Centre for Mechatronics / Robotics Laboratory

Laboratory Coordinator: Dr. Ashish Dutta (2017 – 2021)

Associated Faculty Members (if any):

List of Major Equipment:

- Robots – PUMA, CRS for experiments.
- Humanoid robotics platforms – Biloid , Kondo KHR.
- Hand exoskeletons
- 14 DOF mobile manipulator systems for space robotics experiments.
- Mobile robotics kits for teaching and experiments.
- Pneumatic artificial muscles for robotics applications.
- EEG based Brain Computer Interface system.

Brief description of the laboratory:

The laboratory carries our research in the three main areas of:

(a) Design and control of Brain Computer Interface based hand exoskeletons for rehabilitation of stroke patients.

(b) Analysis, design and control of biped locomotion of humanoid robots for motion on 3D terrain and for performing complex tasks.

(c) Motion planning of Mobile manipulators systems like space rovers for space applications on 3D terrain.

(d) Applications of Machine Learning algorithms for control of robotic systems like hand exoskeleton, space rovers, humanoid robots, etc.

Laboratory research keywords:

Brain computer interface; Hand exoskeletons; biped locomotion; motion planning; machine learning; mobile manipulator systems, .

Major Research and Development Contribution of the Laboratory

Year	Major research and development activity
2020-2021	▪ Brain computer interface-based algorithms for control of hand exoskeletons for rehabilitation of stroke patients. ▪ Motion planning of space rovers using machine learning algorithms ▪ Humanoid robotics gait on deformable terrains.

2019-2020	▪ Machine learning based control of biped robots for walk on 3D terrain. ▪ Optimal Design of Hand exoskeletons ▪ Design of compliant legged robots for deduced impact while jumping or falling.
2018-2019	▪ Motion planning of space rover for lunar applications ▪ Design of legged robots for walk on uneven terrain
2017-2018	▪ BCI based control for robot human cooperation ▪ Clinical trials for recovery of stroke patients.
2016-2017	▪ Design of hand and leg exoskeletons. ▪ Machine learning based algorithms for control of exoskeletons.
2015-2016	▪ Design of compliant biped robots and their control. ▪ Machine learning methods for motion planning in 3D.

Figure #1: 14 DOF Lunar rover for space applications.

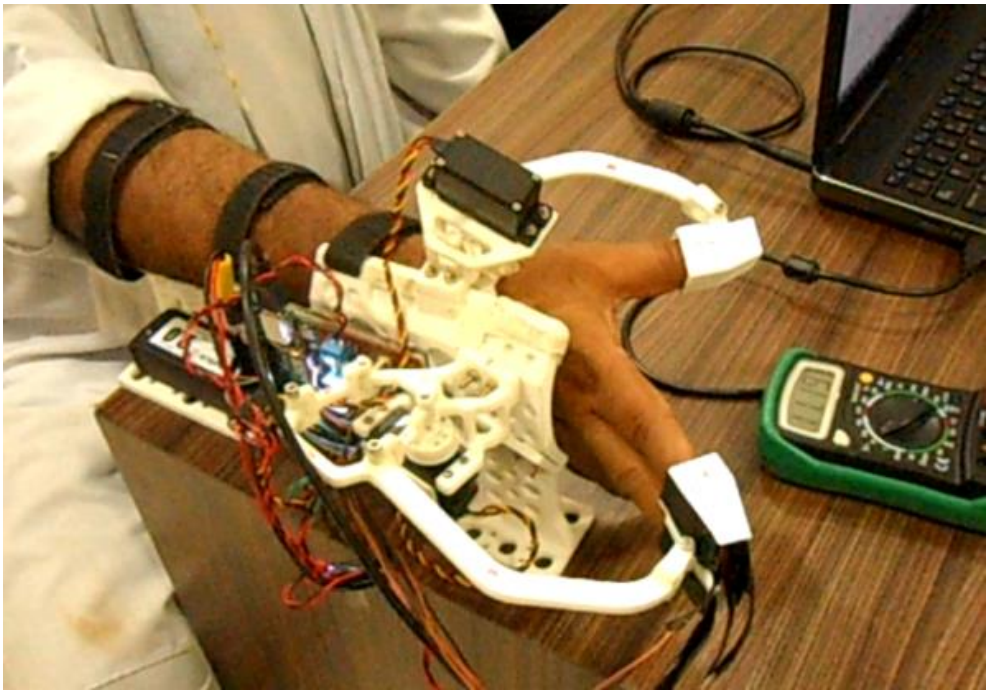

Figure #2: BCI based hand exoskeleton for rehabilitation of stroke patients.

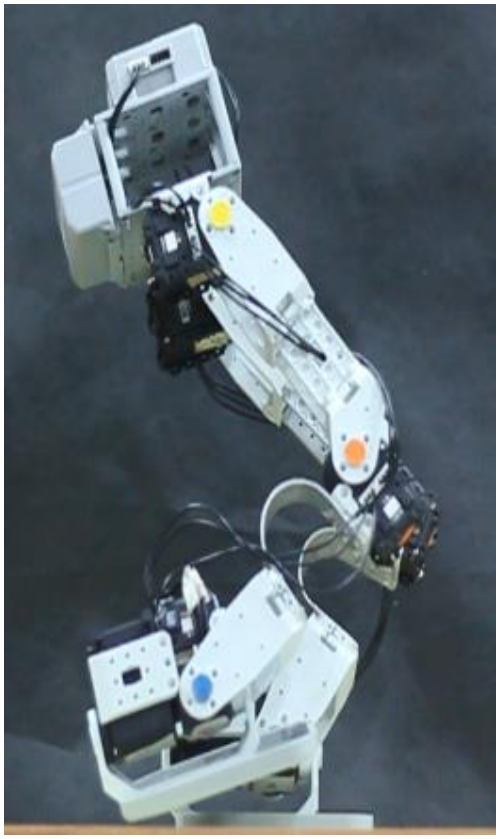

Figure #3: Biped robot with compliance at the shanks.