



Introduction of Measurement and Control LAB

School of Mechanical Engineering, Pusan National University

Prof. Min Cheol Lee

Email: mclee@pusan.ac.kr

Home page: <http://mclab.me.pusan.ac.kr>

ME Building(#303) Room No 819

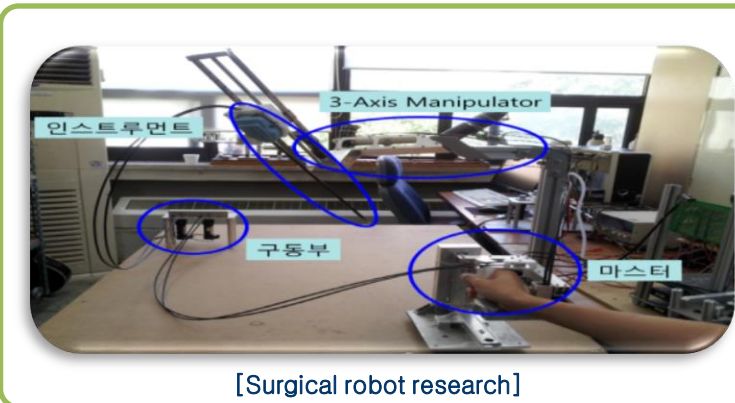
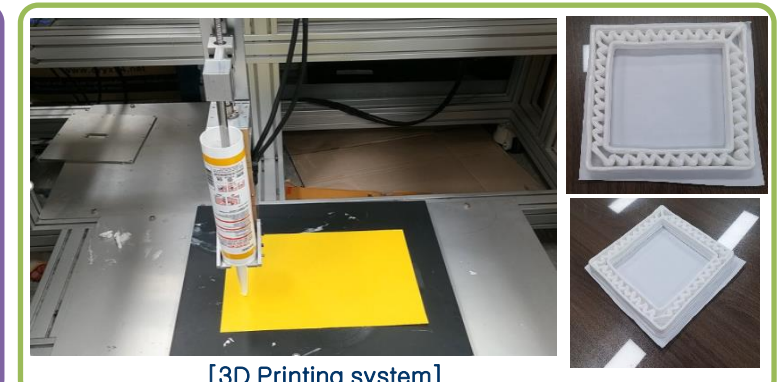
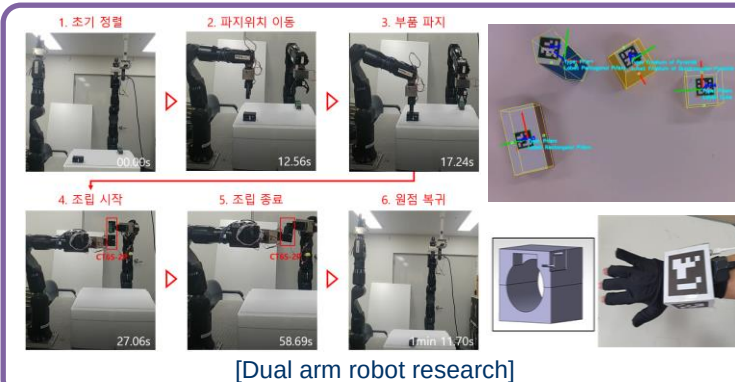


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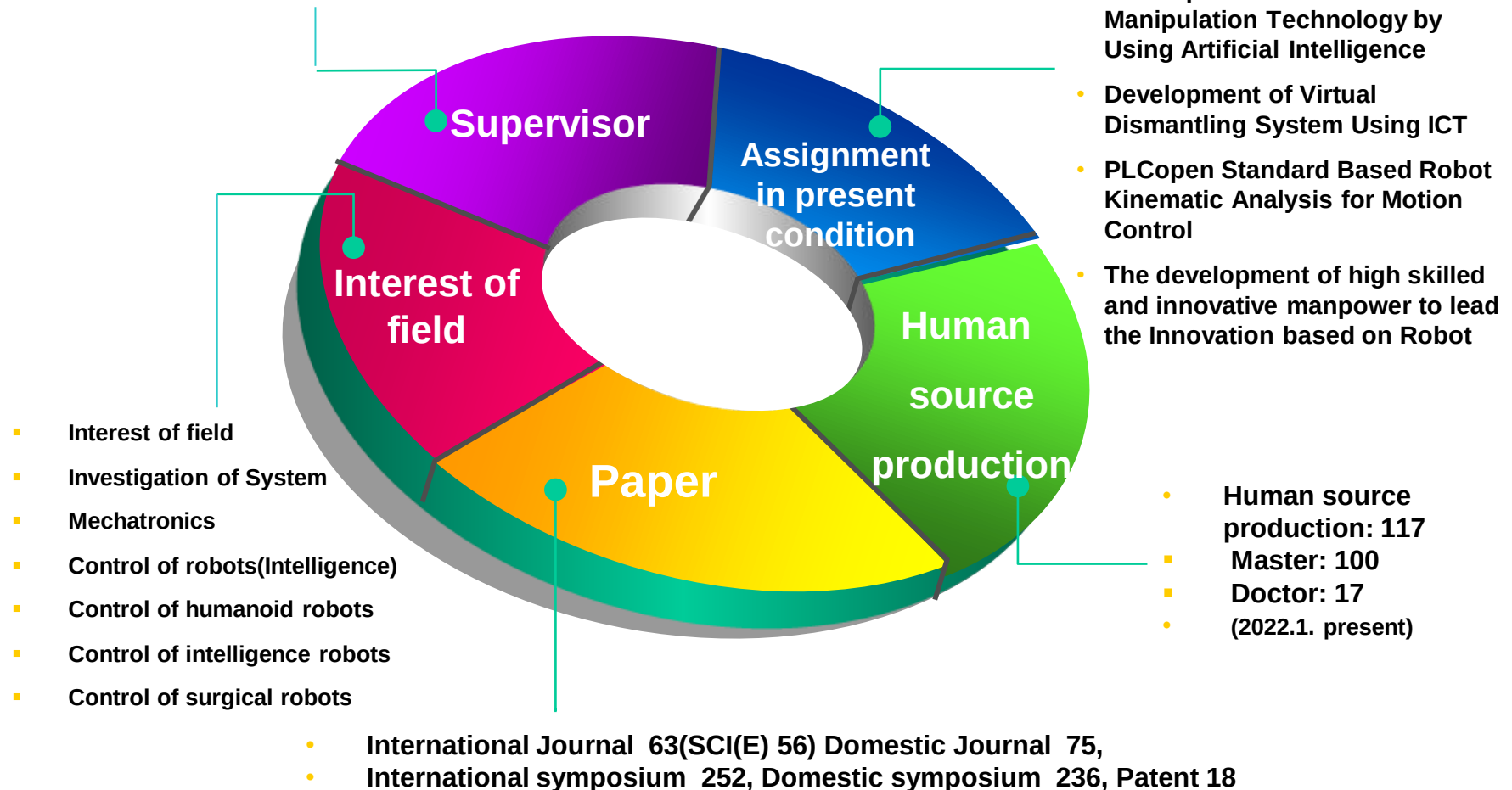
Ph. D. , University of Tsukuba, Applied Physics, Robot Control, 1991

Lab Name : MCLAB (Measurement and Control Laboratory) founded in 1991

Major: Robot Control, Mechatronics, Medical Robotics, Field Robot, Intelligent Robot



Supervisor: Professor Min Cheol Lee



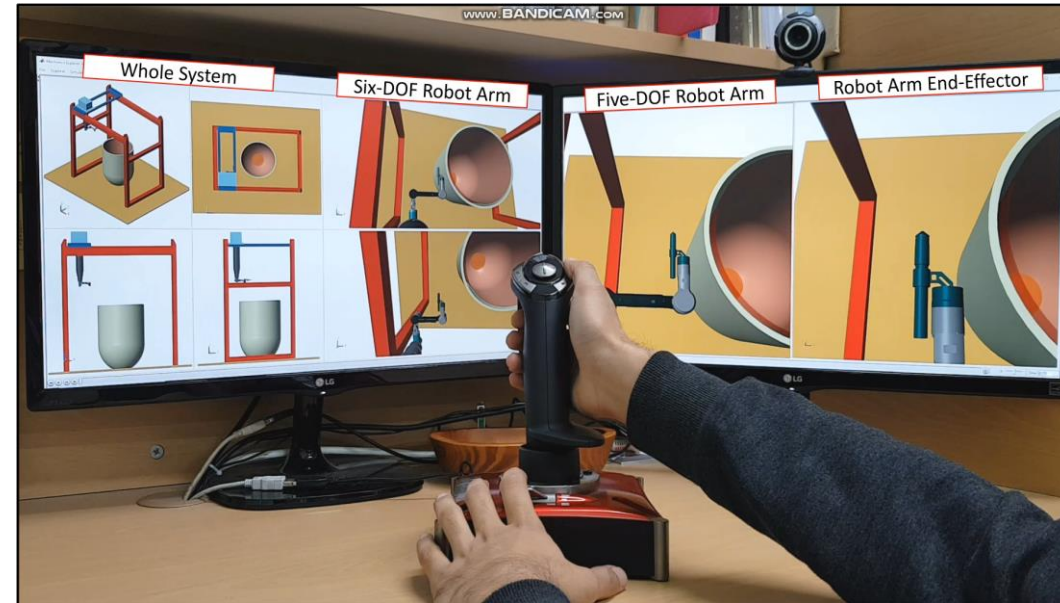
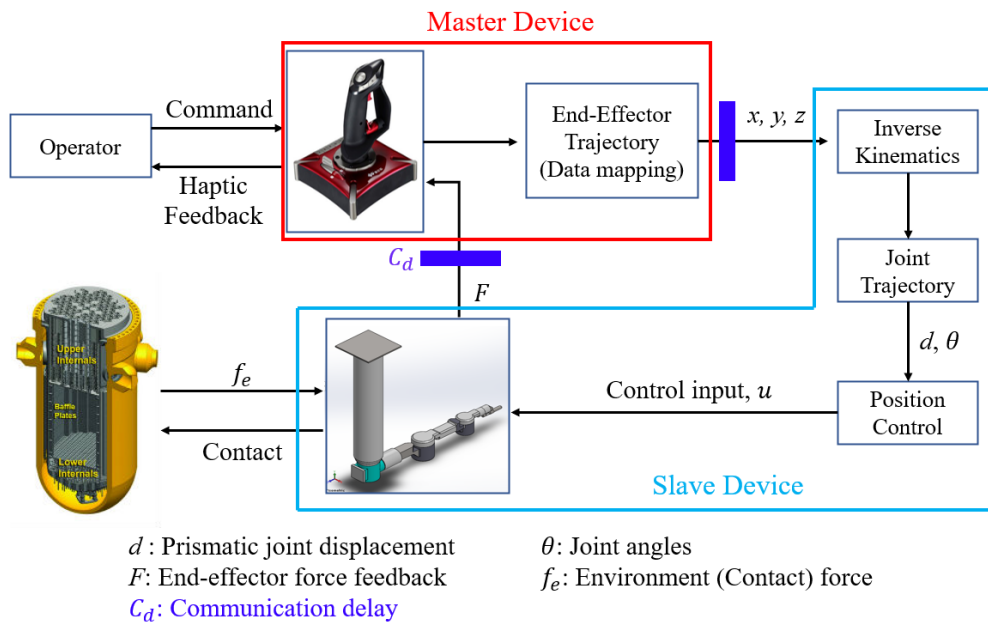


On – Going Research Progress



Final Development Goals

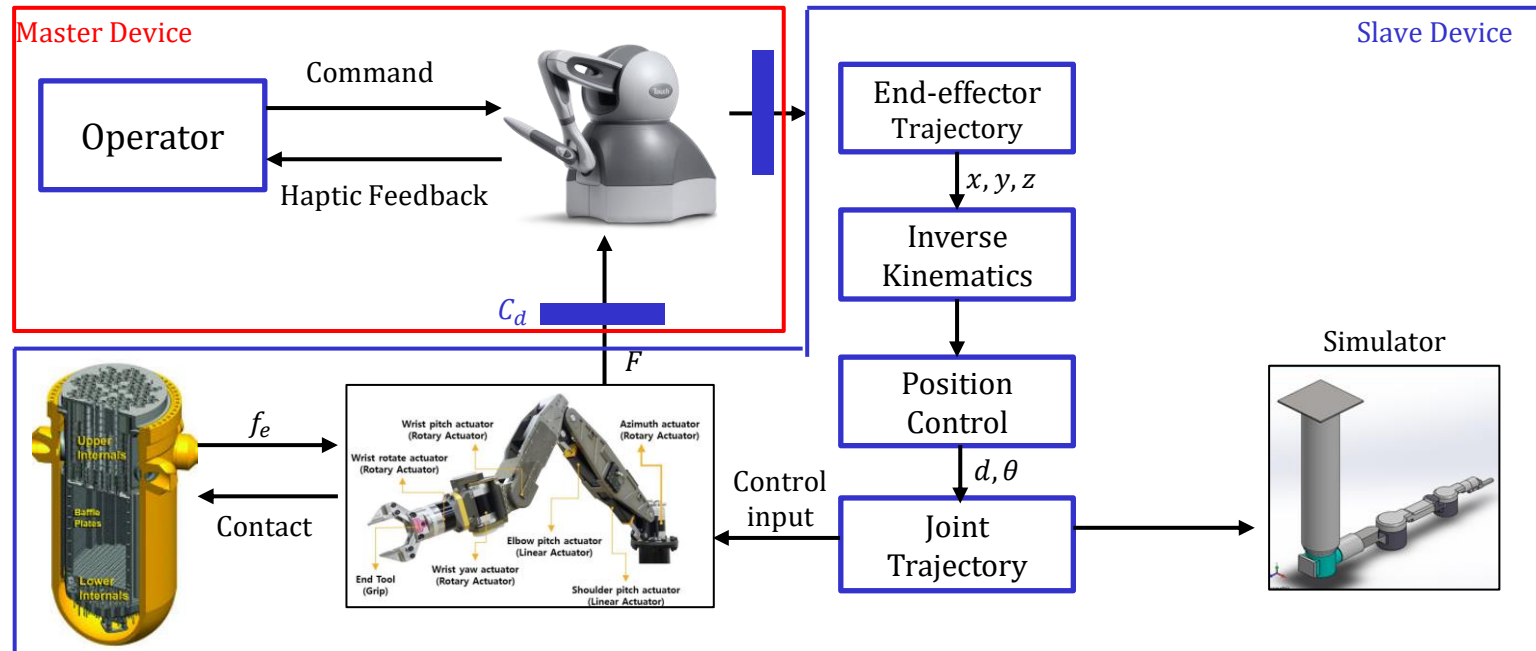
- Develop virtual system to dismantle Reactor Vessel Internals (RVI).
- 5+1 DOF robot manipulator along with xy-crane will use to dismantle RVI with cutting tools.
- Master system (real world) will control this slave system (Virtual system).





Final Development Goals

- Develop TwinCAT based system to remotely dismantle Reactor Vessel Internals (RVI).
- 6 DOF robot manipulator will use to dismantle RVI with laser cutting tools.
- Master system (real world) will control this virtual and real slave system



d : Prismatic joint displacement

F : End-effector force feedback

C_d : Communication delay

θ : Joint angles

f_e : Environment (Contact) force



Near Past Research Achievements



Final Development Goals

- Development of artificial intelligence(AI) based object recognition, gripping and manipulation technology using dual arm system
- Development of AI-based teaching, assembly and control technology for manufacturing robot (dual arm robot) and service robot (agricultural, medical and rehabilitation)

Dual-arm Robot



- Object recognition technology using artificial intelligence
- User friendly AI-based teaching and parts grasping algorithm
- Development of force estimation based assembly algorithm

Manufacturing Robot (parts assembly / packaging)



Object
Recognition

Trajectory
Generation

Robot Arm
Control

Parts Grasping
(AI-based)

Parts Assembly
(Reinforcement learning)

Service Robot (agriculture / rehabilitation)



Object
Recognition

Teaching

Robot Arm
Control

Obstacle Avoidance
(Potential field)

Rehabilitation, Medical,
Agriculture Applications

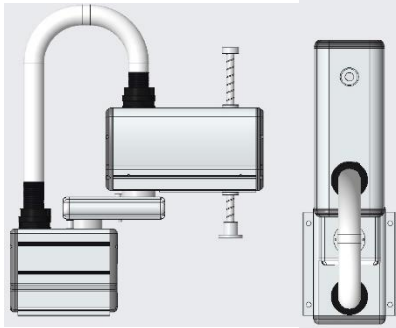


PLCopen Standard Based Robot Kinematic Analysis for Motion Control

Product Definition

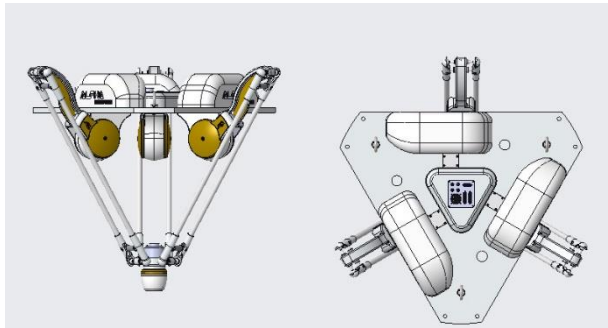
– SCARA Robot

-3 revolute joints & 1 prismatic joint



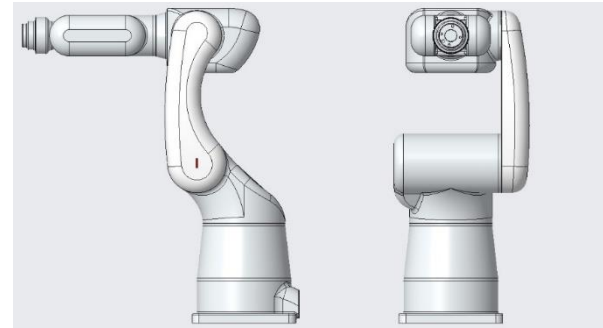
– DELTA Robot

-3 X (2 universal joints & 1 revolution joint)

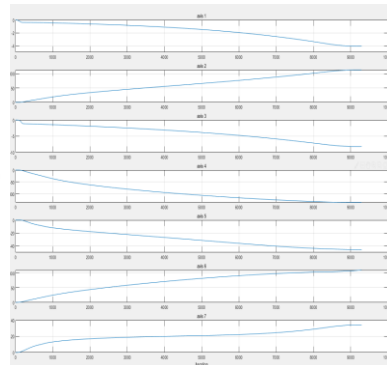
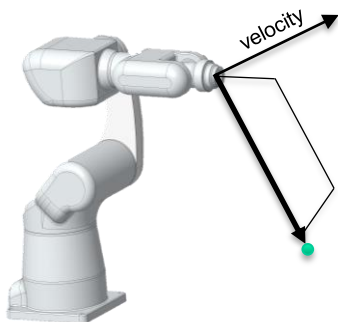


– Articulated robot

-6 revolute joints



Main Contribution



SCARA, DELTA, Gantry, Articulated Robot Inverse / Forward kinematics appliance

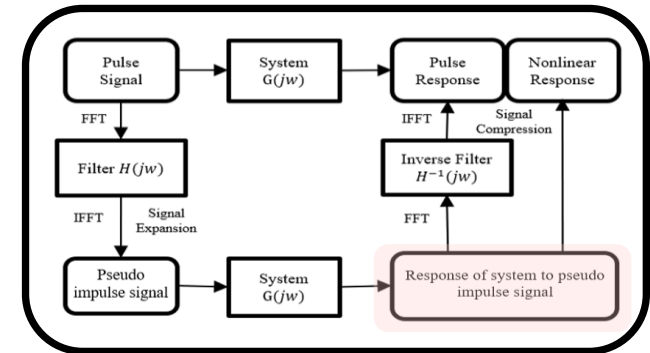
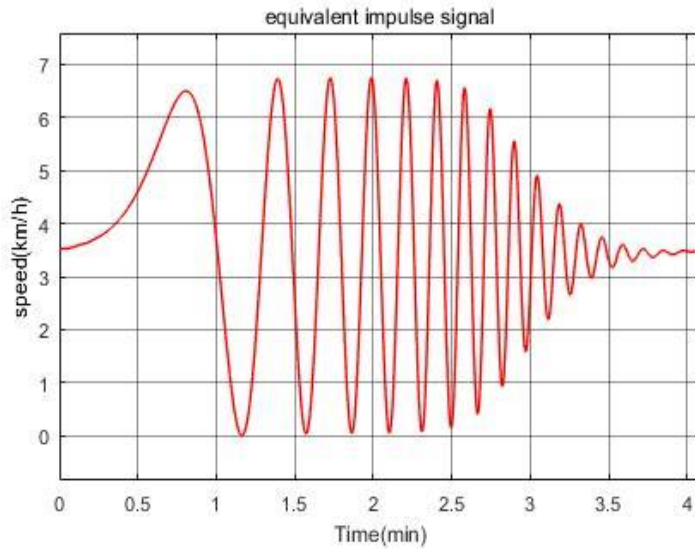
Trajectory Planning

- Calculate the trajectory with route of start point – waypoint – end point by sampling time

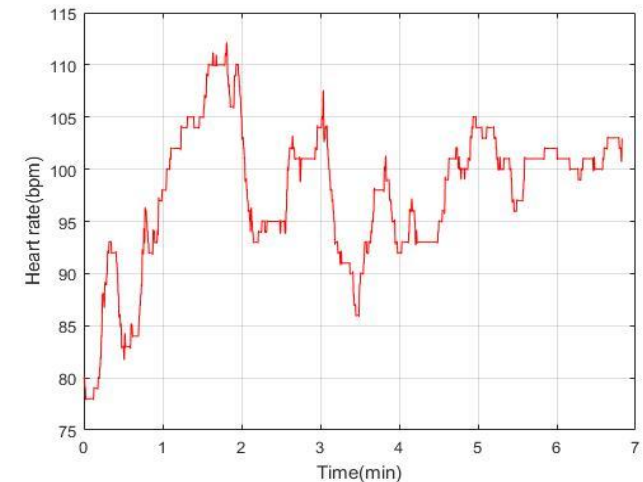
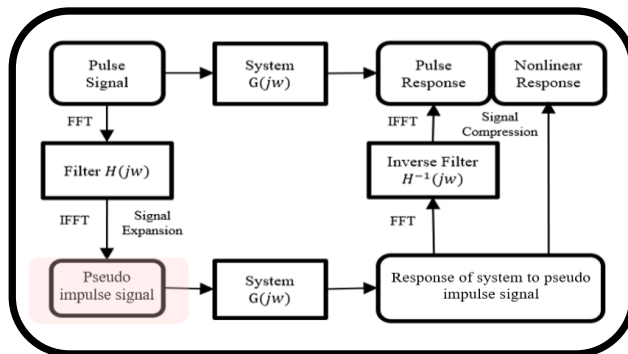
Forward / Inverse Kinematics

- Calculating the rotation of each joints with Inverse Jacobian method within sampling
- Solving the singularity in articulated robot

IT convergence exercise treadmill system for a cardiac rehabilitation



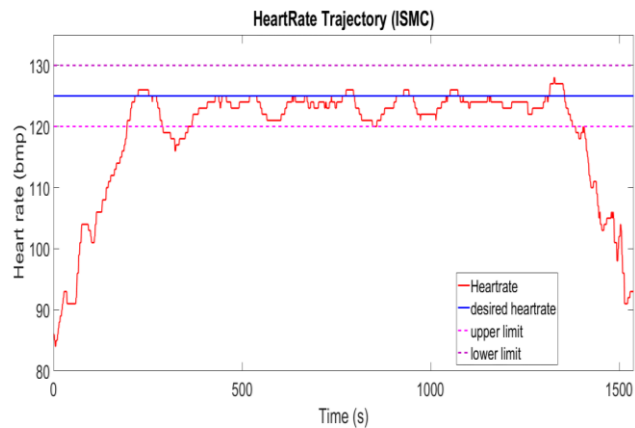
pseudo impulse signal



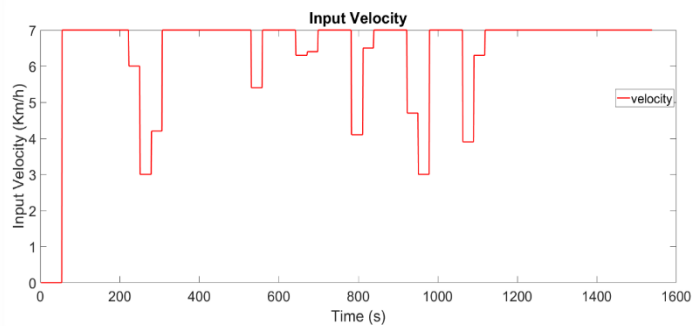
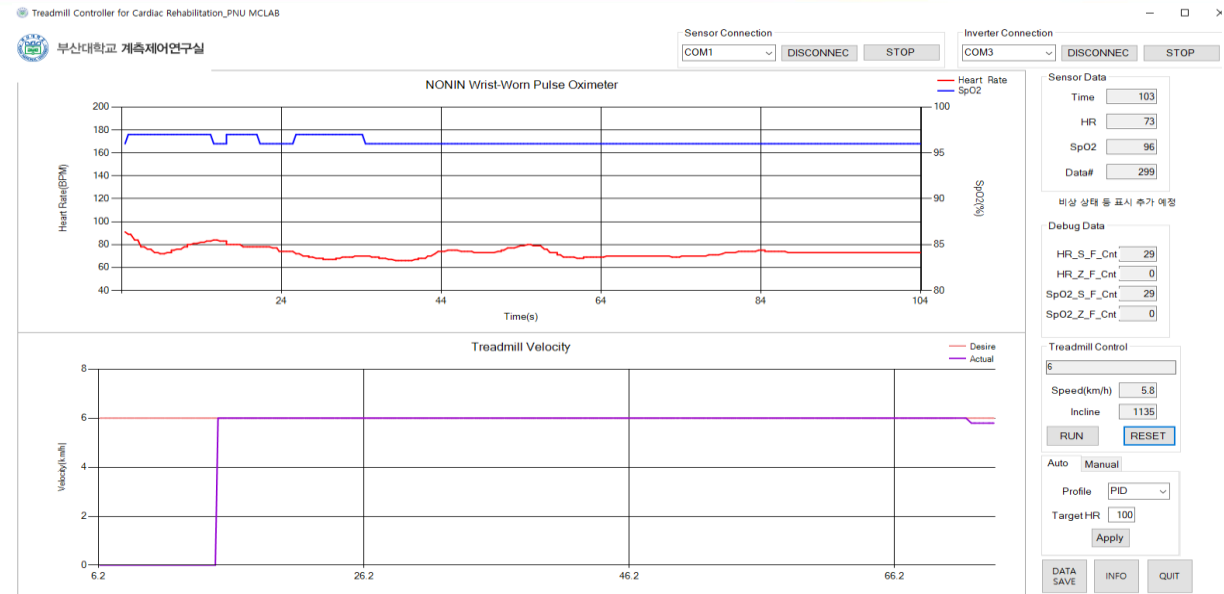
Human heart response under the speed of pseudo impulse signal



Heartrate control



Desire Heartrate tracking



Treadmill velocity

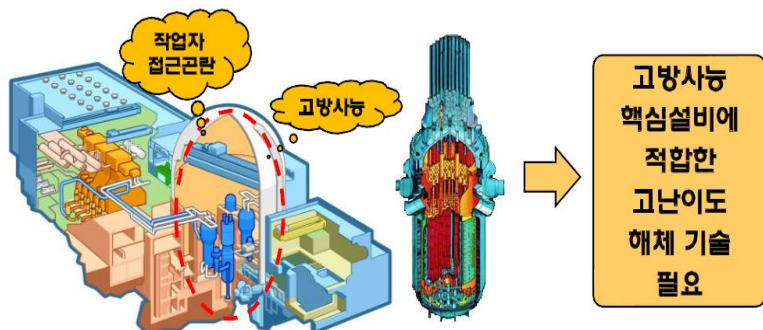


Nuclear Power Plant Dismantling Project



Cutting technology and remote control technology-based nonlinear model of the molten salt

- Robust control for remote cutting and Remote Control Technology Development
- Model, physical model-based molten salt Technology Development and Control



Problems cutting for nuclear decommissioning
And the need for remote control

Using remote cutting edge of technology, and the molten salt concept of source dissolution

