

Hiroshi TAKEMURA (Professor, Department of Mechanical Engineering, Tokyo University of Science)

Purpose of Research

We are conducting research on measurement, modeling, and control of human body motions, focusing on robotics and biomechanics. Our activities cover a wide range from basic research to applied research of human body functions, as well as animal behavioral analysis and development of medical devices.

Summary of Research

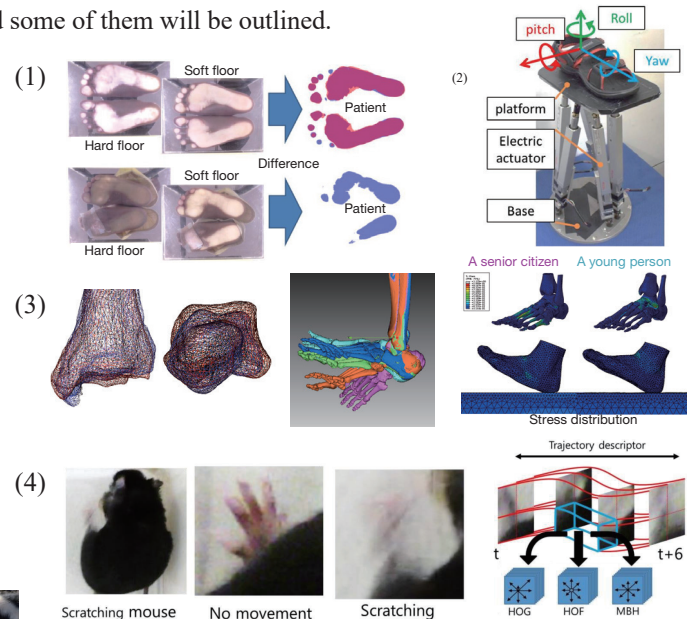
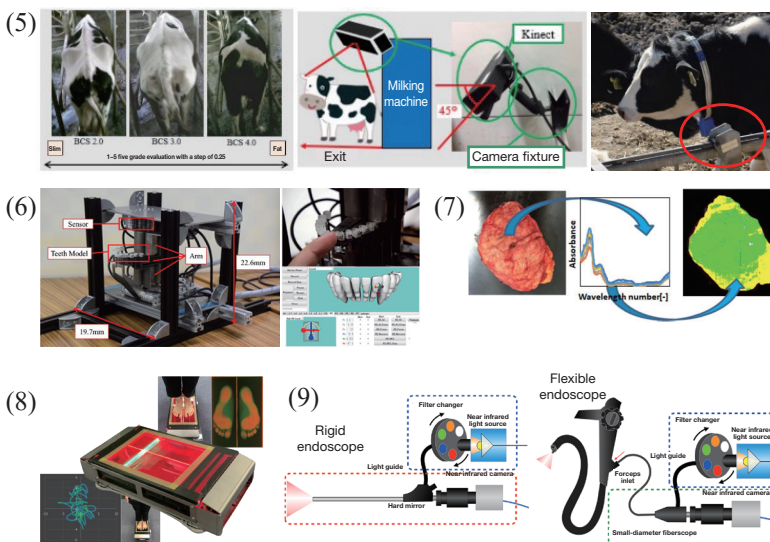
Our wide variety of research themes are roughly categorized below and some of them will be outlined.

■ Research Theme Related to Feet

- (1) Early screening of diabetic neuropathy focusing on foot sole images
- (2) A rehabilitation device in consideration of the ankle joint rotation axis
- (3) Evaluation method for leg bone shape and tibial joint alignment in patients with osteoarthritis
- (4) Counting the number of a mouse's scratching motions using time-subtraction imaging
- (5) Development of automatic measurement system of a cow's BCS using deep learning

■ Research Themes Related to Medical Devices Development

- (6) Measurement devices of orthodontic force and moment
- (7) Recognition of gastrointestinal stromal tumor with a near-infrared spectroscopic camera
- (8) Early screening for diabetic neuropathy
- (9) An endoscopic device using near infrared light



Comparison with Conventional or Competitive Technology

In the research related to feet, we elucidate the structure, function, and motion mechanism of human feet by operating the cycle of medical/experimental motion measurement to digital human modeling and to numerical simulation analysis. Analyses using models close to real things have enabled feedback to the development system.

Expected Applications

- Development of medical devices
- Development of medical/welfare equipment
- Development of automatic measurement systems using deep learning
- Others

What We Expect from Companies

We hope to collaborate with companies who are willing to work with us to achieve the objectives of our research/development projects and put their results into practice.

Points

- We are conducting research on measurement, modeling and control of human motions, focusing on robotics and biomechanics.
- We are also working actively on developing medical devices and medical/welfare equipment.

Past/Current Efforts and Future Developments

We are also actively collaborating with external research institutions, and are conducting research and development of medical/welfare equipment in collaboration with external medical institutions and other related organizations.

- Joint-research Partners: Many achievements of joint-research projects with public institutions (Advanced Industrial Science and Technology [AIST], RIKEN, National Cancer Center Hospital East, National Agriculture and Food Research Organization [NARO], and medical universities) and other private institutions
- Intellectual Property: Japanese Patent No. 5995215 "Cancer Cell Region Extraction Device, Method, and Program," Japanese Patent No. 6666010 "Approaching Device," PCT/JP2020/032439 "Abnormal State Estimation Device, Sole State Estimation Device, System, and Program," and others