Curriculum vitae

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【Introduction】

I am originally from India. After earning a bachelor’s degree in engineering, I wanted to deepen my knowledge in the field of Human Computer Interaction, so I participated in the training of an Indian research institute called Central Electronics Engineering Research Institute（CEERI）under the Council of Scientific and Industrial Research (CSIR), India. As a result, I became interested in technology that helps people in need (physical or cognitive). Then, I entered the Biological Systems Engineering Laboratory of Hiroshima University and researched about soft-type robotic actuation through the MEXT-sponsored “Taoyaka Program”. I chose Japan because Japanese technology is commendably advancing, especially in the fields of automation and robots. In Japan, I was especially able to learn the Japanese language and committed research culture. I would like to continue living in Japan, improve my skills, and grow as a researcher.

【Expertise】

- Soft Robotics: Pneumatic Gel Muscles (PGMs), Human Sensing, Exercise Assistance, Force Feedback, Exergames
- Data processing & analysis: Feature extraction, Classification through Machine Learning (ML), Algorithm development
- Development of interactive Virtual Reality (VR) environments using sensing modules (VR Head Mount Display (HMD): Vive VR, Leap Motion Sensor, Vive Trackers, stretch sensors, Intel RealSense)

【Work experience】

Project Assistant Professor, Hiroshima University (Oct 20’ – present)
Engaged in the project called “Smart society for enjoying long healthy life - Developing AI smart coaching technology that facilitates voluntary skill-up for elderlies” commissioned by the New Energy and Industrial Technology Development Organization (NEDO), Japan under Prof. Yuichi Kurita.

【Education】

PhD – Soft robotics, System Cybernetics (Apr 18’ – Sep 20’) Hiroshima University, Higashihiroshima, Japan – 7390046.
CGPA – 3.4/4
(under Prof. Yuichi Kurita)

TAOYAKA Program M.S. – System Cybernetics (Apr 16’ – Apr 18’) Hiroshima University, Higashihiroshima, Japan – 7390046.
CGPA – 3.5/4

M.Tech – Electronics Design and Technology (June 13’ – May 15’) Tezpur Central University, Tezpur, Assam, India - 784028.
CGPA - 9.45/10
(Project supervised and completed at Council of Scientific and Industrial Research- Central Electronics Engineering Research Institute, India under Prof. Jagdish Lal Raheja)

B.Tech – Electronics and Communication Engineering (May 09’ – May 13’) North Eastern Regional Institute of Science and Tech. (NERIST), Itanagar, India - 791109.
CGPA - 4.91/5

【PR】

My greatest strength is being able to work as a team irrespective of the cultural differences. Understanding team members is very important in teamwork. Especially when there is a deadline, I have to think about problem solving with optimal work allocation in a short span, and I am good at that. I have the ability to do futuristic thinking to solve problems with available resources within a given deadline. During college, I mainly participated in the following team projects. (1) Cassie Lowell (Harvard University student) internship project. I was pleased to be a member of the student team at the host institution, participating in her project and helping to achieve technical results in 6 months. (2) Muscleblazer project (presented in Delft, The Netherlands). In this project, it was a big challenge to prepare the hardware (force feedback suit, control circuit) that can operate without failure in the field while fighting with the deadline. I especially prepared the materials to prevent failure in field demonstrations and helped members to solve possible problems immediately. (3) Taoyaka Onsite Team Project (part of the Multicultural Doctoral Program). This was a one-year project, with field experiments. The hardest part of this project was that each team member had different goals (technical, social and cultural). However, by supporting each other, we were able to achieve these goals. Other team members helped me collect technical data, and at the same time I helped the others in doing field research in my data collection site. In this project, I was able to learn how to act and make the best use of a multicultural project.

【Project information】

Period	Research Content	Working environment	Position
October 2020 ~ October 2021 (12 months)	**■ SmartAidView: Utilizing deceptive visual feedback to manipulate perceived assistive force (SMC 2020, AHs 2021)** - Physical exercise is often supported by robotic assistance. But humans tend to become dependent on and underestimate the robotic assistive force. - To avoid this dependence, assistive force must be gradually reduced without awareness. - In this research, we integrate visual feedback with assistive force to verify its effect on assistive force perception.	MATLAB	Assistant Professor Hiroshima University
October 2020 ~ October 2021 (12 months)	**■ Estimating Signal-Dependent Noise (SDN)-based motion variations to enhance gesture recognition (Advanced Robotics)** - Variations are inevitably generated when human gestures are repeatedly performed. Such variations reduce the accuracy of gesture recognition. This issue can be addressed by increasing the amount of training data. However, this increases the load on the human subjects and the experimenters. - To address this issue, we proposed an algorithm that predicts changes in gesture movement by superimposing SDN (signal-dependent noise) on muscle activity data generated from a single measured gesture trajectory. - The predicted data were used to improve the gesture recognition accuracy by 26% when compared to conventional methods. Gestures considered were chop, punch, star, circle (clockwise and anti-clockwise) and slap.	MATLAB Python	Assistant Professor Hiroshima University
October 2020 ~ July 2021 (10 months)	**■ Feature selection and validation of an ML-based lower limb risk assessment tool (MDPI Sensors)** - Research goal is self-identification of locomotive degradation. ML-based classifiers are used to identify the risk level. - We use 9 squat and 4 one-leg standing exercise features (obtained through skeletal data) as input parameters to the ML classifiers. - The output layer of the classifiers is based on Short Test Battery Locomotive Syndrome (STBLS) test used to detect Locomotive Syndrome (LS) approved by the Japanese Orthopedic Association (JOA). - Best accuracies obtained for test scores of stand-up, 2-stride, and GLFS-25 through Random Forest Regressor were 0.86, 0.79, and 0.73, respectively.	Python	Assistant Professor Hiroshima University
April 2021 ~ October 2021 (7 months)	**■ Squat exergame design (HCII 2021)** - We used VR to design an exergame that combines squat exercise and ski environment with PGM-based force feedback. - Collectible spheres were placed on the pathway of the user so that optimum squat height is achieved with low risk of injury. - We monitored different physiological parameters such as Galvanic Skin Response (GSR), body temperature and heartrate during the squat exercises. - Since GSR indicates the stress level in participants, we observed that providing timed force-feedback during squat tends to reduce stress levels and thus raise the motivation levels to complete the exercise.	Python C# Unity Pneumatic valves Arduino GSR sensors Vive VR	Assistant Professor Hiroshima University

April 2018 ~ October 2020 (30 months)	■ **Soft and wearable upper limb assist and force feedback (IEEE TMRB, AHs 2020, SII 2020, GSIP 2019)** - In this research, we developed a wearable force feedback and assist suit using artificial muscles called PGMs (specially designed low-pressure artificial muscles). - During this project, I conducted several experiments (both technical and human-interface) to identify the effects of applying PGM-based actuation on human body during different scenarios. - I used the prototype in 4 main applications: VR (Virtual Reality) Force Feedback, Navigation Assistance, Rehabilitation Training of elderly, Motor Learning.	MATLAB C# Python Unity LeapMotion Pneumatic valves Arduino sEMG sensors (Delsys)	Student (Doctor) Hiroshima University
April 2017 -April 2018 (12 months)	■ **Design and development of wrist assist device using pneumatic artificial muscle (PAM) and stretch sensor (ICRA, IEEE RAL)** - In this research, we developed a wrist assist device that uses a stretch sensor to detect the intent of the user and based on this detection, the corresponding set of PAMs is actuated to support the remainder of the wrist motion. - In training and evaluation sessions, the majority of subjects showed a statistically significant reduction in muscle actuation when they used the device.	Stretch sensors Pneumatic Artificial Muscles MATLAB Arduino sEMG sensors (Oisaka pEMG)	Student (Master) Hiroshima University
July 2014 -May 2015 (10 months)	■ **Robot control by Brain-Computer Interaction (BCI)** - Quadriplegic patients can become partially independent if they can control devices through their functioning part – brain. - In this research we used BCI technology to control a low-cost robot through facial expressions - First, we extracted Discrete Wavelet Transform (DWT) coefficients from the Electroencephalography (EEG) data and applied PCA (principal component analysis). The processed data was sent to Artificial Neural Networks (ANNs) for meaningful classification. - The ANN was integrated with a GUI (Graphical User Interface) for driving robots using the obtained EEG signals.	MATLAB Arduino Emotiv EPOC (EEG sensors) Gyro sensors Neural Networks Signal Processing	Student (Master) Tezpur University (India)
July 2012 -May 2013 (10 months)	■ **Performance of hybrid MRC / SC diversity receiver in Rayleigh Fading Channel (CCUBE 2016)** - Diversity combining techniques are quite significant in wireless communication engineering. We proposed a hybrid diversity scheme combining Maximal Ratio Combining (MRC) and Selection Combining (SC) for the Rayleigh fading channel. - Performance is evaluated by calculating the outage probability and average bit error rate.	Mathematica MATLAB R Multisim	Student (Bachelor)

【Language qualifications】

Acquisition month	Qualification
July 2020	TOEIC – 945
October 2015	GRE - 305
August 2021	JLPT N3 - 120

【Skill list】

	Usage experience
「OS」Windows	Can install from scratch (10 years)
「OS」iOS	Can understand and use basic functions, install new apps, and troubleshoot (3 years)
MATLAB, Python, Unity	Can write the optimum code according to the situation and give guidance (5 years)
C++, C, C#, Simulink	Can program after reading/ revision (2 years)
Mathematica, Multisim, R	Beginner, but can easily understand the logic (1 year)
Sketch, Figma	Beginner, but can easily understand the logic (6 months)

【Publication List】

Journal papers and book

1. Das, S., Sakoda, W., Ramasamy, P., Tadayon, R., Ramirez, A. V., & Kurita, Y. Feature Selection and Validation of a Machine Learning-Based Lower Limb Risk Assessment Tool: A Feasibility Study. In MDPI Sensors, vol. 21, no. 19. MDPI. 2021.
2. Das, S., Ishibashi, Y., Minakata, M., & Kurita, Y. Estimating Signal-Dependent Noise (SDN)-based motion variations to enhance gesture recognition. Advanced Robotics. In press. Taylor & Francis.
3. Das, S., & Kurita, Y. ForceArm: A wearable pneumatic gel muscle (PGM)-based assistive suit for the upper limb. In IEEE Transactions on Medical Robotics and Bionics, vol 2, no. 2, PP. 269-281. IEEE. 2020.
4. Das, S., Kishishita, Y., Tsuji, T., Lowell, C., Ogawa, K., & Kurita, Y. ForceHand glove: a wearable force feedback glove with pneumatic artificial muscles (PAMs). In IEEE Robotics and Automation Letters, vol 3, no. 3, PP. 2416-2423. IEEE. 2018.
5. Das, S., Tripathy, D., & Raheja, J. L. Real-time BCI System Design to Control Arduino Based Speed Controllable Robot Using EEG. Springer. 2018.

Book chapters

6. Gunarajulu, R., Kurita, Y., Cukovic, S., & Das, S.*, Foot Biomechanics with emphasis on the Plantar Pressure Sensing: A review. In Revolutions in Product Design for Healthcare - Advances in Product Design and Design Methods for Healthcare. In Press. Springer. (*Corresponding author)
7. Das, S., Kurita, Y., & Tadayon, R. Accessible Smart Coaching Technologies Inspired by Elderly Requisites. In Multimedia for Accessible Human Computer Interfaces. PP. 175-215. Springer. 2021.
8. Kurita, Y., Thakur, C., & Das, S. Assistive Soft Exoskeletons with Pneumatic Artificial Muscles. In Haptic Interfaces for Accessibility, Health, and Enhanced Quality of Life, PP. 217-242. Springer. 2020.

Conference papers

9. Ramasamy, P., Das, S.*, & Kurita, Y. Ski for Squat: A Squat Exergame with Pneumatic Gel Muscle-based Dynamic Difficulty Adjustment. In 23rd International Conference on Human-Computer Interaction (HCII), Online. PP. 449-467. Springer. 2021. (*Corresponding author)
10. Das, S., Wongchadakul, V., & Kurita, Y. SmartAidView Jacket: Providing visual aid to lower the underestimation of assistive forces. In Proceedings of the Augmented Humans International Conference (AHs). PP. 152-156. ACM. 2021.
11. Das, S., Wongchadakul, V., Tadayon, R., & Kurita, Y. Creating illusive perceived assistive force using visual feedback. In IEEE International Conference on Systems, Man, and Cybernetics (SMC), PP. 3260-3267. IEEE. 2020.
12. Das, S., Thakur, C., & Kurita, Y. Force-feedback in Virtual Reality through PGM-based ForceHand glove. In IEEE/SICE International Symposium on System Integration (SII), PP. 1016-1021. IEEE. 2020.
13. Das, S., & Kurita, Y. Providing navigation assistance through ForceHand: a wearable force-feedback glove. In IEEE Global Conference on Signal and Information Processing (GlobalSIP), PP. 1-5. IEEE. 2019.
14. Das, S., Ishibashi, Y., Minakata, M., & Kurita, Y. Gesture recognition considering the estimation of signal-dependent noise (SDN)-based motion variation. In Proceedings of the Robotics Symposia (RS), PP. 217-220. 2021.
15. Goto, T., Das, S., Wolf, K., Lopes, P., Kurita, Y., & Kunze, K. Accelerating Skill Acquisition of Two-Handed Drumming using Pneumatic Artificial Muscles. In Proceedings of the Augmented Humans International Conference (AHs), PP. 1-9. ACM. 2020
16. Kishishita, Y., Das, S., Ramirez, A. V., Thakur, C., Tadayon, R., & Kurita, Y. Muscleblazer: Force-Feedback Suit for Immersive Experience. In IEEE Conference on Virtual Reality and 3D User Interfaces (VR), PP. 1813-1818. IEEE. 2019.
17. Tadayon, R., Ramirez, A. V., Das, S., Kishishita, Y., Yamamoto, M., & Kurita, Y. Automatic Exercise Assistance for the Elderly Using Real-Time Adaptation to Performance and Affect. In International Conference on Human-Computer Interaction (HCII), PP. 556-574. Springer. 2019.
18. Goto, T., Das, S., Kurita, Y., & Kunze, K. Artificial Motion Guidance: an Intuitive Device based on Pneumatic Gel Muscle (PGM). In The 31st Annual ACM Symposium on User Interface Software and Technology Adjunct Proceedings (UIST), PP. 182-184. ACM. 2018.

19. Kishishita, Y., Ramirez, A. V., Das, S., Thakur, C., Yanase, Y., & Kurita, Y. Muscleblazer: a wearable laser tag module powered by PGM-induced force-feedback. In Proceedings of the First Superhuman Sports Design Challenge: First International Symposium on Amplifying Capabilities and Competing in Mixed Realities (SHS), PP. 1-6. ACM. 2018.
20. Das, S., Lowell, C. and Kurita, Y. Force Your Hand—PAM Enabled Wrist Support. In International AsiaHaptics conference, PP. 239-245. Springer. 2016.
21. Dinamani, A., Das, S., Bijendra, L., Shruti, R., Babina, S. & Kiran, B. Performance of a hybrid MRC/SC diversity receiver over Rayleigh fading channel. In International conference on Circuits, Controls and Communications (CCUBE), PP. 1-4. IEEE. 2013.