Opening simVITRO

Recycle Bin WINCAPS				
Adobe Acrobst	13 simVITRO - Create or Load Project Project Name Loading Projects	Project Description	# Specimens Specimen Type	
Google Chrome				
Tools NI MAX MScribeUti	Coad Existing Project Create From Existing Create From Template	Load Selected Project	Browse	
Protected Workspace			SIMVITR	
VI Package OpenOffice 4.01 Apps simVITRO				
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- Loading a project
 - Load existing project
 - Used most often (when testing a new specimen in an existing project
 - . Click browse and navigate to project file
 - Create from existing project
 - Create from template

Create From Template

simVITRO - Create or Load Project			X
Template Name	Template Description		Specimen Type 🔺
Knee Template with Motion Capture	Template for Knee Testing w/MotionCapture		Knee
Knee Template	Template for Knee Testing		Knee
SpineFSUCervicalTemplate with Motion Captur	Template for Cervical FSU Testing w/MotionCaptu		Spine
SpineFSUCervicalTemplate	Template for Cervical FSU Testing		Spine
SpineFSULumbarTemplate with Motion Capture	Template for Lumbar FSU Testing w/MotionCaptu		Spine
SpineFSULumbarTemplate	Template for Lumbar FSU Testing		Spine
			T
Create From Existing	e From Selected Template	Q	Browse

- When creating a new project, the following screen will appear
- Project Name and Project Description must be filled in
- A project folder will be created within D:\simVITRO

New Project Info
Creating New Project Enter New Project Information
Project Name
Training
Project Description
Example cervical project
Project Notes
Create New Cancel

• Setup manager

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- Load a specimen or create a new one
- After creating a new specimen, a folder will be created within the project folder



- Setup Record Specimen Info
 - . Click the check 1 on the bottom left when completed

imVITRO Setup Manager								x
Specimen specimen 1		Enter Specimen Detai death, or other pertin	ls. Include r ent informa	notes and com ition to track s	ments on cor pecimen in yo	dition of s our data m	pecimen, cause of anagement or	
Project	-	inventory system.					-	
Training_Cortex		Specimen Number					Gender	
Project Description		specimen 1					+ Female	
This is single level with cortex							4)	
			Age (yrs)	Weight (kg)	Height (cm)	BMI		
Specimen Type			62	40	170	14		
Spine		Medical Diagnosis						
Setup Steps:		COD: Anorexia					•	
Sten	Verified							
Record Specimen Info	OK						Ψ	
Initialize All External Hardware	None	Additional Comments						
Define Robot Coordinate System	None	Additional Comments						
Zero Dynamic Load Cell	None	This specimen had two f	reeze/thaw cy	cles			^	
Mount Specimen	None							
Define Rigid Body Coordinate Systems	None						T	
Determine Neutral Position	None							
I								
1								
II								
	τ							
	►							
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Specimen Successfully Created! Specimen Successfully Identified!	•							

- Setup Initialize all external hardware
 - All position sensors must be configured (microscribe and motion analysis)
 - . Click the blue question mark for instructions



- Setup Initialize all external hardware
 - After configuring the sensors, select all of them and click the connect button
 - If they all connect successfully, click the check button next to the connect button
 - Then click the check 1 button the bottom left

🔁 simVITRO Setup Manager					X
Specimen specimen 1		Select each external all sensors and chan	hardware component to properly initia nels are properly named and wired. Op	lize and configur en up any third p	e. Make certain arty software to
Project		configure or load set	tings for external hardware. If this step	is not properly o	completed,
Training_Cortex		unexpected results r	nay occur.		
Project Description		External Hardware			
This is single level with cortex		Name	Description	Connected	Initialized
		Robot	Mfg: Denso: Model: : SN:	Yes	Yes
Specimen Type		C1 Position	6-Channel MotionAnalysis	Yes	Yes
Spine		C2 Position	6-Channel MotionAnalysis	Yes	Yes
Johne		Digitizer	3-Channel Digitizing Arm	Yes	Yes
Setup Steps:		Robot Position	6-DOF Robot_Position Sensor	Yes	Yes
Step	Verified				
Record Specimen Info	OK				
Initialize All External Hardware	None				
Define Robot Coordinate System	None				
Zero Dynamic Load Cell	None				
Mount Specimen	None				
Define Rigid Body Coordinate Systems	None				
Determine Neutral Position	None	J			1
			2 🕸 🕄 🧊	Connec	e
 Image: A start of the start of	7		Select All		
Verifying Record Specimen Info Specimen Successfully Created! Specimen Successfully Identified!	?				

- Setup Define Robot position
 - Select the point and the robot will move to the corresponding position
 - Place the microscribe tip on the divot below the robot endeffector and record a point
 - When finished recording all points, click the calculator and then the check 1 button

simVITRO Setup Manager		
Specimen specimen 1		To digitize the Robot Coordinate System relative to the digitizer WORLD reference frame, select each of the 7 positions to move the robot to, and then digitize the same point on
Project		the end of the robot for each position.
Training_Cortex		
Project Description		
This is single level with contex		
This is single level with cortex		3
Specimen Type		
Spine		
Setup Steps:		
Sten	Verified	
Record Specimen Info	OK	
Initialize All External Hardware	OK	
Define Robot Coordinate System	None	
Zero Dynamic Load Cell	None	
Mount Specimen	None	
Define Rigid Body Coordinate Systems	None	
Determine Neutral Position	None	A CONTRACTOR OF THE OWNER OWNER OF THE OWNER OWN
		Robot
		Point x y z
		Offset Position -0.007101 0.112018 0.602431
		+X Translation -0.067443 0.111147 0.601923
		+Y Translation -0.006672 0.050438 0.602418
		+Z Translation -0.007496 0.110808 0.663493
		Roll Rotation -0.007319 0.110749 0.605853
		Pitch Rotation -0.000900 0.110624 0.582678
		Yaw Rotation 0.000414 0.091514 0.600698 T
<u> </u>	4	Stored T_World1-Robot
🖌 🎝 🕞 🏹		3D Digitizer Position -0.004 -0.008 0.409 -0.014 -1.000 -0.000 0.123 -0.014 -1.000 -0.000 0.123 -0.004 -0.000 1.000 -0.006 -0.000 0.000 1.000 -0.006
Verifying Initialize All External Hardware		Robot Position
Verifying Record Specimen Info	Ξ	370.108 0.0295613 614.733 179.985 -30.017 -179.973
Specimen Successfully Identified!	+	Coordinate System Completely Defined

- Setup Zero Dynamic Load Cell
 - . Choose Robot and select the actuator

		🔁 simVITRO Setup Manager										
CS Load Posterior Shear CS Load Compression CS Load Left Lateral Shear osterior Shear - Desired ompression - Desired		Specimen specimen 1 Project Training_Cortex Project Description This is single level with cortex		-	Apply gravity parameters fr the robot.	r compe rom a li	ensation (brary, Co	or choosi impute c	e gravity o offsets for	compens r a load ce	ation 211 attache	Denso Robot ed to
eft Lateral Shear - Desired 📈	Translations				Land Co	U Baad						
	0.3-	Specimen Type			Orientation	en Kead	ings at 5	pecific U	mentatio My	Mv	M-	Desition Colorian
	0.2	Setun Stens:		_	onentation		ry	14	WIA	iviy	1112	for Capture
	0-	Step	Verified		-x	0	0	0	0	0	0	۲
	-0.1 -	Record Specimen Info	ОК								-	Ŏ
	-0.2 -	Initialize All External Hardware	OK	- 11	+X	0	0	0	0	0	0	\cup
	-0.3-	Zero Dynamic Load Cell	None	- 11	-y	0	0	0	0	0	0	
	-0.4 -	Mount Specimen	None	_								
	-0.5-	Define Rigid Body Coordinate Systems	None	_	+Y	0	0	0	0	0	0	
	-0.6-	Determine Neutral Position	None	- 83	_						0	
	-0.7			- 111	-2		0	0	Ju	0	0	U U
0.000 AM 10:01:00.000 AM	10:00:00		_	_	+z	0	0	0	0	0	0	0
Select Actuator(s) to Utilize		-			X	-						
ctuator Name		Actuator Type		Configuration	t Connec	ction	0	0	0	0	0	
Robot Manual (No Actuator)		Denso Robot_Actuator		Available								Capture
Mandal (No Actuator)				Available	aravity	compe	nsatio <mark>n</mark> I	Paramete	ers			
							Gravit	v Comnei	nsation Tvr	e Macc	(N) C	oM in Load Cell CS (mm
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	🗎 Use	Selected Actuator(s)			T T	Offse Onl	ets y	0	0	0	0 0	0

- Setup Zero Dynamic Load Cell
 - In the calibrate tab of the advanced robot interface, send the robot to the predefined positions that correspond to the load cell position (i.e. Negative X Load Cell positions the load cell so the –x-axis is pointed down)
 - Capture the load cell output for each position

	simVITRO Setup Manager	
JCS Load Posterior Shear JCS Load Compression JCS Load Left Lateral Shear	Specimen 1 Project Training_Cortex Project Description This is single level with cortex	Denso Robot Apply gravity compensation or choose gravity compensation parameters from a library. Compute offsets for a load cell attached to the robot. Load Cell Readings at Specific Orientations
View View	Specimen Type Spine Setup Steps: Step Verified ▲ Record Specimen Info OK Initialize All External Hardware OK Define Robot Coordinate System OK Kero Dynamic Load Cell None Mount Specimen None Define Rigid Body Coordinate Systems None Define Rigid Body Coordinate Systems None Determine Neutral Position None Verifying Define Robot Coordinate System Verifying Initialize All External Hardware	Orientation Fx Fy Fz Mx My Mz Position Selected for Capture -x 6.72 2.204 -8.939 0.01305 0.09865 0.3623 • • -x 6.72 2.204 -8.939 0.01305 0.09865 0.3623 • • -x 0 0 0 0 •
1/01/1904 1/01/1904 1/01/1904 1/01/1904 Time	ne	Disabled

- Setup Zero Dynamic Load Cell
 - Either load an existing mass/center of mass value and calculate only offsets or create a new mass/center of mass value
 - Most of the time you will just load previously used values

specimen specimen roject Training_Cortex troject Boscription This is single level with cortex specimen Info Specimen Info OK Zero Dynamic Load Cell Mone Define Rbiot Coordinate Systems None Define Rbiot Coordinate Systems Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate Systems None Verifying Define Rbiot Coordinate System	simVITRO Setup Manager									
specimen 1 ▼ Training_Cottex Project Training_Cottex Project training_Cottex Project training_Cottex Project training_Cottex Project specimen Type Spline Spline Contract Step Steps: Stepse: Step Steps: Contract System Ministice All Esternal Hardware OK Define Robot Coordinate Systems OK Define Robot Coordinate Systems None Usering ID Define Robot Coordinate Systems None Usering Define Robot Coordinate Systems None Usering Define Robot Coordinate System Coordinate System Verlying Define Robot Coordinate System Coordinate Sys	pecimen									Denso Robot
Training_Cortex Training_Cortex Training_Cortex Training_Cortex Troject Description This is single level with cortex Spine Setup Steps: Step Step Orientation Patients Rigid Body Obdine Robot Coordinate System None Define Robot Coordinate System None Define Robot Coordinate System Verifying Define Robot Coordinate System	specimen 1									H
Training_Cortex broject Description This is single level with cortex signetimen Type Spine Step Spine Step Step Step Step Step Step Step Step	roject		Apply gravity	compens	ation or	choose g	gravity co	mpensa	tion	
roject Description This is single level with cortex pecimen Type Spine detup Steps: Step Record Specimen Info Diffie Robot Coordinate System Define Robot Coordinate Systems None Define Robot Coordinate Systems None Define Robot Coordinate Systems Verifying Define Robot Coordinate System Verifying Define Robot Coordinate Sy	Training_Cortex		parameters fr	rom a libra	ary. Con	npute off	fsets for a	load cel	l attached	d to
This is single level with cortex pacimen Type Spine Steps: Step Record Specimen Info OK Initialize All External Hardware OK Define Robot Coordinate System None Define Rigid Body Coordinate System None Calculate Current Reading Costs3 2_23 -2.635 0.0115 ¹ 0.5107 -0.3588 Copture Calculate Conventionate System Calculate Conventionate Calculate Convention Calculate Con	roject Description		the robot.							
specimen Type Spine step Step: Step: Record Specimen Info Initialize All External Hardware OK Zero Dynamic Load Cell Readings at Specific Orientations None Define Robot Coordinate System None Define Rigid Body Coordinate System None Define Rigid Body Coordinate System None Define Robot Coordinate System None Define Robot Coordinate System None Define Robot Coordinate System None Define Robot Coordinate System None Calculate Supposed None Calculate Supposed None Calculate Calculate None Calculate Calculate Calculate Calculate None Calculate Calculate None Calculate Calculate None Calc	This is single level with cortex									
Specimen Type Spine Spine Setup Steps: Step Record Specimen Info Define Robot Coordinate System Verifying Define Robot Coordinate System Verifying		The second se								
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for Capture Step Verified Record Specimen Info OK Initialize All External Hardware OK Define Robot Coordinate System OK Mount Specimen None Define Robot Coordinate System None Define Robot Coordinate Systems None Define Robot Coordinate Systems None Define Robot Coordinate Systems None Current 0.0553 2.23 -2.635 0.0115 ^c 0.3582 Image: Colored Coordinate System V Value Image: Colored Coordinate System Image: Colored Co	Spine		Orientation	Fx	Fy	Fz	Мх	My	Mz	Position Selected
Step Verified Record Specimen Info OK Initialize All External Hardware OK Défine Robot Coordinate System OK Carco Dynamic Load Cell None Mount Specimen None Define Robot Coordinate Systems None Define Robot Coordinate System None Define Robot Robot Coordinate Systems None Current 0.3326 9.082 -8.848 -0.3967 0.5085 -0.3582 V 0.3326 9.082 -8.848 -0.3967 0.5085 -0.3582 - Current 0.0553 2.23 -2.635 0.0115* 0.5107 -0.3582 - Current 0.0553 2.23 -2.635 0.0115* 0.5107 -0.3582 - Calculate Gravity Compensation Parameters Gravity Compensation Type Mass (N) Cold in Load Cell CS (mm) Vir Validation/Sawbones Cell Offsets (N, Nm) No specimen E-6 1E-6 Validation/Sawbones Calculate Validation/Sawbones No specimen E-6 1E-6 Validation/Sawbones O	etup Steps:									for Capture
Record Specimen Info OK Initialize All External Hardware OK Zero Oynamic Load Cell None None Define Robot Coordinate System None Define Robot Coordinate System Current Reading O.0553 2.23 - 2.635 0.0115* 0.5107 - 0.3588 Capture Gravity Compensation Type Mass (N) CoM in Load Cell CS (mm) Current Reading Current Curren	Step	Verified	-X	-6.72	2.204	-8.939	0.01309	0.09865	-0.3623	0
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Define Rigid Body Coordinate Systems None Determine Neutral Position None -z 0.3866 2.331 -15.88 0.0117: 0.5205 -0.3565 -z 0.3866 2.331 -15.88 0.0117: 0.5205 -0.3578 -z 0.3866 2.331 -15.88 0.0117: 0.5205 -0.3578 -z 0.3866 2.331 -15.88 0.0117: 0.5205 -0.3582 -z 0.3866 2.331 -15.88 0.0115: 0.5015 -0.3582 -z 0.0905 2.23 -2.635 0.0115: 0.5107 -0.3582 Current Reading 0.0553 2.23 -2.635 0.0115: 0.5107 -0.3582 Gravity Compensation Parameters	Mount Specimen	None					· · · · · · · · · · · · · · · · · · ·			
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-Z 0.300 2.331 13.88 0.0117: 0.3205 0.357e +Z 0.1096 2.165 -2.632 0.0158: 0.5015 -0.3582 (Current Reading 0.0553 2.23 -2.635 0.0115: 0.5107 -0.3583 (Capture Gravity Compensation Parameters (Capture Gravity Compensation Type Mass (N) Cold in Load Cell CS (mm) (Capture) Calculate Gravity Compensation Type Mass (N) Cold in Load Cell CS (mm) (Calculate Gravity Compensation Type Mass (N) 0 0 0 (Calculate Gravity Compensation Type Mass (N) 0 0 0	Determine Neutral Position	None		0.2055	0.001	15.00	0.0117	0.5005	0.2570	
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Image: Second			🥽 👝 G	alculate	Gravity	Compens	ation Type	Mass (N) Co	M in Load Cell CS (mm)
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Verifving Initialize All External Hardware	Verifying Define Robot Coordinate System		I							
Verifying Initialize All External Hardware	Setup Step Define Robot Coordinate System	n								
	Verifving Initialize All External Hardware	-								

- Setup Zero Dynamic Load Cell
 - To create a new mass/center of mass value, the half a specimen with fixtures must be attached to the robot when capturing load cell value (this requires destruction of the specimen, so do this on a previously tested specimen)
 - Fill in a descriptive name (i.e. sheep tibia) and these values can be loaded every time a sheep knee is tested.
 - . Click the check 1

Specimen Denso Robot Project Apply gravity compensation or choose gravity compensation Project Description parameters from a library. Compute offsets for a load cell attached to the robot.
File Edit View Project Operate Tools Window Help
Name Mass in (N) Center of Mass in Load Cell CS in (mm) 2.204 8.939 0.0130! 0.0986! 0.3623 6.7465 0.78042 -0.1689 60.4286 2.417 -8.825 0.0179! 0.9117 -0.3536 0 Save Cancel 0 6 0.082 -8.848 -0.3967 0.5085 0.3566 0 6 2.331 -15.88 0.0117! 0.5205 0.3578 0 e 111 + 96 2.165 -2.632 0.0158! 0.5015 0.3582 0
Set Paramet Image: Construction of the c

- Setup Mount Specimen
 - Drive the robot close to the top of the specimen using the advanced robot interface
 - Push the HandGuide Button and follow instructions for mounting the specimen
 - Be sure deselect HandGuide before moving forward
 - Click the Check 1

	C cim/ITEO Setur Manager		
simVITRO ICS Load Posterior Shear	Specimen T		Configu
JCS Load Compression CS Load Left Lateral Shear	Project Training_Cortex Project Description	2	
srce (N)	This is single level with cortex	HANDGU	IDE Robot
0- 510P RESET DRVES HELP HAND OUDE Store Current currents Current X(mm) Y(mm) X(mm) Y(mm) X(mm) Y(mm) Store Store Rest(Hold) Pre-(hold) Rest(Hold) Pre-(hold) Yee (6 Yee (6 Yee (Specimen Type Spine Setup Steps: Step Record Specimen Info OK	Fx (N) Fy (N) Fz (N) Tx (Nm) IV (Nm) 50 50 200 10 10 10 40 175 8 8 8 8 30 30 123 6 6 6	Tz (Nm) 10 8 6
-0.4 - 1 10 20 30 40 50 60 70 80 90 10 10 200 00000000 2000 00000000000	Initialize All External Hardware OK Define Robot Coordinate System OK Zero Dynamic Load Cell OK Mount Specification None Define Rigid Body Coordinate Systems None	20 20 75- 4 4 10 50- 2 2 0 0 0 0 0 0 0	4 2 0
1- Defined Positions 1.2- 1.0000000 at 1.001000 at 1.001000 at 1.001000 at 1.001000 at 1.001000 at 1.001000 at 1.001000 at 1.001000 at 1.001000 at 1.00100 at 1.0010000 at 1.00100000000 at 1.00100000000000000000000000000	Determine Neutral Position None	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-2- -4 -6 -8-
Odd- Tool Peddin Codiguration File If a Accele 0.04- Tool Collocation If a Accele If a Accele 0.04- Tool Collocation If a Accele If a Accele 0.02- If No Tool Load See If a Accele	x x	.50: .50: .20: .10: .10: 22: .42: 1.8: .40: .10: 1. Verify that the robot end-effector is not touching anything.	01
0.02-	🖌 🏑 🕞 🛃 🚞 😧	2. I um the knob on the control box to "HANDGUDE" 3. Click the "HANDGUDE" button on the screen.	
-0.06 - 25/03/0014 56:05 PM Error Code 401660	Verifying Setup Step 'Zero Dynamic Load Cell'	,	
1002/000 AN (Ventying Define Robot Coordinate System	Disabled 1	
ICS Load Left Lateral Rending Torque ICS Load Left Auto Rending Torque ICS Load Left Auto Rending Torque ICS Load Rending Torque Left Lateral Bending Torque - Desired ICS Load Rending Torque - Desired ICS Load Rending Torque - Desired ICS ICS Lo	ight Lateral Bending Angle Atala Rotation Rotatio Rotation Rotation Rotation Rotation Rotation R	int	
Right Aust Rotation Tarque - Desired 🚺 U Flexion Tarque - Desired 🔄 E ystern Message Log	eft Avial Rotation Angle - Desired Contract Cont	Experiment Run Name 0 Prepare	Run Abort View
25/02/2014 44345 PM Main Program Starts			

- Setup Define Rigid Body Coordinate System
 - Collect the points for each rigid body and when finished, click the calculator
 - . If there are no errors, click the check

😰 simVITRO Setup Manager									
Specimen specimen 1		To digitize each R	Rigid Body						
Project		to the digitizer W							
Training_Cortex		reference frame,	select a		C. C. C.	a land		1 AL	
Project Description		rigid body and th	e digitize	-	P	4	-	1	
This is single level with cortex		each rigid body la	andmark.		Acres			-	
This is single level with contex				11		100			
Specimen Type		When completed rigid bodies, pres	with all s calculate	T	4			-	
Spine		to determine all	the		A	1	D P	-	
Setup Steps:		associated transf	ormation					1	
Step	Verified	matrices.		1875-11		-	1	and the second s	
Record Specimen Info	OK						1		
Initialize All External Hardware	ОК								
Define Robot Coordinate System	ОК								
Zero Dynamic Load Cell	ОК								
Mount Specimen	ОК						<u></u>		
Define Rigid Body Coordinate Systems	None						12		
Determine Neutral Position	None	Rigid Bodies		Digitized	Positions				
		Rigid Body	Done	Point			x	у	ZA
		C2	No	Anterior S	Superior End P	ate	-0.000000	0.000000	0.000000
		C1	No	Anterior I	nferior End Pla	ite	-0.000000	0.000000	0.000000
		Load Cell	No	Left Supe	rior End Plate		-0.000000	0.000000	0.000000
				Left Infer	ior End Plate		-0.000000	0.000000	0.000000
				Right Sup	perior End Plate	2	-0.000000	0.000000	0.000000
		-		Right Infe	erior End Plate		-0.000000	0.000000	0.000000
				Left Later	al Transverse P	rocess	-0.000000	0.000000	0.000000
				Right Lat	eral Iransverse	Process	-0.000000	0.000000	0.000000
		J	T					10	T
						Capture th			
			*		167.68	33 -26	5.114 20	0.75	
Verifying						6D Sens	or Position	IS	
Setup Step 'Mount Specimen'	E			414.558	1.11283	567.591	-179.558	1.23985	173.132
Verifying	-		-	98.0259	120.282	-11.8891	177.777	8.89608	-79.5581