IUBAT-INTERNATIONAL UNIVERSITY OF BUSINESS AGRICULTURE AND TECHNOLOGY

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Innovation and Entrepreneurship Center

Application Form for Financial Support to Research Projects

Project Title: Design and Manufacture of Prosthetic Bionic hand Controlled via MYO-Sensors.

Principal researcher:
Name: **Gopal Mandal**
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External researcher and Institute (if any): **N/A**

Name: **Dr. Sazzad Bin Sharif**

Department or Institute: **Bachelor of Mechanical Engineering (BSME)**
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Duration of the Project: **06 Months**

Total cost in Taka: **70,000 TK**

Has this project been submitted elsewhere for financial assistance?

Yes [ ] No. [√]

1. Outline of the Project

A. Title of the project: Design and Manufacture of Prosthetic Bionic hand Controlled via MYO-Sensors and Adaptive Machine Learning Algorithm.

B. Introduction:

Throughout the entirety of this project, it has been approached as a full-time endeavor. A 3D printable design for a myoelectric prosthetic arm is presented. The arm is electronically actuated and controlled by a user flexing his/her muscles. The bionic arm presented has the potential to be used by an amputee or person born without a limb. This type of technology does exist although it is expensive and generally not available to people in developing countries. This project covers a broad range of engineering disciplines. The root of the system is an innovative mechanical design for a 3D printed prosthetic arm. Modern-day electronic actuators and circuitry animate the device and allow for sophisticated control schemes. It is hoped that this work will be of value to a diverse audience.

C. Background and literature review

Objectives:

1. To design economically viable prosthetic bionic hand for amputees using Solid Works software and analyze it using Finite Element Analysis in ANSYS.
2. To fabricate the hands using 3D printing from local vendors.
3. To integrate the hand with myo-sensors and micro-controllers.
4. To perform clinical trials on two amputees with missing hands.

D. Methodology: We are working with amputee patients as the subject of our experimental prosthesis. Based on the patient's arm condition, the prosthetic structure has to be designed from the hand joint. We have consulted with the patient and took accurate and precise measurements for the cou-pling joints. We are using Dassault Systems Solid Works to design a 3D model of the patient's hand. This will make the user to wear the hand more comfortably. The next step is in designing the whole hand structure and the ankle joint, some of the parts will be metal and some plastic due to weight balancing between two hands. We are working with sensors which will be attached to different part of the bionic hand which will help to send feedback to our processor which will interim coordinate with various equipment. The system will use a 10-bit microcontroller to make calculations and operations. We are using MYO Sensors to detect electric (motor neuron signal) pulses from the brain, which we will then filter and convert the signal in to dig-ital binary output, so that the patient's thought can be used to control the bionic hand. There will be various other

sensors such as muscle flex, pressure, to make the bionic hand more ac-curate while taking decisions. We are experimenting with the EMG data and combing Virtual Reality to get more precise signal from the brain. Once the signal is processed, we will start doing trials on the test subject and collect data for learn while the patient is using the Bionic hand. Finally, the subject trials will continue and the structure with the programming will also evolve, while there will be an established communication between Human and Machine.

E. Expected outcome of the research: First, we made our model of the bionic arm with plywood. We were able to run it successfully then we decided to go further and made a design and print it by 3d printer. A prototype model of the hand has been made using servo motor and also, we are working with the solid works 3D modeling to make the hand more accurate. There are various factors in consideration while making the structural prototype, the design is being adjusted every time with respect to the patient's comfort ability. We have developed a robotic arm (basic design) to study the dynamics and movements of the arm. In future a better arm will be affixed to the patient.

2. Timeline (Gantt Chart)

Example:

Activity	2022						2023					
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Aprl	May
Literature Review	■	■	■									
Design the climbing device			■	■	■							
Theoretical analysis such as structural analysis						■	■	■				
Prototyping									■			
Conduct experiment and data collection										■		
Final report											■	■

3. Budget Summary in Taka:

Name of Components	Price	LINK
Arduino Nano US FT232 (x1)	**600 TK**	**https://store.roboticsbd.com/arduino-bangladesh/926-arduino-nano-gravitech-us-ft232-original-robotics-bangladesh.html**
Force Sensitive Resistor (x1)	**900 TK**	**https://store.roboticsbd.com/sensors/417-force-sensitive-resistor-square-robotics-bangladesh.html**
Analog EMG Sensor by OYMotion (x1)	**7,000TK**	**https://www.aliexpress.com/item/32844351454.html**
Mechanical structure (x3)	**30,000 TK**	
Servo MG995 (x2) **& MG90s – Micro** (x4)	**4,100- TK**	**https://store.roboticsbd.com/motor/295-mg996continuousrotationservobangladesh.html**
Battery (x1)	**7,600 TK**	
Electronics	**10,000TK**	
Contingency	**10,000TK**	
Total amount =	**70,000 TK**	