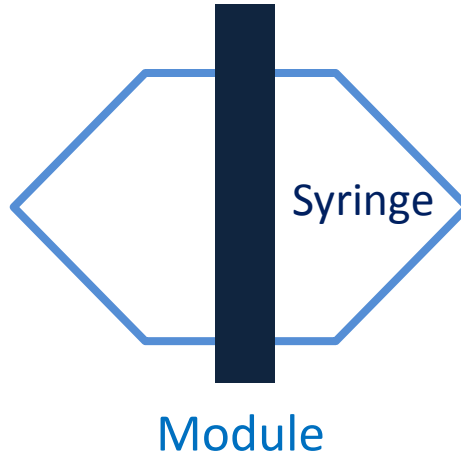


1 DOF translation

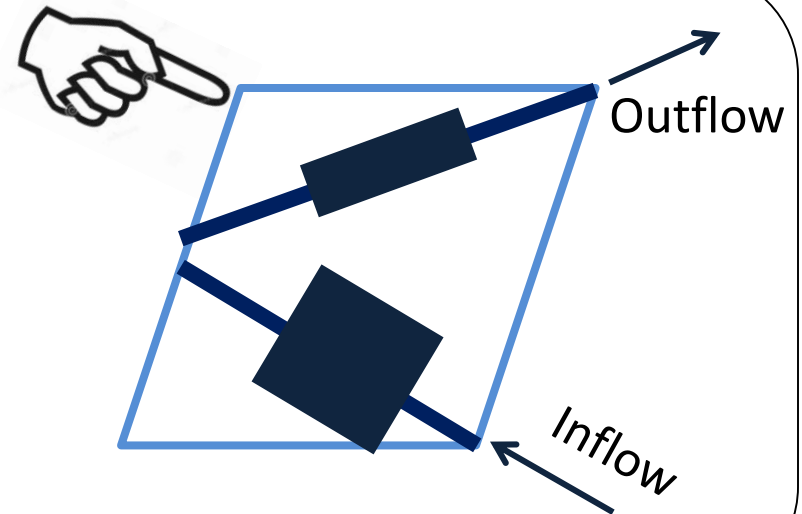
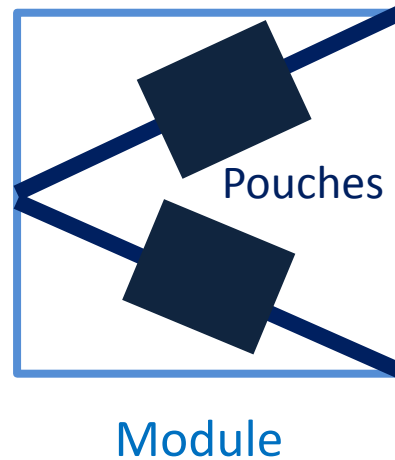


FORCE TRANSMISSION DEVICES & MECHANISMS

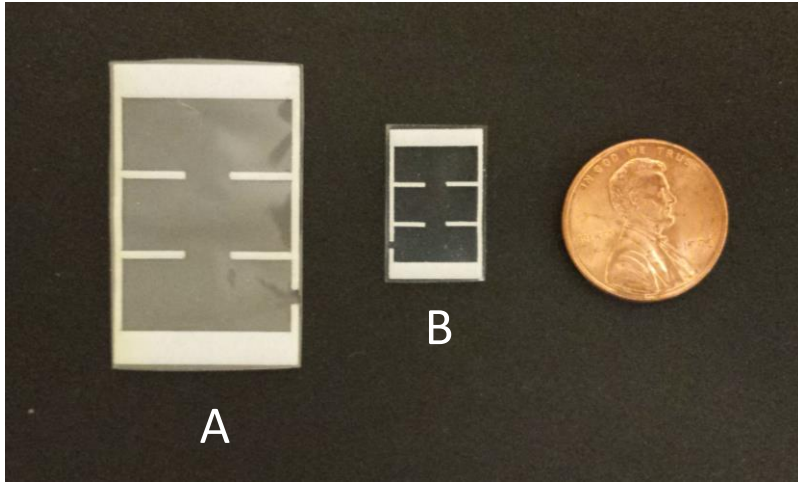
Syringe



Miniature pouch

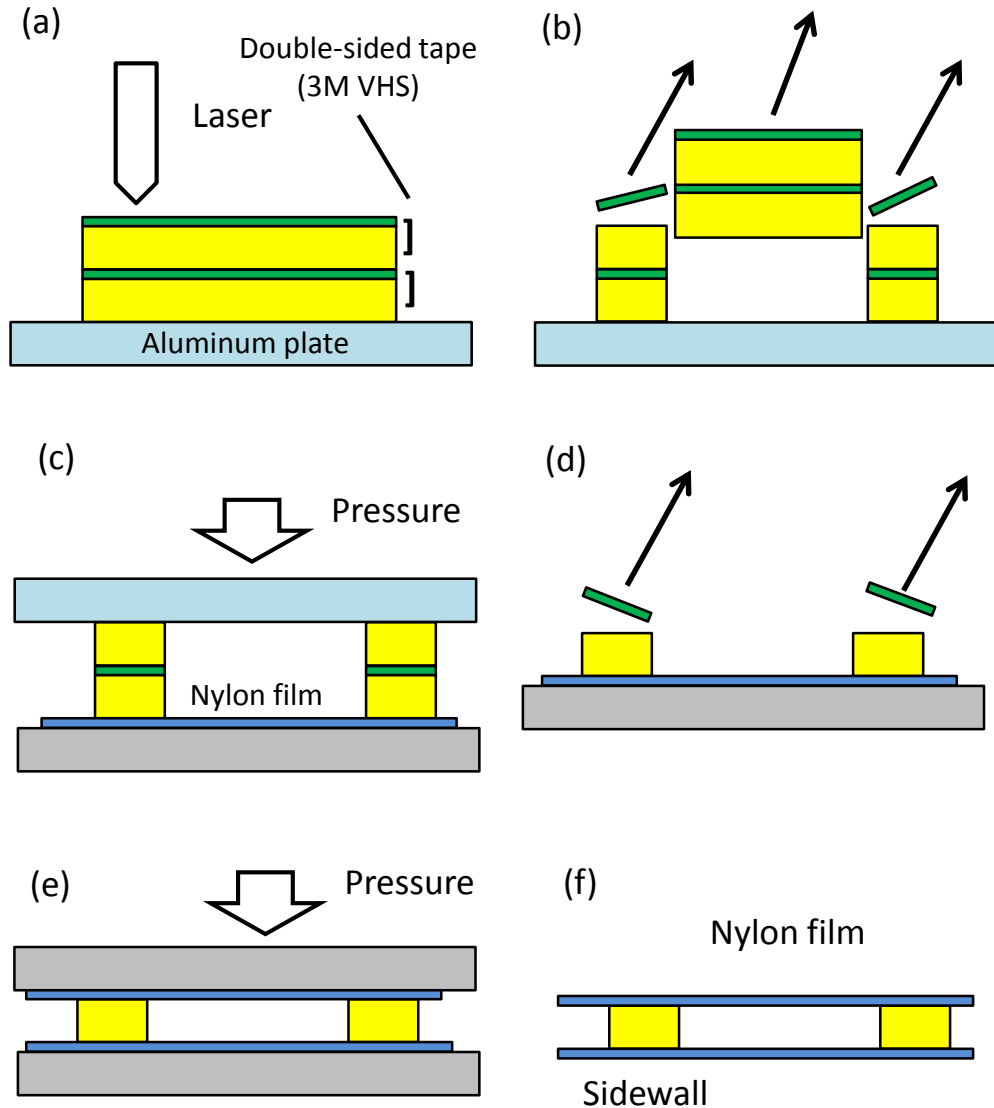


MINIATURE POUCH



Prototypes

	A	B
Width x Length	20 X 40 mm ²	11 x 20 mm ²
Sidewall width	1 mm	500 μm



DISPLACEMENT AMPLIFICATION/REDUCTION

Human interface device



Cross-sectional
Area = 1 mm^2

Displacement < 10 mm

Macro-manipulation



Cross-sectional
area = 0.1 mm^2



Displacement < 100 mm

Micro-manipulation

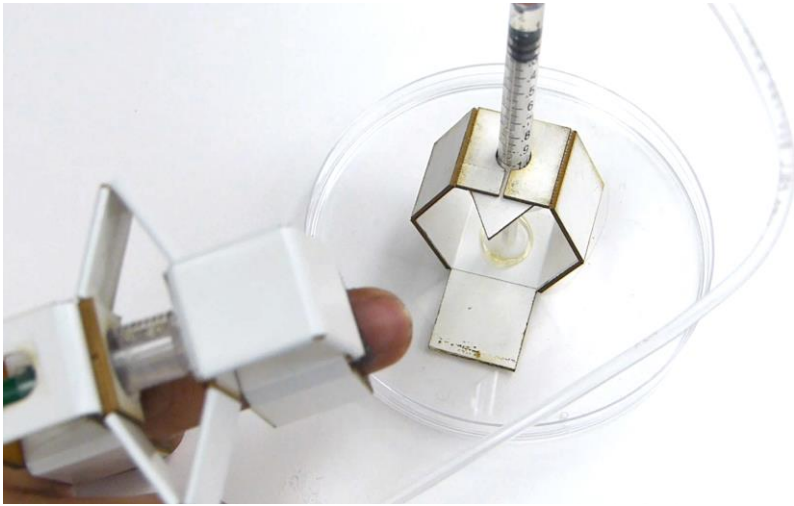
Cross-sectional
Area = 10 mm^2



Displacement < 1 mm

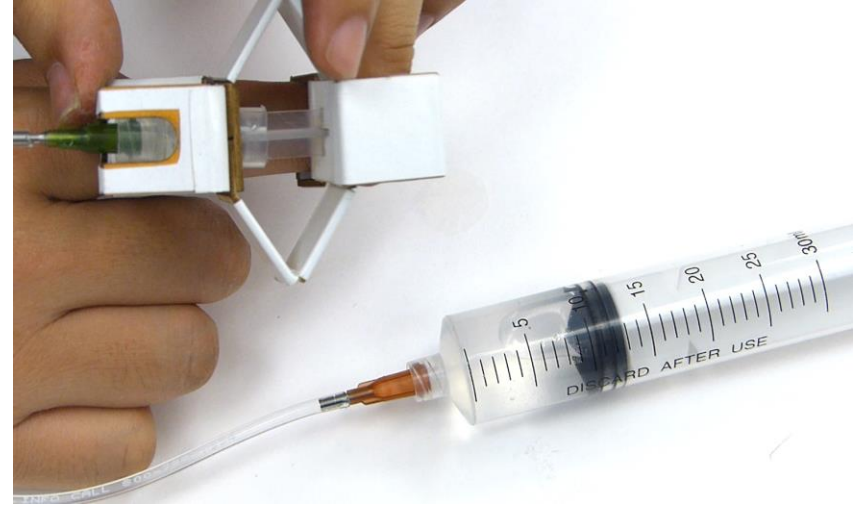
PROOF-OF-CONCEPT DEMONSTRATIONS

For macro manipulation



- ✓ Displacement
- Exo-finger < 5 mm
- Manipulator < 10 mm

For micro manipulation

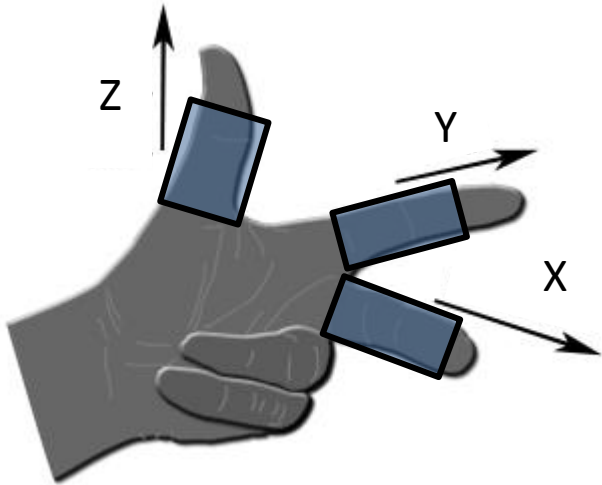


- ✓ Displacement
- Exo-finger < 5 mm
- Manipulator < 2 mm

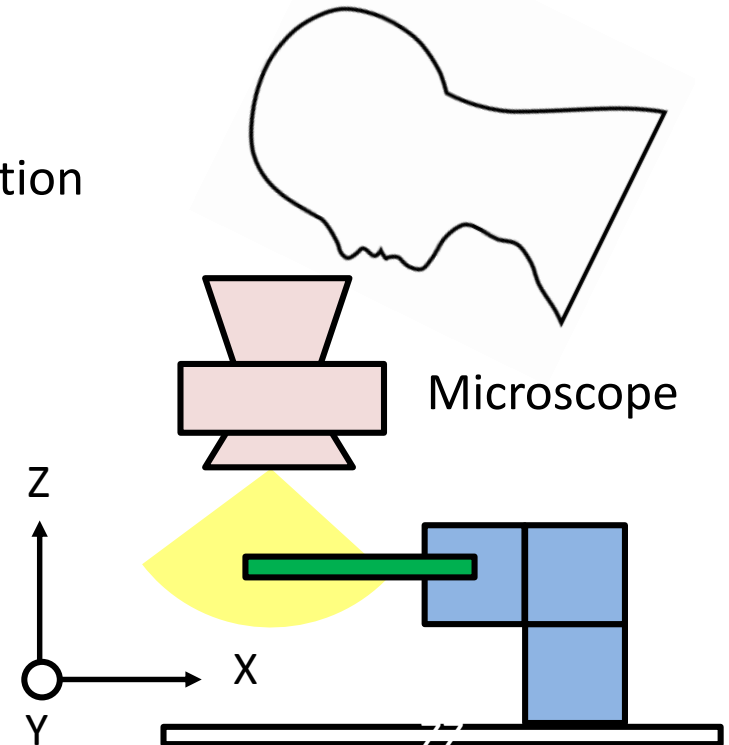
- ✓ One degree-of-freedom manipulator actuated by the exo-finger

FUTURE WORK

- ✓ Project started this April
- Early stage
- ✓ Solving hardware issues and finding better designs of exo-finger
- ✓ Welcome to do a collaborative research
- Computational design
- ✓ Demonstration of a 3 D.O.F micro-manipulation



Printable human interface device



Printable manipulator