

इंडियन इंस्टीट्यूट ऑफ टेक्नोलॉजी दिल्ली
हौज खास, नई दिल्ली -110016
(औद्योगिक अनुसंधान एवं विकास इकाई)
INDIAN INSTITUTE OF TECHNOLOGY DELHI
Hauz Khas, New Delhi-110016
(Industrial Research & Development Unit)

No. IITD/IRD/RP03830G/185899

Dated: 02/12/2019

Advertisement No.: IITD/IRD/239/2019

Applications from Indian nationals are invited for Project Appointment under the following project. Appointment shall be on contractual basis with consolidated pay, renewable yearly or upto the duration of the project, whichever is earlier. निम्नलिखित परियोजना के तहत भारतीय नागरिकों से आवेदन आमंत्रित किए जाते हैं। अपॉइंटमेंट, अनुबंधित आधार पर समेकित वेतन, नवीकरणीय वार्षिक या परियोजना की अवधि तक, जो भी पहले हो, के साथ होगा।

Project Summary : This is a 5 year project divided into two phases: Phase 1 preliminary study, and phase 2 development of device Aim: The aim of the proposal is to carry out preliminary studies for developing a proof-of-concept wearable soft-robotic upper limb exosuit for muscle power augmentation with BMI interface. The whole product development can be divided into some sub-objectives: I. Developing an external, wearable musculotendon structure, with artificial muscle and Bowden cable like mechanical tendon for upper limb power augmentation. Exploring the feasibility of smart multifunctional polymers as artificial muscle. II. Performing complete biomechanical analysis of the upper limb musculotendon system for actuator placement and network of tendon (Bowden cables) routing. III. Development of a simulation platform for combining the musculoskeletal analysis of human motion and externally powered actuator system to understand the active coupled dynamics and facilitate model-based control laws development. IV. Design, development and experimental characterization of proof-of-concept soft robotic wearable exosuit for muscle augmentation. V. Signal processing, feature extraction for BMI interface will be developed separately to integrate it with the actual prototype. We plan to use a standard EMG/EEG driven BMI protocol as control input.

Scientific Importance of the project Smart (EMG/EEG controlled) wearable exoskeleton has many advantages over its bulky, hard counterpart. On top of that, the materials used in the manufacturing are mostly polymeric material, -hence when it is coupled with modern rapid prototyping techniques makes the device form factor cheap and affordable. Brain Machine Interface to control soft robotic gears is a new technological challenge but can unlock immense potential in the coming future. The project will also initiate soft robotic research in the defense sector in India. Bio-inspired soft automation, combined with smart, intelligent material development is going have big impact in defense technologies around the world. If successful, the current project may lead to many innovative usages for Indian armed force, for example the soldiers posted in difficult northern terrain needs performance boosting full body wearable exoskeleton, shape changing camouflaging jacket or bioinspired robotic artillery. The artificial muscle technology and BMI based control platform developed in this project can lead to performance boosting wearable exosuits.

The post(s) may be downgraded as per discretion of the Selection Committee if none of the candidate is found suitable for the post.

Title of the Project	Wearable soft robotics for Upper Limb Muscle Power Augmentation with BMI interface – A proof of concept study (under JATC) (RP03830G)	
Funding Agency	DRDO, Ministry of Defence	
Name of the Project Investigator	Prof. Sitikantha Roy	
Deptt./Centre	Department of Applied Mechanics	
Duration of the Project	Upto:24/10/2020	
Post (s)	Consolidated fellowship / Pay-slab	Qualifications
Research Associate (1) Biomechanics Will mostly work in Computational and experimental musculoskeletal biomechanics of upper limb human movement with OpenSim	Rs.47,000-49,000-54,000/- p.m. plus HRA @ 24%	PhD/MD/MS/MDS or equivalent degree in Mechanical/Biomedical Engineering/Civil/Aerospace/Applied Mechanics. OR MVSc/M.Pharm/ME/MTech in Mechanical/Biomedical/Civil/Aerospace/Applied Mechanics having 3 years of research, teaching and design and development experience in Biomechanics related field. With good publication record in SCI Journal. Desirable skill: Experience in Musculoskeletal Biomechanics, Open Sim based biomechanical simulation and interfacing, experience in Python, C++ or MATLAB. Knowledge in multibody dynamics, muscle physiology will be plus.
RA (1) CONTROL	Rs.47,000-49,000-54,000/- p.m. plus HRA @ 24%	Ph.D.in Electrical/Electronics/Instrumentation/Mechanical/Biomedical Engineering with specialization in Systems and Control/Robotics. OR M.Tech. 1st class in the aforementioned disciplines (with specialization in Systems and Control/Robotics) with minimum of 3 years of research experience after M.Tech, with good publication record in SCI index Journals. Additionally, candidates are required to have excellent mathematical skills, device design experience and proficiency in MATLAB/C++/Python.

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<p>RA (1) Will work in soft actuator, artificial muscle field.</p>	<p>Rs.47,000-49,000-54,000/- p.m. plus HRA @ 24%</p>	<p>Ph.D. in Mechanical/Applied Mechanics/Civil/Biomedical Engineering with specialization in Smart Materials/Artificial Muscle Design/Actuator or Sensor Design and Modeling.</p> <p style="text-align: center;">OR</p> <p>M.Tech. 1st class in the aforementioned disciplines (with specialization in Smart Materials or Transducer Design) with minimum of 3 years of research experience after M.Tech.</p> <p>Additionally experience in design/modeling of smart material-based devices, understanding of actuators/sensor devices or biomedical devices is preferred. Furthermore, background in FEA modeling or MATLAB/C++/Python programming is required.</p>
<p>Sr. Research Fellow (1) Biomechanics (Work with OpenSim musculoskeletal Biomechanics Tool, interface with MATLAB in simulation, interact with experimental labs for data motion data generation and analysis)</p>	<p>Rs.35,000/- p.m. plus HRA @ 24%</p>	<p>MTech 1st class in Mechanical/Civil/Aerospace/Applied Mechanics with background in computational mechanics/biomechanics and keen interest in biomechanical problem with minimum 2 years of research/design and development experience after M.Tech. with NET/GATE* qualification. Desirable: Knowledge in C++, Matlab and OpenSim musculoskeletal biomechanics. *The requirement of NET/GATE examination for the selection to the post of SRF may be relaxed for the candidates who have graduated from Centrally Funded Technical Institutes (CFTIs) with a CGPA of more than 8.000 (80% aggregate marks). ** Applicants with less than 2 years' experience in relevant areas may be considered for JRF position with proportionate salary as per rule.</p>
<p>Sr. Research Fellow (1) Control (will be responsible to develop control algorithm for soft robotic suit augmentation. Will mostly oversee the control MATLAB based control law interfacing with OpenSim etc)</p>	<p>Rs.35,000/- p.m. plus HRA @ 24%</p>	<p>M.Tech. 1st class in Electrical/Electronics/Instrumentation/Mechanical/Biomedical Engineering with specialization in Systems and Control/Robotics with a minimum 2 years of research/design and development experience after M.Tech. with NET/GATE* qualification. Additionally, candidates with device design experience and proficiency in MATLAB/C++/Python will be preferred. *The requirement of NET/GATE examination for the selection to the post of SRF may be relaxed for the candidates who have graduated from Centrally Funded Technical Institutes (CFTIs) with a CGPA of more than 8.000 (80% aggregate marks). **Applicants with less than 2 years' experience in relevant areas may be considered for JRF position</p>
<p>Sr. Research Fellow (1) Smart materials will work in soft actuator field.</p>	<p>Rs.35,000/- p.m. plus HRA @ 24%</p>	<p>M.Tech. 1st class in Mechanical/Applied Mechanics/Civil/Biomedical Engineering with specialization in Design or Engineering Mechanics and a minimum 2 years of research/design and development experience after M.Tech. with GATE qualification. Preferred qualifications: Experience in design/Modeling of smart material-based devices, understanding of actuators/sensor devices, biomedical devices, FEA Modeling, proficiency in MATLAB/C++/Python. Additionally, some experience in biomechanics is preferred. * The requirement of NET/GATE examination for the selection to the post of SRF may be relaxed for the candidates who have graduated from Centrally Funded Technical Institutes (CFTIs) with a CGPA of more than 8.000 (80% aggregate marks). **Applicants with less than 2 years' experience in relevant areas may be considered for JRF position.</p>
<p>Principal Project Scientist (1) Brain Machine Interface Will mostly work in EEG signal classification for motor control of human motion.</p>	<p>Rs.56,000-60,000-64,000-69,000-74,000-79,000/- p.m. plus HRA @ 24%</p> <p>Higher salary is possible based on qualification and competence of the candidate.</p>	<p>Classification of hand movement (actual and motion intension) based on brain source localization and other methods. •Expected profile: 1) PhD in biomedical engineering, electrical engineering, quantitative neuroscience, computer science, computer engineering or related fields. 2) Adequate knowledge of linear algebra, Biomedical signal processing and Machine learning. 3) High proficiency in Matlab and Python are mandatory. 4) Experience with acquisition and analysis of EEG. Desirable: 5) Experience in BCI or other neural prosthetics application. 6) Knowledge of toolbox like EEGLab, Brainstorm and Fieldtrip are plus point</p> <p style="text-align: center;">OR</p> <p>MTech/ME/MSc (Engg) in Computer Science/Electrical Engineering/Mechanical Engineering/Biomedical or related field with experience in EEG signal analysis, BCI, proficiency in MATLAB and Python, with atleast 6 years of experience and good publication record in SCI Journal.</p>

Please email (jatcexosuit@gmail.com) your application packet with a Subject line “Application for RA or SRF position in Biomechanics Or Control Or Brain Machine Interface Or Smart Materials or Actuator”

Kindly include the following in your email as a single pdf attachment with your (First name_Last name_field applied.pdf (for example if you are applying for biomechanics, and your name is Sunil Roy please save the file as Sunil_Roy_biomechanicsRA.pdf or sunil_biomechanicsSRF.pdf) 1. ird_rec_4 form. 2. A detailed CV. 3. Details of all the publications if any and your best papers (in case of RA in particular) 4. A brief cover letter indicating how your skill sets/previous experience fit with the position requirements. **If you have any questions regarding the application, please email at sitiroy@gmail.com or call at 01126591220 during office hours.** IIT Delhi reserves the right to fix higher criteria for short-listing of eligible candidates from those satisfying advertised qualification and requirement of the project post and their name will be displayed on web link (<http://ird.iitd.ac.in/shortlisted>) alongwith the interview details. Only short-listed candidates will be informed.

5% relaxation of marks may be granted to the SC/ST Candidates. In case of selection of a retired/superannuated government employee, his/her salary will be fixed as per prevailing IRD norms. **The last date for submitting the completed applications by e-mail at the email id: JATCEXOSUIT@GMAIL.COM is 17/12/2019 by 5.00 p.m.** The shortlisted candidates who are called for interview should bring original certificates (both professional and academic) with a recent passport size photograph at the time of interview.

सहायक कुल्सचिव, आईआरडी

वितरण

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- Prof. Sitikantha Roy, PI, Department of Applied Mechanics
- Copy to Chairperson, DRC/CRC
- Dr. Harshita Bhatnagar, RD Coordinator, (R&D) Wing