

NHP KINARM™ Exoskeleton Lab

A versatile research facility to study sensory, motor and cognitive function

Complete Research Lab

Designed by neuroscientists for neuroscientists, the NHP KINARM Exoskeleton Lab lets you start collecting data immediately. BKIN's standard system includes:

- One/two KINARM Exoskeleton robot(s) for the upper limb
- 2D virtual/augmented reality display
- Dexterit-E™ experimental control software and hardware

NHP-Human Compatibility

The NHP KINARM exactly replicates our Human KINARM Exoskeleton providing de-risked translation of basic research paradigms from NHP to humans and basic research (NHP or human) to clinical research, especially important in drug/therapy development.

Dual Function Robots

Each KINARM robot can be used as an exoskeleton for the shoulder and elbow (leaving the hand free to interact with objects in the environment) or converted to a hand-based end-point robot.

2D Virtual/Augmented Reality

Standard system includes 19" diagonal 2D virtual/augmented reality display for natural, intuitive presentation of visual stimuli.

Easy To Use and Powerful

System includes Dexterit-E™ behavioural control and data acquisition software, which combines the power of a real-time operating system with the ease of a Windows™-based interface. Demonstration tasks can be used immediately for data collection. Custom Task Programs can be created using high-level graphical programming tools.



Quick Facts

- Sophisticated platform to monitor and manipulate NHP upper limb
- Broad range of hand and joint-based kinesiological information
- Consistent use of 2-D robotic paradigm between NHP and human systems guarantees translation from lab to clinical research
- “Arms-free” restraint chair with wide range of adjustability

“KINARM is a broad-based, versatile research facility that allows users to develop and design their own behavioural tasks to study sensory, motor and/or cognitive deficits.”

– Dr. Stephen Scott, Professor, Centre of Neuroscience Studies, Queen's University and Inventor of KINARM

Components of NHP KINARM Exoskeleton Lab

- One or two motorized KINARM Exoskeleton robot(s) for either right and/or left-handed investigation
- Workstation and visual display for presentation of 2D virtual targets in the actual plane of limb motion
- BKIN's "arms-free" NHP restraint chair with adjustable seat, footrest, belly-rest, back-rest, hip-restraints
- Interface to external data acquisition system (analog and digital outputs)
- Dexterit-E data acquisition and experimental control software
- Computer systems to run Dexterit-E (including a real-time computer for precise and safe action)
- A library of Simulink® blocks to assist with rapid custom Task Program creation (MatLab® and Simulink® must be purchased separately)

Controlling KINARM Lab with Dexterit-E™

Dexterit-E provides a friendly, easy-to-use user interface for controlling a KINARM Lab.

Custom Tasks can be created and implemented with a KINARM Lab to probe a broad range of sensory, motor and cognitive functions. To create a custom task, users program their task using Simulink® and Stateflow® high level graphical programming tools.

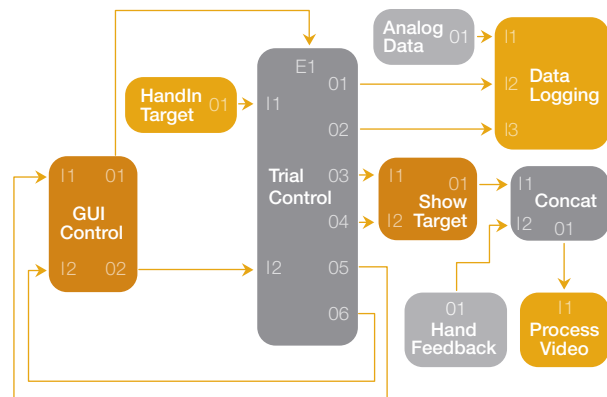
Demo Tasks

- Visual Guided Reaching - task to monitor basic motor skills
- Reaching During Unpredictable Force Fields - task to study motor learning/adaptation
- Position Control Task

System Specifications

- Real-time control and data acquisition at 1kHz
- Peak torque pulse of 4Nm at shoulder, 2Nm at elbow (~8N at the hand)
- Feedback resolution of 0.009°, (~40 microns at the hand)
- 19" diagonal (4:3 aspect) usable workspace
- Fits wide range of NHP sizes (~4.5-14 kg – maximum collar ID of 4")
- Minimum lab footprint 6'x6' (KINARM robot and stand, chair, workstation, not including computer systems)

Task Programming in Simulink®



Graphical programming language ensures easy task programming

Parameter Control

Task parameters can be modified in tables (e.g. size, color, location of targets, number of trials in the task, order and repetition of trials, etc.)

	X	Y	Visual Radius	Logical Radius
Target 1	0.000	0.000	1.000	1.000
Target 2	0.000	-10.000	1.000	1.000
Target 3	10.000	0.000	1.000	1.000
Target 4	0.000	10.000	1.000	1.000
Target 5	-10.000	0.000	1.000	1.000
Target 6	0.000	0.000	1.000	1.000
Target 7	0.000	0.000	1.000	1.000
Target 8	0.000	0.000	1.000	1.000
Target 9	0.000	0.000	1.000	1.000

User-specified tables permit customization of behavioural tasks