

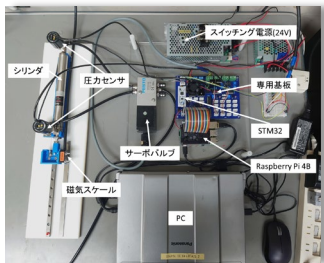


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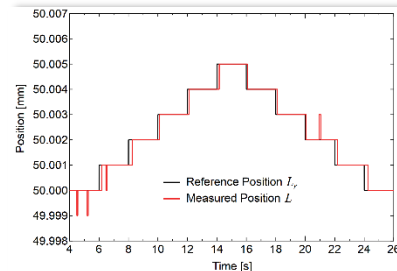
# Construction of Industrial and Human support Devices Utilizing Pneumatic Drive Systems

## Professor Masahiro Takaiwa

### High precision positioning control using pneumatic cylinder



Realtime Linux environment

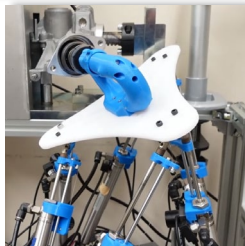


1micron step motion

### Precision work by pneumatic multiple D.O.F. robot



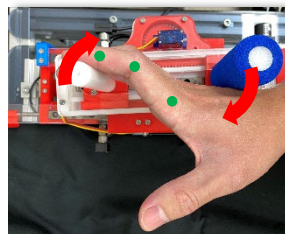
Simultaneous  
insertion with gear  
and bearing



### Application to human support system



Walking support shoes



Wrist hand rehabilitation device

A feature of the pneumatic drive system is the air compressibility, which makes it easily be affected by frictional force during precise position control. We have developed a high-precision positioning technology with a repeat positioning accuracy of  $\pm 0.2 \mu\text{m}$  using a commercially available pneumatic cylinder.

In the mean while, the air compressibility brings absorb function of trajectory errors even it involves contact with the environment without generating excessive contact reaction force. By utilizing this function, we aim to propose a paradigm shift in which flexible robots perform precision assembly work, and to develop it into practical applications.

The pneumatic actuator also has a high output/weight ratio and the low stiffness characteristics, which is attractive to be used as wearable device. We are also conducting applied research on pneumatic walking support shoes without electric power but wearer's body weight and wrist/finger rehabilitation devices using parallel sticks driven with pneumatic actuators.

Keywords : human support, pneumatic drive

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