Materials List for:

Robotic Mirror Therapy System for Functional Recovery of Hemiplegic Arms

Jaewon Beom*^{1,2}, Sukgyu Koh*³, Hyung Seok Nam¹, Wonshik Kim³, Yoonjae Kim³, Han Gil Seo⁴, Byung-Mo Oh^{4,5}, Sun Gun Chung^{4,5}, Sungwan Kim^{1,6}

Correspondence to: Sungwan Kim at sungwan@snu.ac.kr

URL: https://www.jove.com/video/54521

DOI: doi:10.3791/54521

Materials

Name	Company	Catalog Number	Comments
LabVIEW	National Instruments		System design software
24 V power supply	XP Power	MHP1000PS24 24V	Any 24 V power supply should do
AHRS sensor receiver	E2box	EBRF24GRCV	
AHRS sensors	E2box	EBIMU-9DOFV2	You will need total 3 sensors. Any AHRS sensors will do
EC90 flat motor module	Maxon	323772 + 223094 + 453231	Any geared motor with higher than 30 Nm should do. (For our custom machined parts, you will need these particular flat motor and gear module, but the gear ratio and encoder may vary)
EC45 flat motor module	Maxon	397172	Any geared motor with higher than 10 Nm should do (For our custom machined parts, you should use the same gear module but the gear ratio, motor, and encoder may vary)
EPOS2 70/10 controller	Maxon	375711	This can be replaced with EPOS 24/5 controller
EPOS2 24/5 controller	Maxon	367676	
Connector and cable set	Maxon	381405 + 384915 + 275934 + 354045	You can also make these cables. Connectors and corresponding wire info can be found in "300583- Hardware-Reference-En.pdf" and "300583-Cable-Starting-Set- En.pdf"
Coupling- Oldham, Set Screw Type	Misumi	MCORK30-10-12	Type may vary
Coupling- High Rigidity, Oldham, Set Screw Type	Misumi	MCOGRK34-12-12	Type may vary
Shaft Collars	Misumi	SCWDM10-B	You will need 4 sets
Shaft Collars	Misumi	SDBJ10-8	You will need 2 sets
Precision Linear Shaft	Misumi	PSSFG10-200	Any straight 10 mm diameter shaft with at least 200 mm length should do
Bearings with housings	Misumi	BGRAB6801ZZ	
Elbow motor force dispersion shaft	custom machined	3D CAD	

¹Department of Biomedical Engineering, Seoul National University College of Medicine

²Department of Rehabilitation Medicine, Chungnam National University Hospital

³Interdisciplinary Program for Bioengineering, Seoul National University Graduate School

⁴Department of Rehabilitation Medicine, Seoul National University Hospital

⁵Seoul National University College of Medicine

⁶Institute of Medical and Biological Engineering, Seoul National University

^{*}These authors contributed equally



Elbow rooftop frame custom machined Part Drawings You will need 2 frames. Support wall custom machined Part Drawings You will need 2 frames. Elbow coupling hollow cylinder cover custom machined Part Drawings Wrist motor force dispersion shaft custom machined Part Drawings Wrist rooftop frame custom machined Part Drawings Wrist rooftop frame custom machined Part Drawings Upper wrist coupling hollow cylinder cover Lower wrist coupling hollow custom machined Part Drawings Lower wrist coupling hollow cylinder cover Lower wrist coupling hollow custom machined Part Drawings Upper elbow support 3D printed Part Drawings Upper elbow support 3D printed Part Drawings Acrylic mirror custom laser cutting Part Drawings Task table custom machined Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Circle trace Part Drawings Circle trace	Lower elbow support	custom machined	Part Drawings	
Support wall custom machined Part Drawings You will need 2 frames. Elbow coupling hollow cylinder cover Wrist motor force dispersion shaft custom machined Part Drawings Wrist rooftop frame custom machined Part Drawings Upper wrist coupling hollow cylinder cover Lower wrist coupling hollow cylinder cover Lower wrist coupling hollow custom machined Part Drawings Upper wrist coupling hollow custom machined Part Drawings Lower wrist coupling hollow custom machined Part Drawings Upper elbow support custom machined Part Drawings Handle 3D printed Part Drawings Upper elbow support 3D printed Part Drawings Friction reduction ring 3D printed Part Drawings Acrylic mirror custom laser cutting Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Part Drawings Optional Part Drawings Optional				
Elbow coupling hollow cylinder cover Wrist motor force dispersion shaft Upper wrist coupling hollow cylinder cover Lower wrist coupling hollow custom machined Part Drawings John the Cover Custom machined Part Drawings John the Custom machined Part Drawings Definiter John printed Part Drawings Part Dr	,		-	You will need 2 frames
Wrist motor force dispersion shaft Wrist rooftop frame custom machined Wrist rooftop frame custom machined Upper wrist coupling hollow cylinder cover Lower wrist coupling hollow cylinder Part Drawings Lower wrist coupling hollow cylinder Part Drawings Lower Brain Dra			-	Tou will fleed 2 frames.
Wrist rooftop frame custom machined Part Drawings Upper wrist coupling hollow cylinder cover Lower wrist coupling hollow custom machined Part Drawings Loyen elbow support 3D printed Part Drawings Upper elbow support 3D printed Part Drawings Friction reduction ring 3D printed Part Drawings Acrylic mirror custom laser cutting Part Drawings Task table custom machined Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional		custom machined	Part Drawings	
Upper wrist coupling hollow cylinder cover Lower wrist coupling hollow cylinder cover Lower wrist coupling hollow cylinder cover Joint movement limiter Loustom machined Part Drawings Part Drawings Part Drawings Part Drawings Diprinted Part Drawings Darinted Part Drawings Optional Part Drawings Optional	Wrist motor force dispersion shaft	custom machined	Part Drawings	
cylinder cover Lower wrist coupling hollow cylinder cover Joint movement limiter custom machined Part Drawings Handle 3D printed Part Drawings Upper elbow support 3D printed Part Drawings Part Drawings Friction reduction ring 3D printed Part Drawings Acrylic mirror custom laser cutting Part Drawings Custom machined Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings Part Drawings DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings BCHA18 Goalpost JD printed Part Drawings Circle trace 3D printed Part Drawings Optional Part Drawings Optional Part Drawings Optional	Wrist rooftop frame	custom machined	Part Drawings	
younder cover Joint movement limiter custom machined Part Drawings Handle 3D printed Part Drawings Upper elbow support 3D printed Part Drawings Friction reduction ring 3D printed Part Drawings Acrylic mirror custom laser cutting Part Drawings Task table custom machined Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost JD printed Part Drawings Circle trace JD printed Part Drawings Angled assist JD printed Part Drawings Optional Part Drawings Optional	Upper wrist coupling hollow cylinder cover	custom machined	Part Drawings	
Handle 3D printed Part Drawings Upper elbow support 3D printed Part Drawings Friction reduction ring 3D printed Part Drawings Acrylic mirror custom laser cutting Part Drawings Task table custom machined Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	Lower wrist coupling hollow cylinder cover	custom machined	Part Drawings	
Upper elbow support 3D printed Part Drawings Friction reduction ring 3D printed Part Drawings Acrylic mirror custom laser cutting Part Drawings Task table custom machined Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter iid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Part Drawings Optional Part Drawings Optional	Joint movement limiter	custom machined	Part Drawings	
Friction reduction ring 3D printed Part Drawings Acrylic mirror custom laser cutting Part Drawings Task table custom machined Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Part Drawings Optional Part Drawings Optional	Handle	3D printed	Part Drawings	
Acrylic mirror custom laser cutting Part Drawings Task table custom machined Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	Upper elbow support	3D printed	Part Drawings	
Task table custom machined Part Drawings Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	Friction reduction ring	3D printed	Part Drawings	
Silicone sponge DOF limiter 3D printed Part Drawings DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Circle trace 3D printed Part Drawings Curved assist 3D printed Part Drawings Optional Part Drawings Optional Part Drawings Optional	Acrylic mirror	custom laser cutting	Part Drawings	
DOF limiter 3D printed Part Drawings DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	Task table	custom machined	Part Drawings	
DOF limiter lid 3D printed Part Drawings Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	Silicone sponge			
Healthyarm handle 3D printed Part Drawings Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	DOF limiter	3D printed	Part Drawings	
Ball rollers - Press fit Misumi BCHA18 Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	DOF limiter lid	3D printed	Part Drawings	
Goalpost 3D printed Part Drawings Circle trace 3D printed Part Drawings Angled assist 3D printed Part Drawings Optional Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	Healthyarm handle	3D printed	Part Drawings	
Circle trace 3D printed Part Drawings Optional Angled assist 3D printed Part Drawings Optional Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	Ball rollers - Press fit	Misumi	BCHA18	
Angled assist 3D printed Part Drawings Optional Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional Part Drawings Optional	Goalpost	3D printed	Part Drawings	
Curved assist 3D printed Part Drawings Optional Plain assist 3D printed Part Drawings Optional	Circle trace	3D printed	Part Drawings	
Plain assist 3D printed Part Drawings Optional	Angled assist	3D printed	Part Drawings	Optional
	Curved assist	3D printed	Part Drawings	Optional
Task board custom laser cutting Part Drawings	Plain assist	3D printed	Part Drawings	Optional
	Task board	custom laser cutting	Part Drawings	