Simulation and Control of a pneumatically actuated dynamic walking robot

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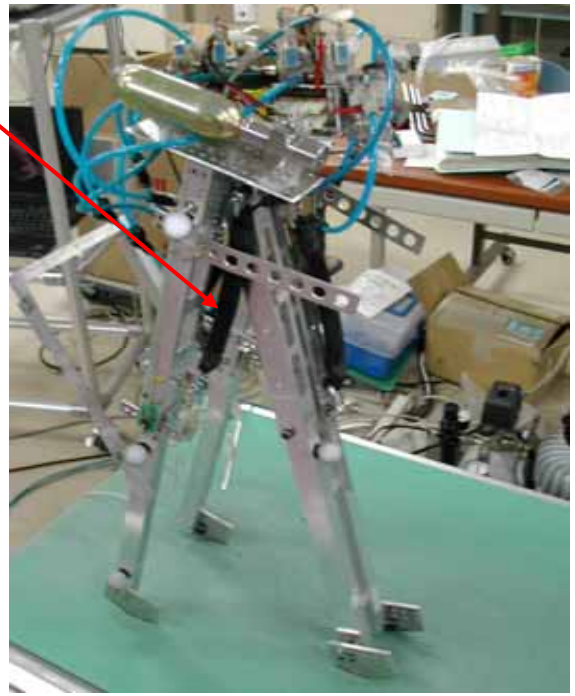
DeMaMech Exchange project
Europe ←→ Japan
5 months project in Osaka, Japan
- An unforgettable experience -

Research

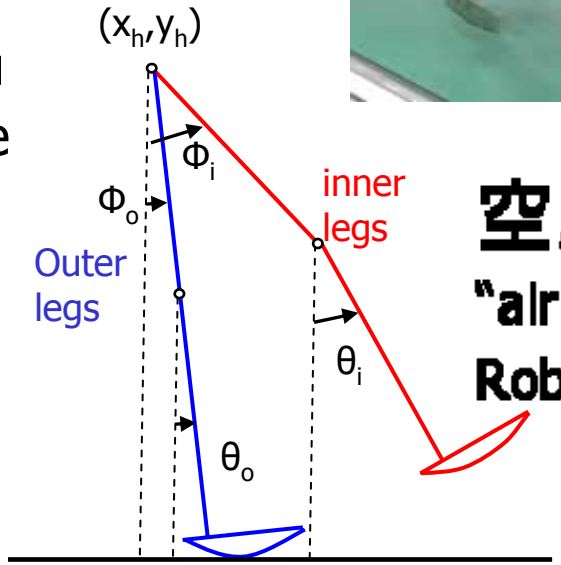


Que-kaku is a 2D pneumatic walking robot that:

- Walks using six McKibben muscles,
- Is controlled by a feed-forward controller
- Can walk autonomously using gas tanks

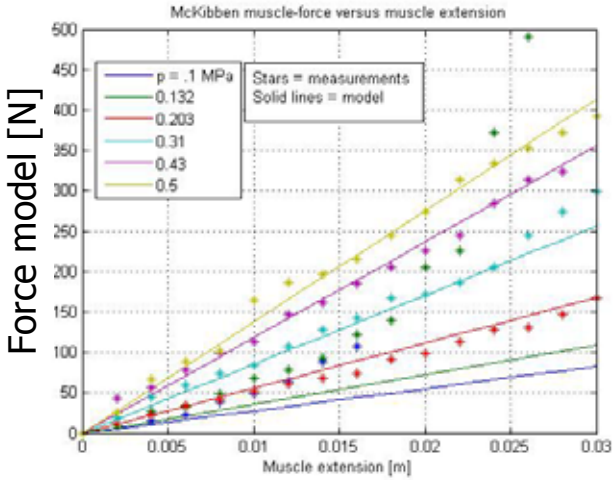
Using the MATLAB package I did:

- Make a dynamic model of Que-kaku
- Make and implement a model of the pneumatic McKibben muscles
- Investigate the walking behavior
- Simulate walking behavior
- Controller design on simulation
- Implementation and validation



空脚, Que-kaku = "air legs" in Japanese. Robot built by Takuma.

Research (2)

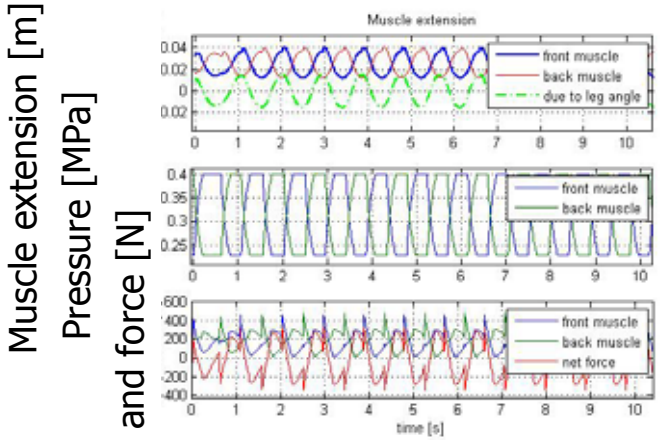


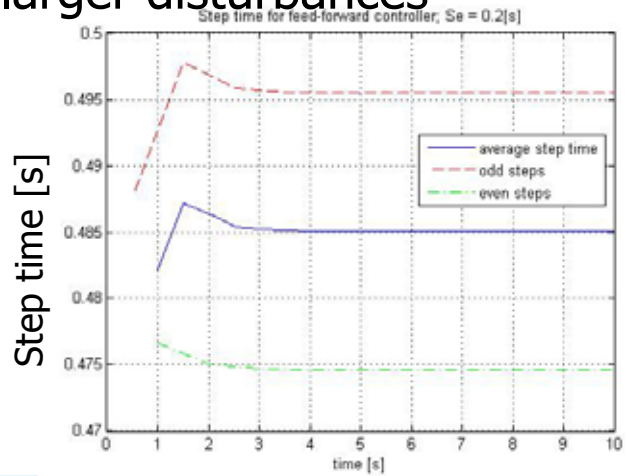
Based on force measurements a **muscle model** is made with linear extension-pressure-force relations

- Using the simulation new **controllers** or hardware can be easily tested and the effect on different variables can be observed

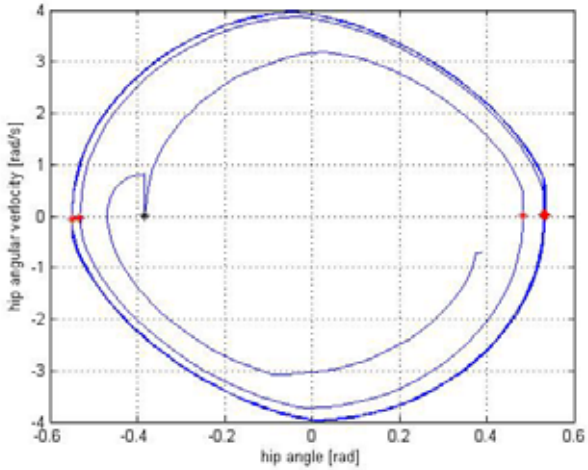
Feedback can improve the walking behavior of the robot

- The walking behavior can be automatically changed
- The robot can handle larger disturbances





Phase plot of hip joint [rad] v/s [rad/s]



Exchange student life





- I lived in Senri International House, 20 minutes by bike from campus
- A beginner course for Japanese helped me to learn basic Japanese
- The people are very nice, social and interested
- I traveled and have seen many beautiful and exciting places
- Kyoto, Shikoku, Hiroshima, Miyajima, Tokyo, Okinawa
- It was an unforgettable experience!