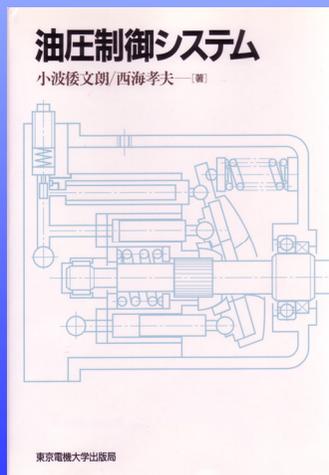


Fluid Mechanics

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Konami, Nishiumi, Hydraulic Control Systems, Tokyo Denki University Press, (1999)



Nishiumi, Fluid Mechanics for Beginners, Nikkkan Kogyo Shimbun Ltd. (2010)

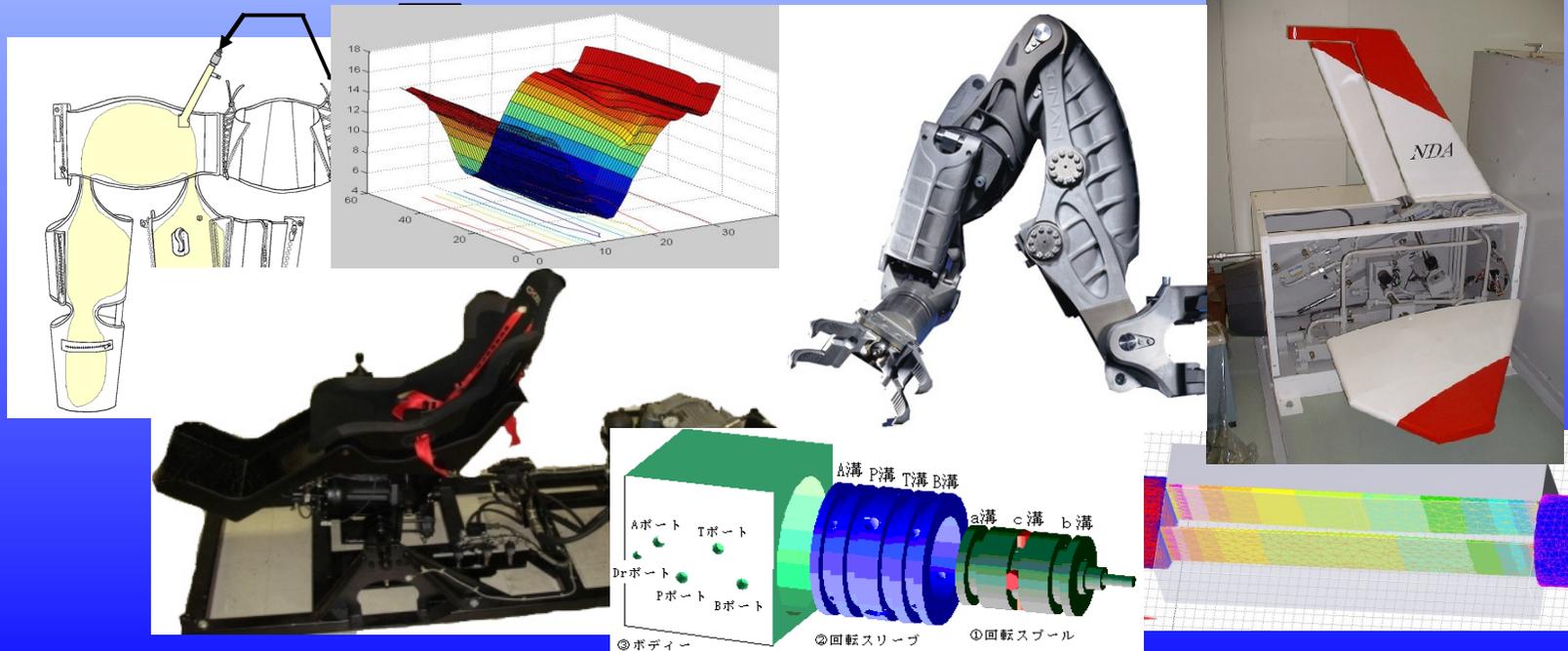


Nishiumi, Hydraulics for Beginners, Nikkkan Kogyo Shimbun Ltd. (2012)

Research Area

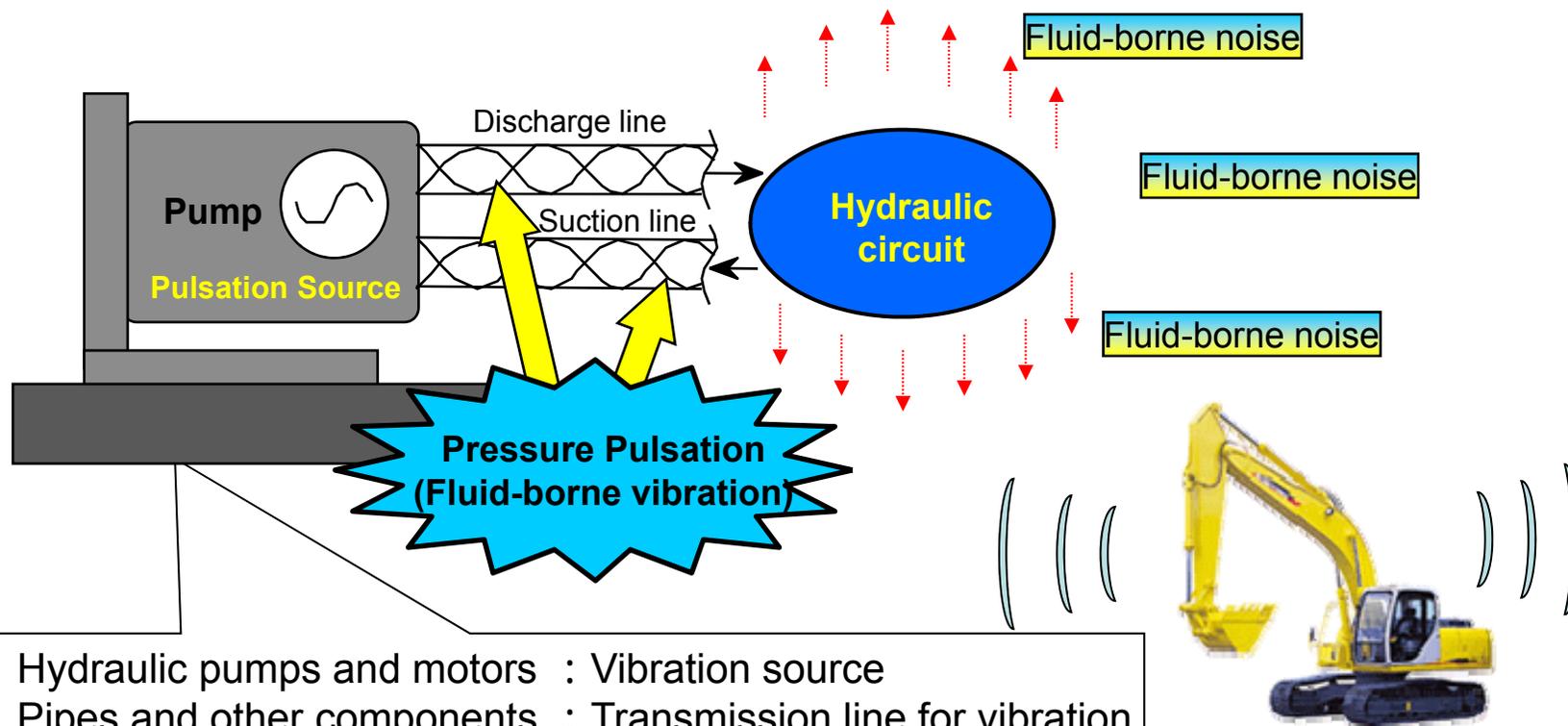
Our main research activities focus on **Fluid Power System**. Through the research, we are pursuing a creation of new technology which contributes to the prosperity of our life !

Fluid power system is the instruments or technology that uses fluid as a medium for the transmission and control of power. **Fluid power system** has powerful advantages over the other power transmission and control technology, these are, high power density, high dynamic response with a heavy load, easiness for remotely controlled and transmitted power. Therefore, it is utilized in the various industry field, i.e. defense technology, airplane, ships, automobiles, construction machines, agricultural machines, manufacture machines, rescue robots, medical robots, etc..



Reduction of Fluid-borne Noise in Hydraulic Systems

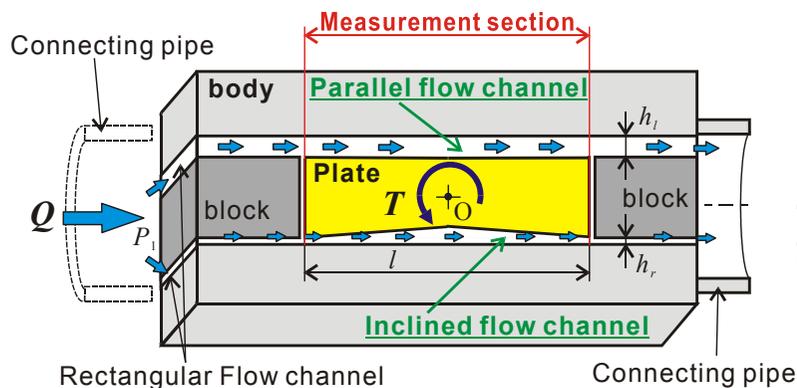
The problem caused by the noise and vibration generated from hydraulic systems are one of the big issue has to be solved immediately. Our research group involves in the fundamental research of the noise reduction, as well as the development of new application and optimum design of hydraulic silencers.



T. Ichiyanagi, T. Kuribayashi, T. Nishiumi
Investigations on Wave Propagation of the Pressure Pulsation in a Helmholtz type hydraulic silencer with a Hemispherical Vessel
Transaction of the ASME, Journal of Vibration and Acoustics, Vol.139, No.1, pp.011003-1 ~ 011003-8 (2017.2)

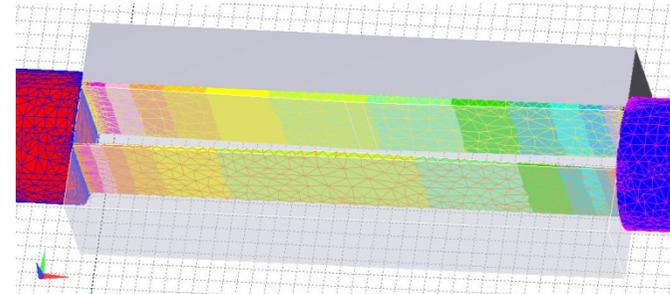
New type of flow meter

Our newly proposed flow meter is based on the measurement of torque generated in the plate inside flow line due to the generation of the lateral flow force. Flow can be easily obtained from this torque.

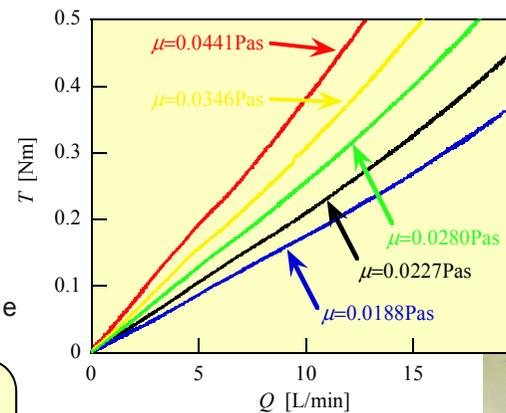


Main feature

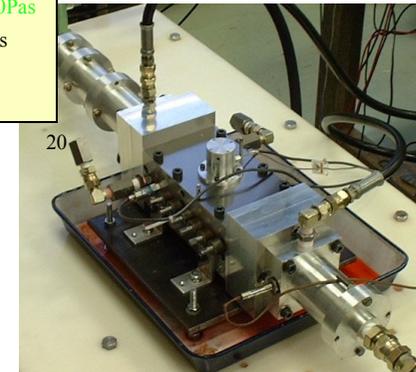
- Simple structure
- Low pressure loss
- Expecting high dynamic response



Pressure contour by CFD



Flow versus torque

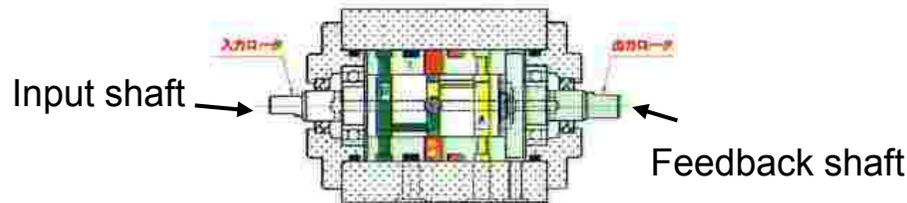


T. Ichiyanagi, T. Nishiumi

CFD Analysis and Improvement of Torque Detected Type Flow Meter
International Journal of Fluid Power, Vol.14, No.3, pp.5 ~ 14 (2013.11)

Development of new rotary control valve

Unlike the conventional hydraulic control valves, this electro – hydraulic valve controls a flow by rotating its spool. Adding to an input rotation shaft, the valve has a feedback shaft that makes it possible to realize a mechanical feedback mechanism inside the valve.

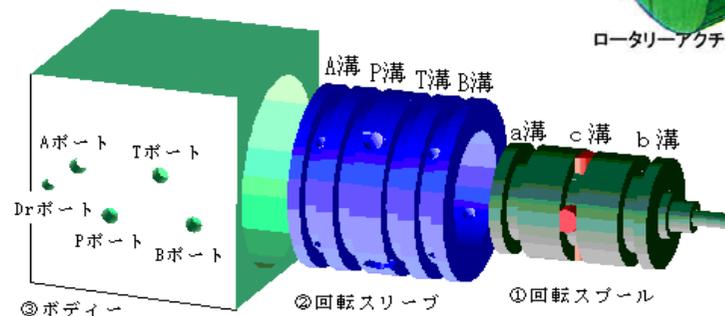
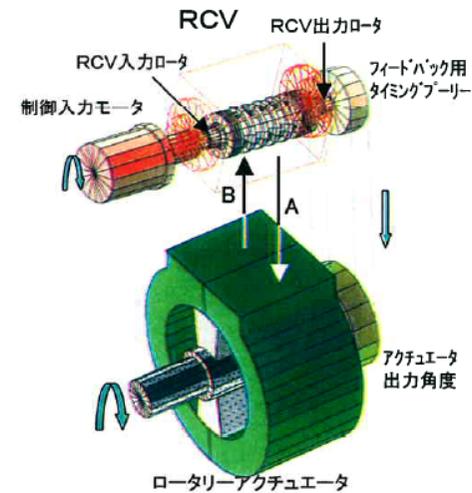


Input & feedback shafts



Actuator

Mechanical feedback control



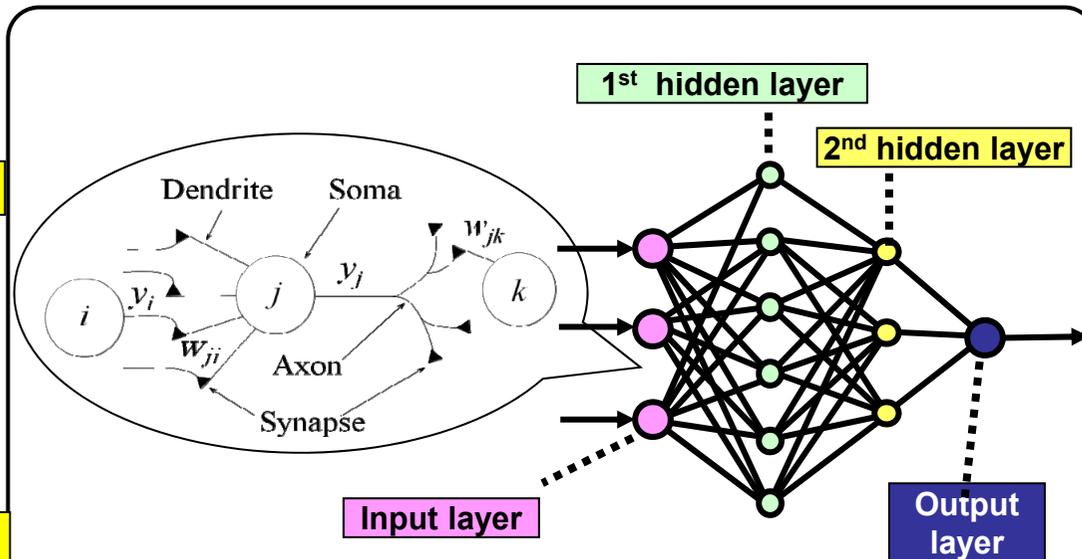
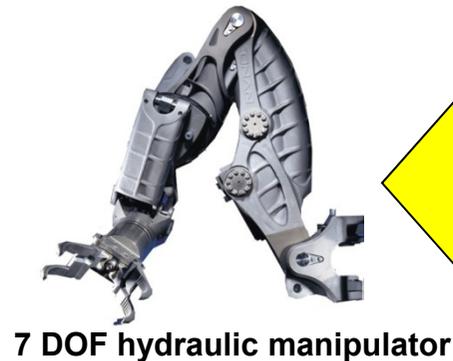
Main Feature

- Few input energy is needed
- Excellent pressure balance
- Anti-contamination

Takayoshi Ichiyanagi, Takao Nishiumi, Nobuyuki Kindo, Haruhisa Takatani :
 Basic Characteristics of a Hydraulic Rotary Control Valve
 Proc. of JSME Mechanical Engineering Congress 2006 Japan, Vol.2 , pp.325-326 (2006.9, Kumamoto)

Neural Network control for Hydraulic Servo Systems

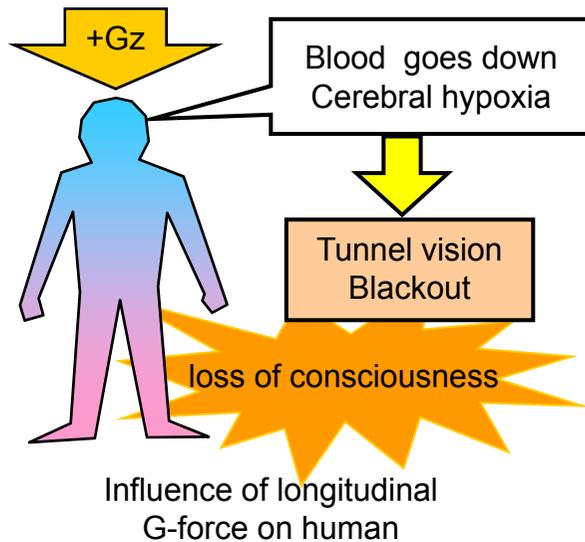
Hydraulic servo system is widely used in the various actuation systems due to its high dynamic response with heavy loads. However, its inherent non-linearity of the system is often a difficulty for achieving the precise control. Therefore, Our research group try to overcome this problems by applying the Neural Network control algorithm to the hydraulic servo systems.



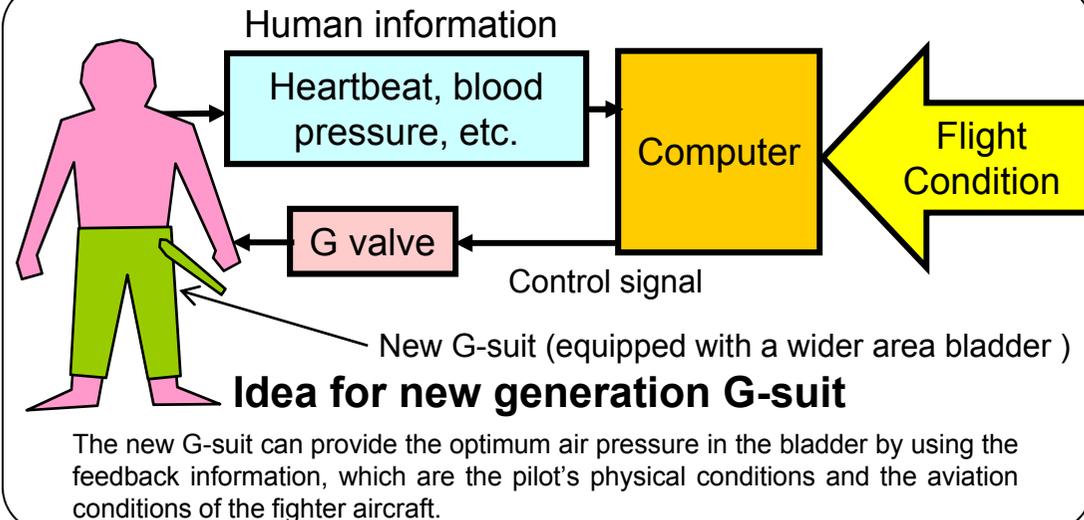
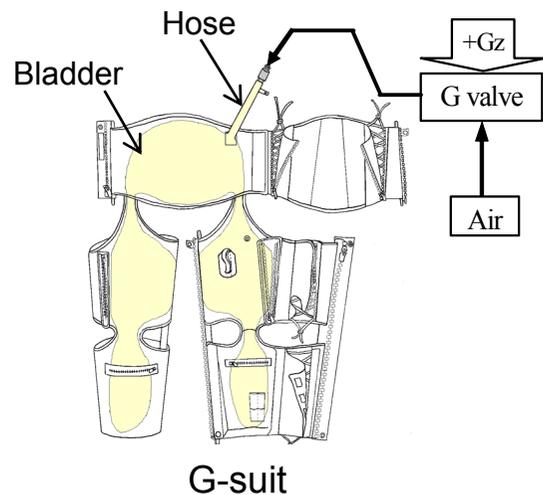
The Neural Network, which replicates a human brain cell structure and its signal transmission mechanism, has a strong adaptive learning ability to the input signal and a robustness toward the disturbances.

Takao Nishiumi, Hiroshi Katoh, Takashi Haraguchi, Takayoshi Ichiyanagi :
Design of the Neural Network Angular Velocity Compensator based on Modeling of a Hydraulic Servo Motor System,
Transaction of Japan Society of Mechanical Engineers , Ser. B Vol. 71 No.712, p.2941~2948 (2005.12)

Pneumatic G-suit for a fighter pilot



A G-suit is a gear for air fighter pilots that prevent them from physical bad conditions such as tunnel vision, blackout, and loss of consciousness. These are all because of cerebral hypoxia due to an excess longitudinal sustained G-force. Therefore, the G-suit utilizes the pneumatic system to control the air pressure in order to avoid blood goes down to the legs side. Alongside the recent development of the new generation fighter aircraft, an improvement of the G-suit performance is also desperately required now.



Hiroshi Katoh, Takao Nishiumi :
 Pressure control of the pneumatic G-suit for an airplane pilot (Investigation on Basic Characteristics of the G-suit)
 Proc. on Spring Conference of Japan Fluid Power System Society 2008, pp.110-112, (2008.5)