POSTECH 창의IT융합공학과 Department of Creative IT Engineering

IMS Lab
Innovative Medical Solution
Medical Device Innovation Center
Pohang University of Science and Technology

Professor

Sung-Min Park (박성민)

Tel : +82-54-279-8842
Fax : +82-54-279-8842
E-Mail : sungminpark@postech.ac.kr

Introduction

The innovative medical solution (IMS) lab started its journey in 2016 with an objective of grooming future leaders for future IT based healthcare field. Current healthcare system has been challenged by unsustainable cost increase, and the efficacious healthcare solution based on IT technologies has been identified as a potential solution for this socio economic challenge. The IMS lab has been led by a practical leader and filled with talented, passionate members. All of us share the goal of exploring inventive ideas and bringing them to real world.to empower patients and transform the current healthcare system with pragmatic technological solutions.

Diseases Prediction & Treatment

"To contribute to human welfare by bringing innovative ideas to commercial clinical products that save human lives."

Neuro-modulation

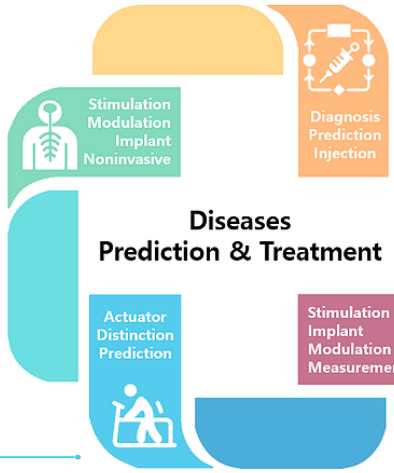
There are a lot of neurons in the human body, and these neurons transmit information using electrical signals. By modulating neurons, many diseases can be treated. Various neuro-modulation systems which can safely correct erroneous neural signals are being developed.

Implantable neuro-modulation device
Non-invasive neuro-modulation
Drug delivery based magnetic stimulation

Body & Stress control

Bodily discomforts and severe or constant stress effect person's quality of life poorly. Arm rehabilitation and posture adjustment using soft actuator and stimulators can improve those discomforts. Research of detecting stress level using bio-signals in everyday life can help stress control for better quality of life as well.

Arm rehabilitation
Textile actuator for posture adjustment
Computational stress detection



Diabetes

Automated blood glucose control system is being studied for convenient diabetes management. Inexpensive and small patch-type pump is controlled to infuse insulin by artificial intelligence-based prediction and decision making algorithms with non-invasive continuous glucose monitoring. All of these work comprehensively as a single artificial pancreas system.

Artificial pancreas system/Prediction
Noninvasive continuous glucose monitoring
Patch-type insulin pump

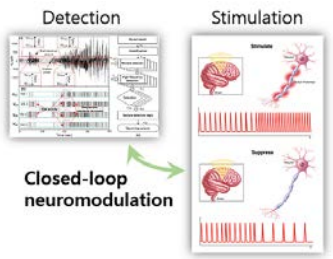
Cardiovascular

Cardiovascular disease is the leading global cause of death. Managing BP is important to reduce the risk of the cardiovascular disease. More effective and efficient ways to monitor and modulate the BP are being researched.

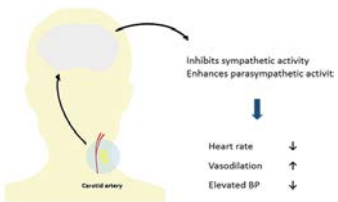
Implantable heart monitor device
Cuff-less BP(Blood Pressure) measurement
Blood vessel modeling
BP modulation by stimulation/denervation

Neuro-modulation

Neurological disorder treatment system



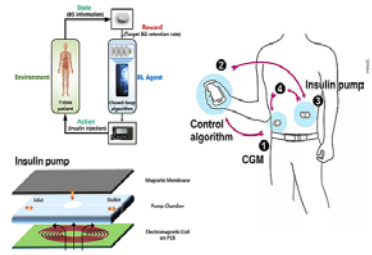
Hypertension treatment system



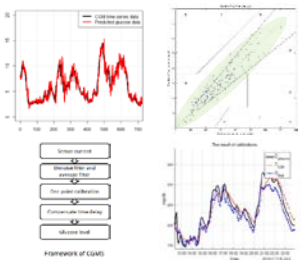
The human brain consists of lots of neurons connected together. Abnormal operation of these neurons causes neurological disorders such as epileptic seizures and dementia. We are researching and developing the detection and electrical stimulation techniques needed to cure these diseases.
Barorelflex is one of the mechanisms that control the blood pressure. The nerves responsible for the reflex are distributed in the carotid artery. Our goal is to develop the minimally invasive stimulator which can be implanted in the neck to manage hypertension excluding medication.

Diabetes

AI-based control algorithm



BG Prediction & CGM algorithm



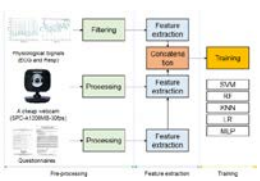
Our goal is to develop an innovative artificial pancreas that helps patients with diabetes avoid discomfort and help with the treatment of diabetes. Using the Reinforcement Learning model, we are developing an AI algorithm that can help manage blood glucose. We aim to provide a comprehensive diabetes care solution by integrating medical-based Big data and AI-based algorithms. We are also working on a controllable implantable insulin pump that combines the technologies of electromagnetic technology and diaphragm pumps using MEMS. In addition to artificial pancreas system, we are also studying AI-based blood glucose prediction algorithm and CGM software design.

Body & Stress control

Electro active polymer (EAP) textile actuator

Electro active polymer has light weight, low active voltage and flexible mechanical property. Textile structure can reinforce the mechanical property of the actuator and improve output power. Our goal is developing the rehabilitation device using textile artificial muscle to rehabilitate arm or joint for after stroke and arthritis patients.

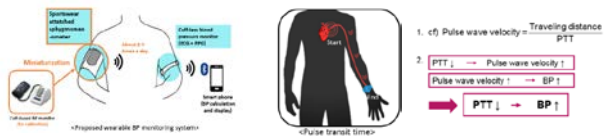
AI-based stress monitoring system



To appropriately treat stress, it is important to automatically detect stress and to provide a personalized intervention. With deep learning approaches, we develop automatic stress detection model. Furthermore, we plan to design an innovative service to provide a stress manage system for employees.

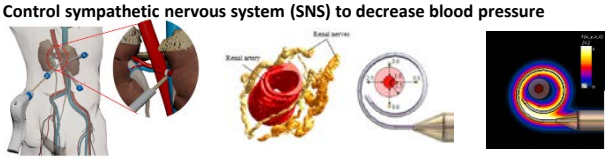
Cardiovascular

Basic concept of cuff-less blood pressure monitoring system



In order to prevent the hypertension, ambulatory blood pressure monitoring(ABPM) is an very important concept. Unlike the traditional cuff-based method, cuff-less blood pressure monitor is designed to consider the user convenience for ABPM.

Control sympathetic nervous system (SNS) to decrease blood pressure



SNS plays a key role in hypertension. We tried to damage sympathetic nerves which located around the outer wall of renal (kidney). To do this, we set three goals. 1. Damage all renal nerves 360 degrees 2.Protect renal artery and minimize thermal damage to the arterial lumen. 3.Do not damage other tissue during surgery.