GESTURES IN BIONIC ARM

-Presentation for group 4:
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Adding additional functionality to pre-existing technology.

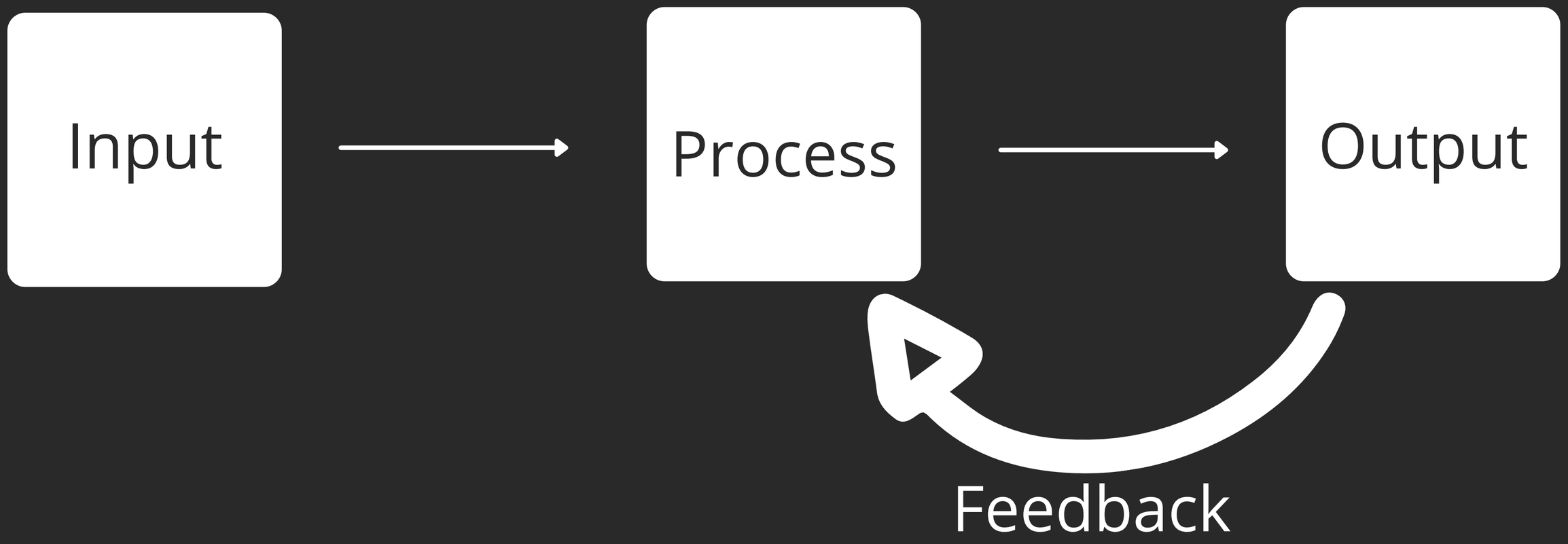
Why robotic arms?

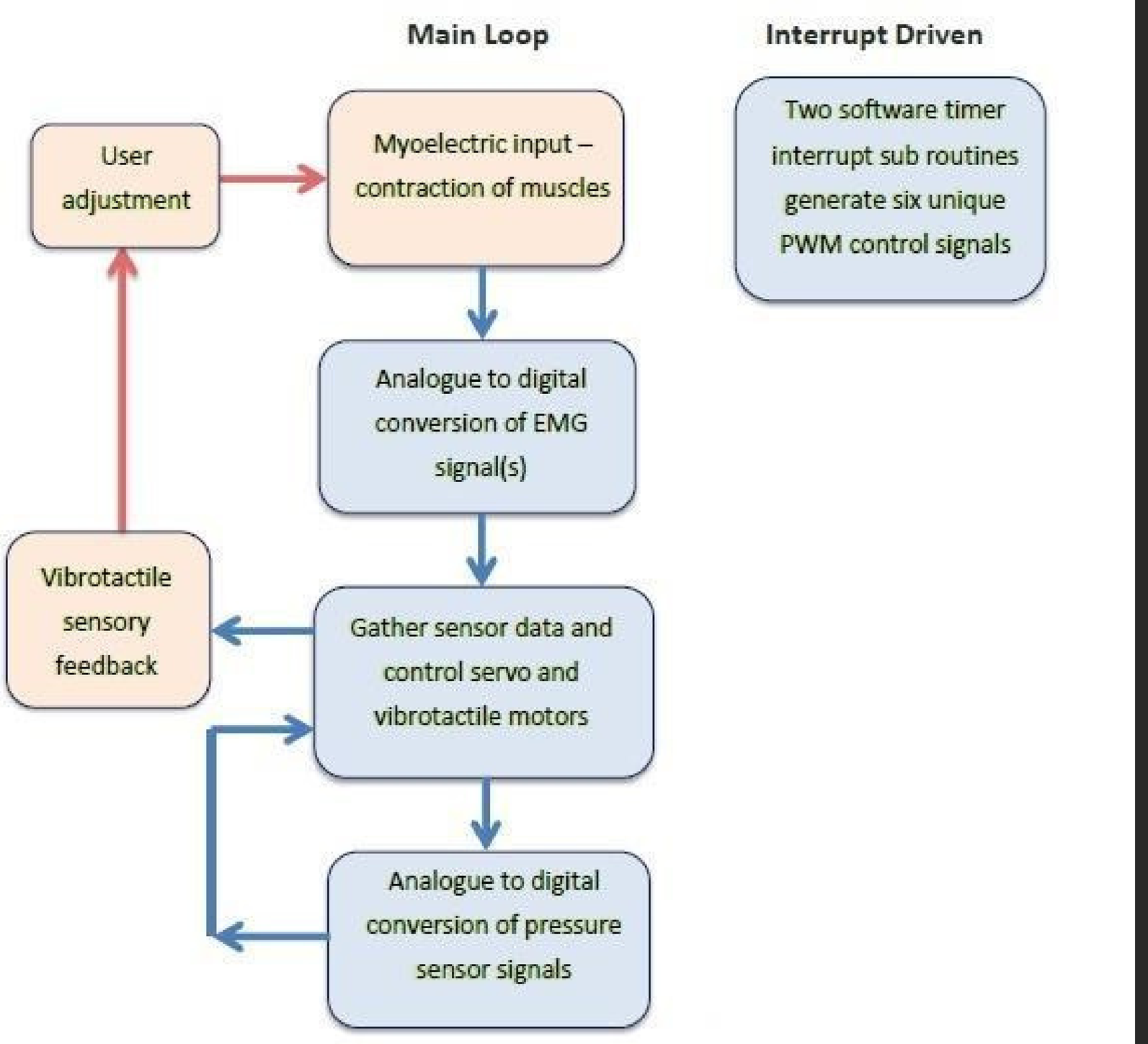
These days robotic arms are used in manufacturing industries. However, the field of bionics has been getting a lot more attention and research.

Introduction

Bionic arm or bioelectronic arm is a robotic arm which is controlled by the action of muscle stimulation. It is basically the combined application of electronics, mechanics and biomedical engineering. The EMG signal generated due to the contraction and relaxation of the muscles are guided properly so that the artificial arm can also move accordingly. The main procedure is to process the EMG signal. The remaining work is done by feeding the analog EMG signal to a microprocessor which is accordingly programmed to rotate the motors. Bionics (also known as bionical creativity engineering) is the application of biological methods and systems found in nature to the study and design of engineering systems and modern technology.

The most basic block diagram

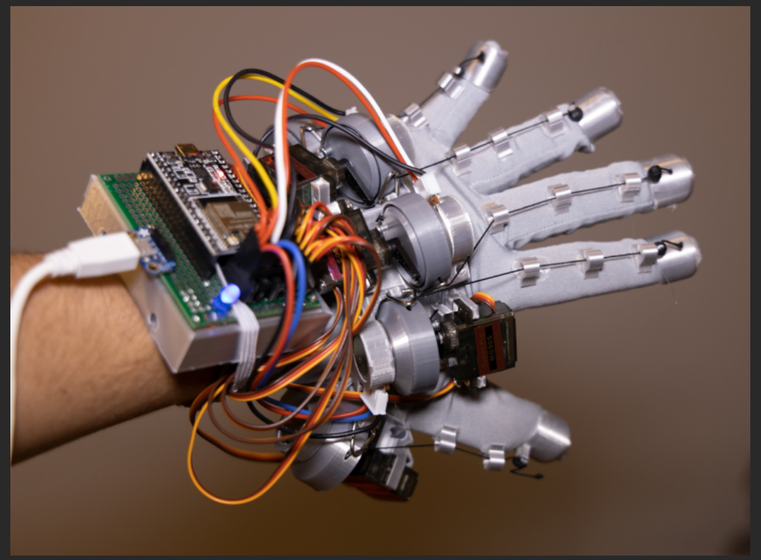


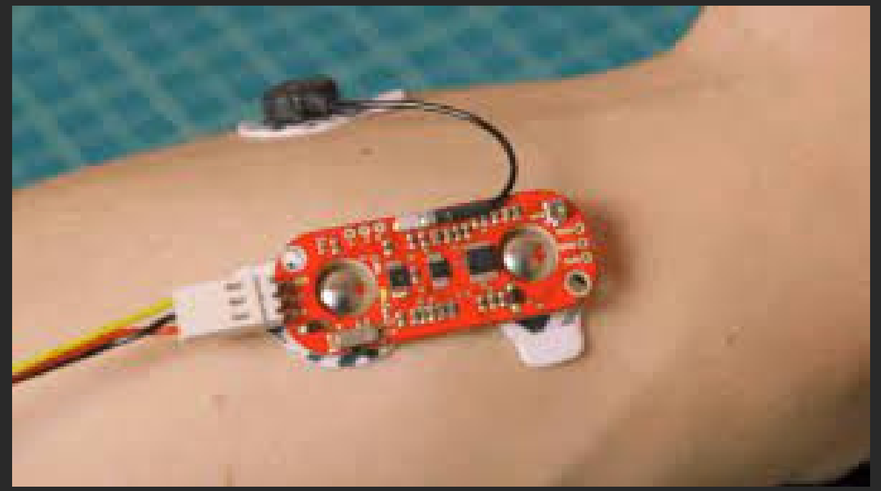

Main Loop
Interrupt Driven
Two software timer interrupt sub routines generate six unique PWM control signals
Myoelectric input – contraction of muscles
User adjustment
Analogue to digital conversion of EMG signal(s)
Vibrotactile sensory feedback
Gather sensor data and control servo and vibrotactile motors
Analogue to digital conversion of pressure sensor signals

EMG generation

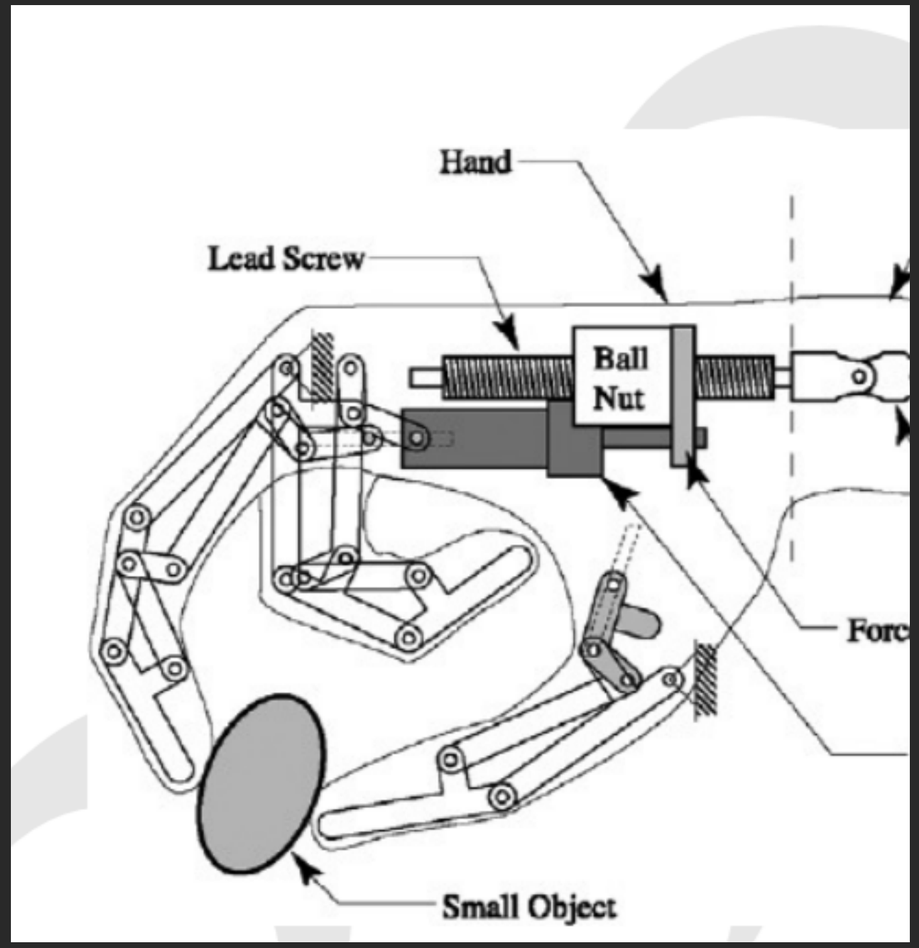
Electromyography is the process of recording the total electrical activity of the motor nerve and muscle innervated by it on cathode ray oscilloscope or simply the study of the action potential(AP) in human skeletal muscle. The machine that records the electrical activity is called electromyograph and the record is known as electromyogram (EMG). When the motor nerve is stimulated, not only the nerve develops the AP,but also muscle fibres develop AP. The resulting electrical activity may be considerable and in the resultant complex the individual APs are buried.

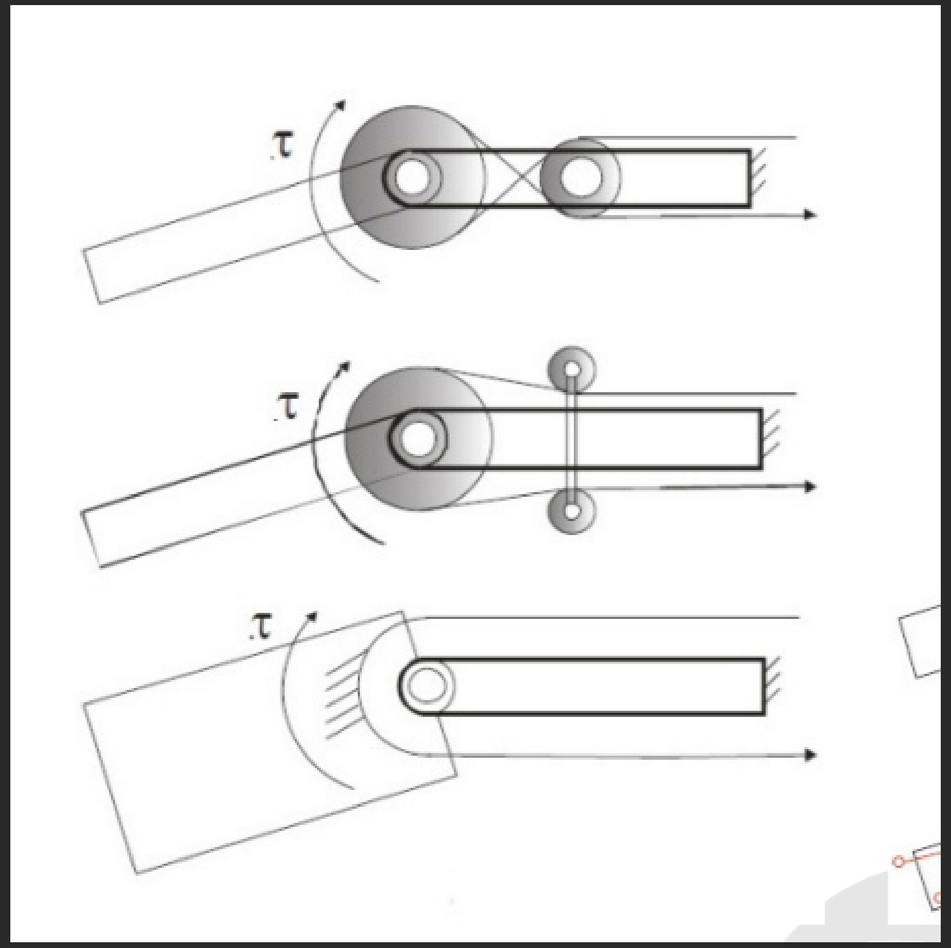
Input





Output





Electrodes

The electrode used in EMG processing is surface electrodes which is made up of silver chloride or stainless steel. Three electrodes are placed side by side one of which is reference electrode. the other one is for positive and the other negative. A gel type adhesive is used which has two function. One is to keep the electrodes attached to the skin. The other function is to provide a low resistive path which helps the electrodes acquire the EMG signals very easily. The input impedance of the system is very high so. The reason is that it helps the signal to amplify very easily. Needle type electrodes are also used for EMG acquisition. But needle type electrodes are very costly and cannot be used so easily in this type of experiment.

Where we fell short

1. Overestimating the usablity and reliability of the EMG sensor
2. Overestimating the time available to us
3. Over reliance on 3D printers
4. Rushed manufacturing

Future Scope

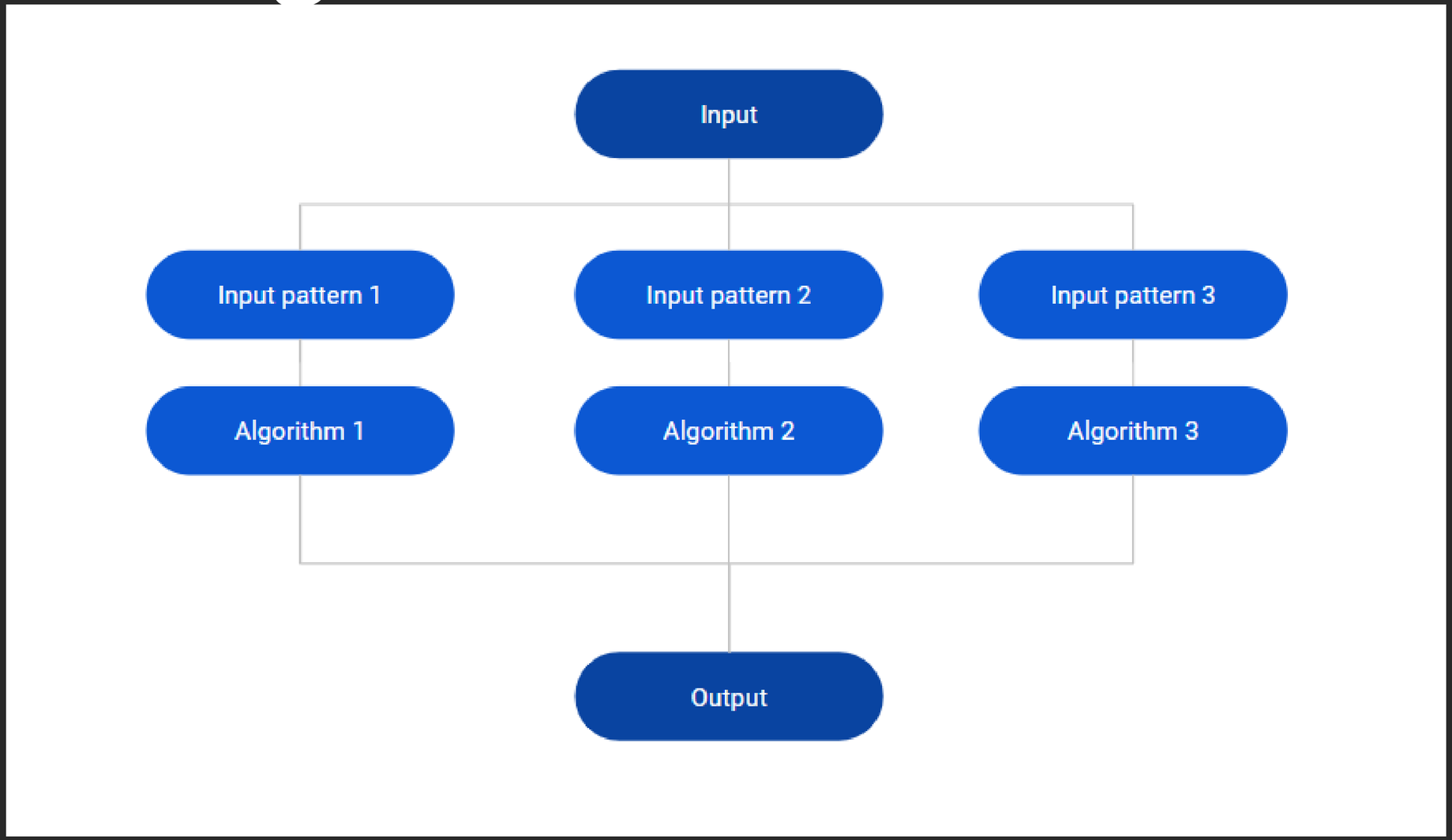
i. Using better mechanical elements that mimic human limbs more accurately
ii. Using EEG instead of EMG for better more usable input
iii. Adding extra functions and algorithms

What we will add

Functionality to Bionic ARM

1. Drill Bit to any finger.
2. Automatic hand sanitizer.
3. Various medical tools for Doctors like surgery assisting devices.

Basic algorithm for extra functions



Applications

- Medical field.
- Bionics.
- Mechanical Field.

Conclusion

The bionic arm can have many application. The prosthetic limbs can use this technique for natural movements of the limbs. The bionic arm increases the strength of a normal arm by almost 100. The precision of holding any object increases a lot. If the arm is properly designed then any microscopic thing can also be gripped which is impossible by humans. This technique can be used in robotic surgery where the doctor controls a robot from far distance to operate a patient by using joystick. If the doctor can control the robot by his will which s accordingly converted into his EMG signal them it would be beneficial to him. Though the thought is under process but if properly worked then this dream can come true soon. The advancement of science helps us to get things which once was unimaginable.