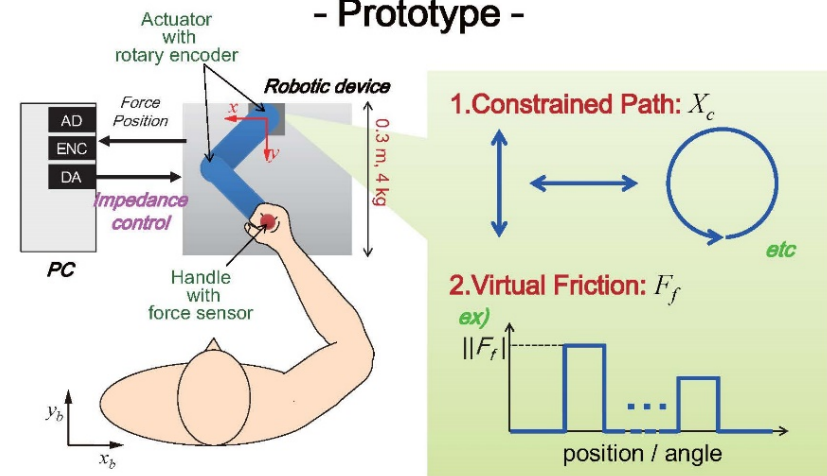


Development of a robotic evaluation system for the ability of proprioceptive sensation in slow hand motion

Yoshiyuki TANAKA

- Prototype -

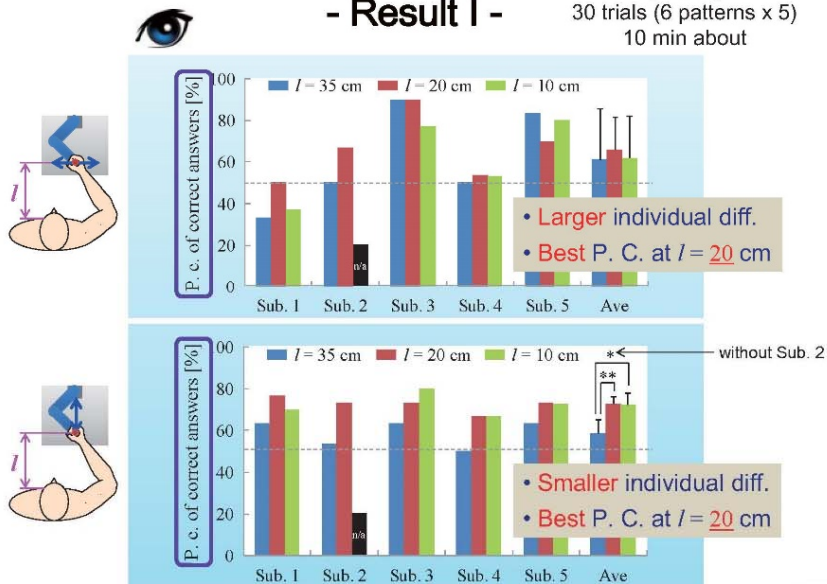


Motion dynamics of the handle:

$$\underbrace{M(X)}_{\text{Inertia}} \ddot{X} + \underbrace{B(X)}_{\text{Viscosity}} \dot{X} + \underbrace{K(X)}_{\text{Stiffness}} X + \underbrace{F_f}_{\text{Friction}} = F_h$$

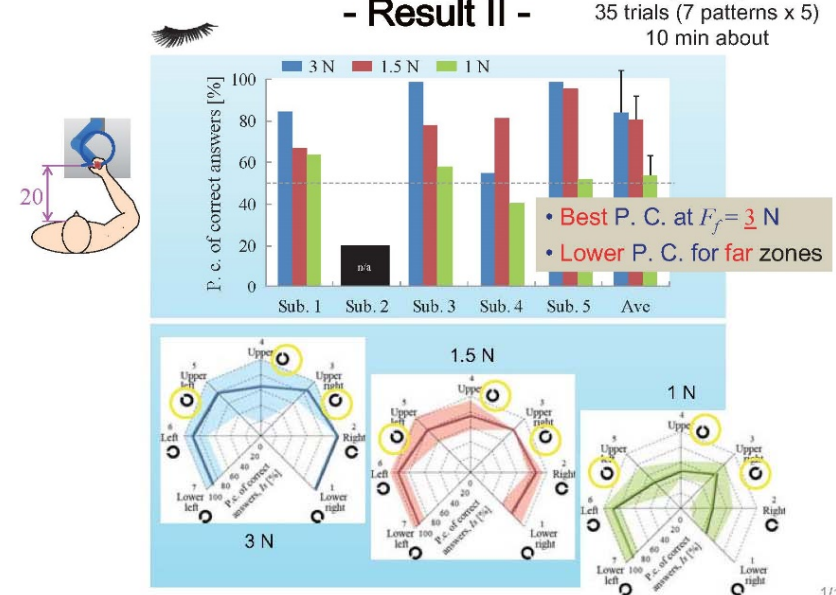
- Result I -

[1-set]
30 trials (6 patterns x 5)
10 min about



- Result II -

[1-set]
35 trials (7 patterns x 5)
10 min about



A Multiple-Input Single-Output Model for Human Force Perception in Pedaling

Yoshiyuki TANAKA



Magnitude estimation

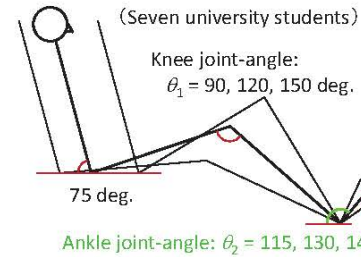
- Method -

Input variables



- Standard force stimulus
- Ankle joint-angle
- Knee joint-angle

A subject is asked to perceive a reaction force at his foot according to the specified condition, and answer its magnitude in percentage.

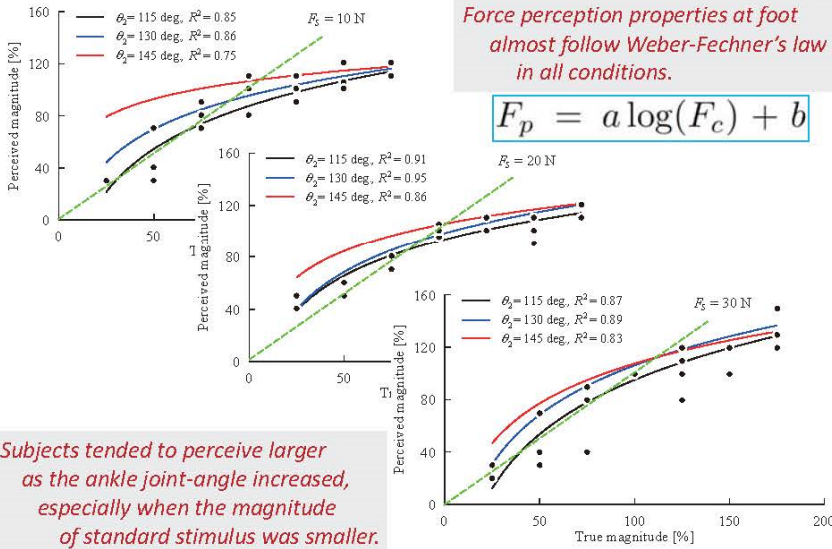


Standard stimulus: F_s [N]	Comparison stimuli: F_c [N]
10	2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5
20	5.0, 10.0, 15.0, 20.0, 25.0, 30.0, 35.0
30	7.5, 15.0, 22.5, 30.0, 37.5, 45.0, 52.5

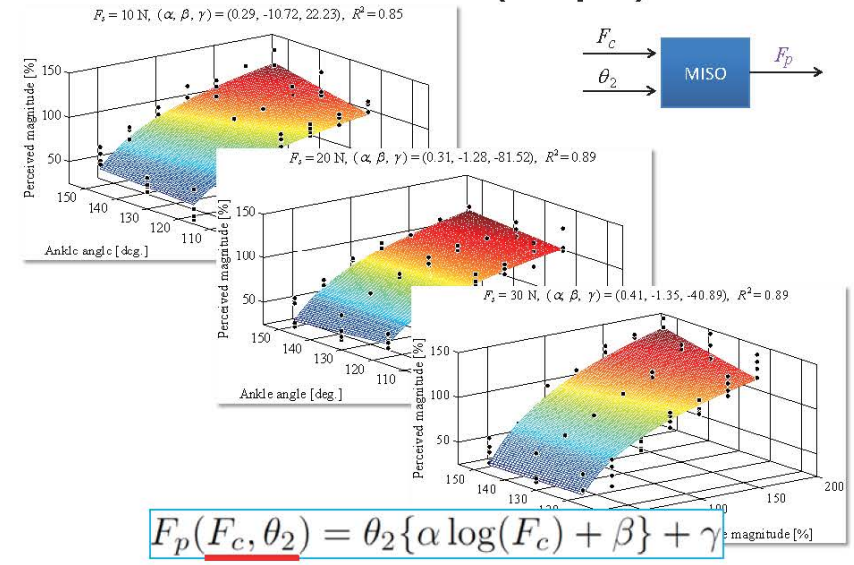
(25%, 50%, 75%, 100%, 125%, 150%, 175%)

- Each standard is provided at $\theta_2 = 115$ deg.
- 5 trails for each comparison

- Results: SISO -



- Results: MISO (2-input) -

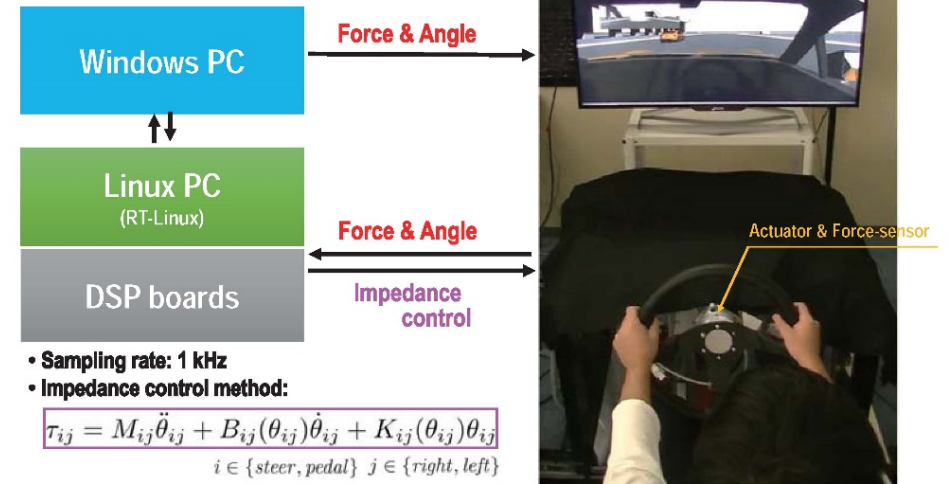




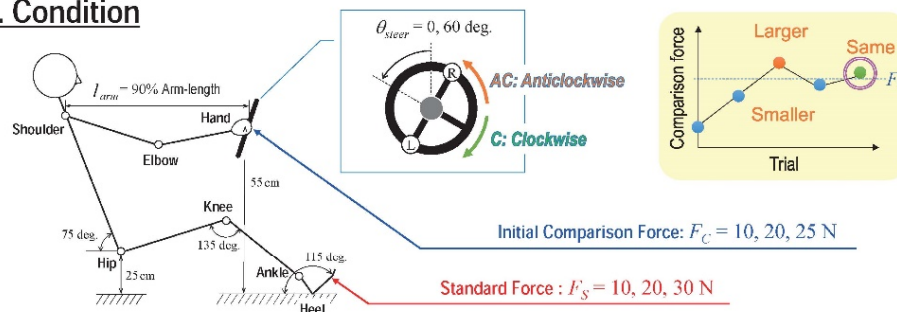
Analysis and Modeling of Human Force Perception Properties during the Operation of a Driving Interface System Using Limbs

Yoshiyuki Tanaka

Driving simulator



Exp. Condition



- Standard Stimulus by the right pedal is set as $F_S = 10, 20, 30 \text{ N}$ (Five sets for each F_S)
- Initial Comparison Stimulus by the steering wheel is set as $F_C = 10, 20, 25 \text{ N}$
- Five Handling Conditions and two rotation directions:



- 8 subjects (University students, right-handed)

[Assumption]
 No difference on force perception abilities between both arms.

Exp. Results

