## 1. Quick start

Download and install DK3 setup file (dk3\_setup.exe) from our partners website.

https://senso.me/download

Launch dk3\_setup.exe



Proceed by pressing 'I Agree'

🌍 Senso DK3 Setup		_		×
Choose Components Choose which features of Sens	o DK3 you want to install.			
Check the components you wa install. Click Next to continue.	nt to install and uncheck the comp	onents you do	n't want i	to
Select components to install:	<ul> <li>Senso DK3 software</li> <li>FTDI driver for Senso DK3</li> <li>Senso DK3 SteamVR drive</li> <li>Senso DK3 manual</li> </ul>	Description Position you over a comj see its desc	ur mouse ponent to ription,	)
Space required: 10.0 MB	< >>			
Nullsoft Install System v3,05	< <u>B</u> ack	<u>N</u> ext >	Car	ncel

Proceed by pressing 'Next' until the end.

You also may need to install FTDI driver (some versions of Windows 10 don't require this driver, but there is no down side, so install it anyways)

FTDI CDM Drivers		×
	FTDI CDM Drivers	
~	Click 'Extract' to unpack version 2.12.28.2 of FTDI's Windows driver package and launch the installer.	
	www.ftdichip.com	
	< Back Extract Cancel	

### Close the installation window

🌍 Senso DK3 Setup	_	$\Box$ $\times$
Installation Complete		Number
Setup was completed successfully.		
Completed		
Completed		
Show details		
Nullsoft Install System V3.05		
< <u>B</u> ack	Close	Cancel

Before the next step make sure that 11Dvr Glove has been charged for at least 45 minutes via any kind of USB charger (using the USB port of your computer may require more time for the charging process).



Get New Pic\*

Insert the DK3 RF adapters into the USB ports of your computer or laptop.

Though one adapter is enough to work with both 11Dvr Gloves, it is strongly recommended that you use both of them.

The radio dongles use MIMO technology and using two adapters with some distance between each other can help increase the strength of the connection. to make connection.



New Picture\*

At this step you should see blue icon in the system tray which shows active state of the RF adapters



### Launch DK3\_GUI.exe

Senso DK3 easy configurator		- 🗆 💙
DK3 connector IP address 127.0.0.1 IP	port 53452 Disconnect Scanning	
Available devices & connection type	S	
Configuration parameters		
<ul> <li>connect by type</li> </ul>	connect by MAC MAC:	
Main frequency & channel	IP configuration	26020
Optimal bands:	Main client connection (JSON data)	
902 - 928 MHz, 2-GFSK (US)	A)	
Auxilary, non-optimized :		
O 2400 - 2498 MHz, BLE (Globa	al) Mirroring for 2nd glove	Glove is not connected
Channel	2 127.0.0.1 53451	
Save config file Save	e config & calibrate Run, no recalibration	Battery : 0% Haptic effects probe
strieve list from server arning : two RF adapters are recomm anning	mended for better quality	Fn Fn Fn Fn Fn Wrist Shid
Glove IMU data		
-		
-		
-		
-		
3		
	Scanning	

This GUI is the easiest way to find and configure the DK3 gloves.

After the launch it will scan and show all DK3 devices nearby.

DK3 connector         IP address       127.0.0.1       IP port       53452       Disconnect       Rescan         Available devices & connection types         SensoDK3 (R) A4:34:F1:28:43:F3 rssi=-51 bat=100 fw=0101 (RF) (0) SensoDK3 (L) A4:34:F1:28:43:B8 rssi=-54 bat=100 fw=0101 (RF) (0)         Configuration parameters         Connect by type       IP connect by MAC       MAC:         Main frequency & channel       IP configuration	Senso
Available devices & connection types         SensoDK3 (R) A4:34:F1:28:43:F3 rssi=-51 bat=100 fw=0101 (RF) (0)         SensoDK3 (L) A4:34:F1:28:43:B8 rssi=-54 bat=100 fw=0101 (RF) (0)         Configuration parameters         Connect by type       Image: connect by MAC         Main frequency & channel       IP configuration	Senso
SensoDK3 (R) A4:34:F1:28:43:F3 rssi=-51 bat=100 fw=0101 (RF) (0)         SensoDK3 (L) A4:34:F1:28:43:B8 rssi=-54 bat=100 fw=0101 (RF) (0)         Configuration parameters         connect by type       connect by MAC         Main frequency & channel       IP configuration	Senso
Configuration parameters  Connect by type  Connect by MAC  Main frequency & channel  IP configuration	Senso
Connect by type Connect by MAC MAC:	Senso
Main frequency & channel IP configuration	Senso
Optimal bands:       Main client connection (JSON data)         985-868 MHz, 2-GFSK (EU)       127.0.0.1         902 - 928 MHz, 2-GFSK (USA)       53450         Auxilary, non-optimized :       Mirroring for 2nd glove         Channel       32 (867.000 MHz)	Glove is not connected
Save config file Save config & calibrate Run, no recalibration	Battery : 0% Haptic effects probe
/aming : two RF adapters are recommended for better quality ound SensoDK3 (R) A4:34:F1:28:43:F3 rssi=-51 bat=100 fw=0101 (RF) (0) ound SensoDK3 (L) A4:34:F1:28:43:B8 rssi=-54 bat=100 fw=0101 (RF) (0) ✓	Fn     Fn     Fn     Fn     Wrist     Shid       001 Strong Click - 100%
-	
•	
-	
·	

In case, you don't see devices in the list, please ensure that the gloves are charged, and are within close proximity of the RF adapters.

If you connect gloves to your computer via USB for charging you will probably see additional strings in system tray and in the GUI interface



The 11Dvr Gloves can use both RF or USB connectivity, but the most useful way is to use RF connectivity.

👆 Senso DK3 easy configurator	– 🗆 X
DK3 connector IP address 127.0.0.1 IP port 53452 Disconnect Rescan	
Available devices & connection types SensoDK3 (L) A4:34:F1:28:43:B8 rssi=0 bat=100 fw=0101 (USB) (2) SensoDK3 (R) A4:34:F1:28:43:F3 rssi=0 bat=100 fw=0101 (USB) (3) SensoDK3 (R) A4:34:F1:28:43:F3 rssi=-61 bat=100 fw=0101 (RF) (0) SensoDK3 (L) A4:34:F1:28:43:B8 rssi=-69 bat=100 fw=0101 (RF) (0)	رالس
Configuration parameters Connect by type Connect by MAC MAC: Main frequency & channel Optimal bands: 865-868 MHz, 2-GFSK (EU) 902 - 928 MHz, 2-GFSK (USA) IP configuration Main client connection (JSON data) 127.0.0.1 53450	Senso
Auxilary, non-optimized :         Mirroring for 2nd glove           2400 - 2498 MHz, BLE (Global)         Mirroring for 2nd glove           Channel         35 (867.375 MHz)         127.0.0.1	Glove is not connected
Save config file         Save config & calibrate         Run, no recalibration           Found SensoDK3 (R) A4:34:F1:28:43:F3 rssi=0 bat=100 fw=0101 (USB) (3)         Found SensoDK3 (R) A4:34:F1:28:43:F3 rssi=-61 bat=100 fw=0101 (RF) (0)           Found SensoDK3 (L) A4:34:F1:28:43:B8 rssi=-69 bat=100 fw=0101 (RF) (0)         Found SensoDK3 (L) A4:34:F1:28:43:B8 rssi=-69 bat=100 fw=0101 (RF) (0)	Battery : Haptic effects probe Fn Fn Fn Fn Fn Fn Wrist Shid 001 Strong Click - 100%
Glove IMU data	
- Scanned	

Here are three RF options you can choose - ISM band 865 (European Union), 902-928 (US / North America) or universal worldwide band 2400 which is available everywhere but **not** recommended due to performance issues and interference with other devices or WiFi networks.

Choose the proper option suitable for your location. You can also choose radio channel (random by default)

Now it's time to put 11Dvr Gloves on and calibrate them.



The calibrating procedure is needed to detect the position of built in sensors, with accordance to the fabric of the glove, and the anatomy of the hand.

Place your hand at flat surface with all fingers together including thumb, then click 'Save config & calibrate' (or just double click at the selected glove in the list).

After several seconds you will see the first-time calibration procedure. Here you will need to follow three simple steps.

	Jurator								19 <u>00</u>		^
DK3 connector IP address 127.0.0.1	IP port [	i3452 Dis	connect	Rescar	1						
Available devices & conne	ction types							12020-0-			
SensoDK3 (R) A4:34:F1 SensoDK3 (L) A4:34:F1	1:28:43:F3 rss 1:28:43:88 rss	i=-64 bat=100 i=-67 bat=98	9 fw=0101 ( fw=0101 (R	(RF) (0) RF) (0)					**		
Configuration parameters											
🔘 connect by type	conne	ct by MAC	MAC: A	4:34:F1:28:4	3:B8	エナエナエナ		A	动行	141414	1
Main frequency & channe	el	IP configuration				エナエナエ			计正计正	行行	
Optimal bands:		Main client or	oppection (19	(etch MO2		72525	1747474	나고승고	经经	1414	1-1-
• 865-868 MHz, 2-GF	FSK (EU)		52/5			エナエナエー		1-1-1-1-	エキエキア	计正式	石
O 902 - 928 MHz, 2-0	GFSK (USA)	127.0.0.1	0345	21		171717		行行	シナシナ	12121	11
Auxilary, non-optimized	1:	client : co	nnected			-7-1-1-1	テニテニテニ	74747	14747	+1+1	
O 2400 - 2498 MHz, F	BLE (Global)	Mirroring for 2	2nd alove			Place	alm on the	table	and sta	av calm	
-							unn on un		und Ju	ay cum	
Channel 21 (065 62	E MUN	127.0.0.1	5345	50		rssi=-57	-60 temp=28(	C Vb=4 13	19V Vp=3	976V (69/	(69)
Channel 21 (865.62	5 MHz) 🗸	127.0.0.1	5345	0		rssi=-57, mag=[-1	-60, temp=28 ( 75,-126, 186] g	C, Vb=4.13 rv=[-0.8,-3	39V Vp=3. 1.0, 9.3] lia	.976V (69/	(69) ), 0.0]
Channel 21 (865.62	5 MHz) 🗸	127.0.0.1	5345	50		rssi=-57, mag=[-1 Battery :	(-60, temp=28 ( 75,-126, 186] g 00%	C, Vb=4.13 rv=[-0.8,-3	89V Vp=3. 1.0, 9.3] lia	976V (69/ a=[ 0.0, 0.0	'69) ), 0.0]
Channel 21 (865.62 Save config file	5 MHz) 🗸 Disconne	127.0.0.1	5345	connect glo	ve	rssi=-57, mag=[-1 Battery : 1 Haptic eff	/-60, temp=28 ( 75,-126, 186] g 00% <b>(</b> ects probe	C, Vb=4.13  rv=[-0.8,-3	89V Vp=3. 1.0, 9.3] lia	976V (69/ =[ 0.0, 0.0	'69) ), 0.0]
Channel 21 (865.62 Save config file	5 MHz) V	127.0.0.1	5345	connect glo	ve	rssi=-57, mag=[-1 Battery : 1 Haptic eff	(-60, temp=28 ( 75,-126, 186] g 00% ects probe	C, Vb=4.13  rv=[-0.8,-3	39V Vp=3.	976V (69/ a=[ 0.0, 0.0	(69) ), 0.0]
Channel 21 (865.62 Save config file eamVR driver configured	5 MHz) V	127.0.0.1	5345	connect glo	ve	rssi=-57, mag=[-1 Battery : 1 Haptic eff	-60, temp=28 ( 75,-126, 186] g 00% ects probe Fn Fn Fn	C, Vb=4.13 rv=[-0.8,-3	99V Vp=3. 1.0, 9.3] lia	976V (69/ a=[ 0.0, 0.0	(69) ), 0.0]
Channel 21 (865.62 Save config file eamVR driver configured sunch "Senso_DK3_proce configuration_A4_34_E1_2	5 MHz) Disconne essing.exe /ini=C: 28 43 B8 ini"	127.0.0.1	fig_data	i0 connect glo	ve	rssi=-57, mag=[-1 Battery : Haptic eff	-60, temp=28 ( 75,-126, 186] g 00% ects probe Fn Fn Fn	C, Vb=4.13 Inv=[-0.8,-3	39V Vp=3. 1.0, 9.3] lia in Wr	976V (69/ a=[ 0.0, 0.(	(69) ), 0.0]
Channel 21 (865.62 Save config file eamVR driver configured aunch "Senso_DK3_proce configuration_A4_34_F1_2	5 MHz) Disconne essing.exe /ini=C: 28_43_B8.ini"	127.0.0.1	fig_data	i0 connect glo	ve ^ v	rssi=-57, mag=[-1 Battery : 1 Haptic eff	-60, temp=28 ( 75,-126, 186] g 00%	C, Vb=4.13 rv=[-0.8,-3 Fn F	39V Vp=3. 1.0, 9.3] lia	976V (69/ a=[ 0.0, 0.(	(69) ), 0.0
Channel 21 (865.62 Save config file eamVR driver configured aunch "Senso_DK3_proce configuration_A4_34_F1_2 Glove IMU data	Disconne Disconne essing.exe /ini=C: 28_43_B8.ini"	127.0.0.1	fig_data	connect glo	ve ^ ¥	rssi=-57, mag=[-1 Battery : <sup>-</sup> Haptic eff Fn	-60, temp=28 ( 75,-126, 186] g 00% ects probe Fn Fn ong Click - 100	C. Vb=4.13 rv=[-0.8,-3 Fn F	39V Vp=3. 1.0, 9.3] lia	976V (69) ==[ 0.0, 0.0	(69) ), 0.0
Channel 21 (865.62 Save config file teamVR driver configured aunch "Senso_DK3_proce configuration_A4_34_F1_2 Glove IMU data Central Wr	Disconne Disconne essing.exe /ini=C: 28_43_B8.ini"	127.0.0.1 Act glove Vnsis_senso \cor Fn1	fig_data	connect glo Fn3	ve	rssi=-57, mag=[-1 Battery : 1 Haptic eff Fn 001 Str	-60, temp=28 ( 75,-126, 186] g 00% ects probe Fn Fn ong Click - 100 Shoulder	2, Vb=4.13 rv=[-0.8,-3 Fn F	39V Vp=3. 1.0, 9.3] lia	976V (69/ a=[ 0.0, 0.0	(69) ), 0.0
Channel 21 (865.62 Save config file eamVR driver configured aunch "Senso_DK3_proce configuration_A4_34_F1_2 Glove IMU data Central Wr A0: -173	Disconne Disconne essing.exe /ini=C: 28_43_B8.ini" *ist Thumb_1 301 -776	I127.0.0.1 Act glove Vnsis_senso\cor Fn1 -485	fig_data Fn2 -693	Fn3 -161	ve	rssi=-57, mag=[-1 Battery : 1 Haptic eff Fn 001 Str 001 Str Thumb_2 -329	-60, temp=28 ( 75,-126, 186] g 00% ects probe Fn Fn ong Click - 100 Shoulder 8	2, Vb=4.13 rv=[-0.8,-3 Fn F	39V Vp=3. 1.0, 9.3] lia	976V (69/ a=[ 0.0, 0.0	(69) ), 0.0
Channel 21 (865.62 Save config file teamVR driver configured aunch "Senso_DK3_proce configuration_A4_34_F1_2 Glove IMU data Centra1 Wr A0: -173 A1: -616 -	5 MHz) Disconne essing.exe /ini=C: 28_43_B8.ini'' -ist Thumb_1 301 -776 -275 1502	En1 -485 526	Fn2 -693 405	Fn3 -161 307	ve	rssi=-57, mag=[-1 Battery : 1 Haptic eff Fn 001 Stn 001 Stn Thumb_2 -329 1188	-60, temp=28 ( 75,-126, 186) g 00% ects probe Fn Fn Fn ong Click - 100 Shoulder e e	2, Vb=4.13 rv=[-0.8,-3 Fn F	39V Vp=3. 1.0, 9.3] lia	976V (69/ a=[ 0.0, 0.0	(69) ), 0.0
Channel 21 (865.62 Save config file teamVR driver configured aunch "Senso_DK3_proce configuration_A4_34_F1_2 Glove IMU data Central Wr A0: -173 A1: -616 - A2: 1892 -2	5 MHz) Disconne essing.exe /ini=C: 28_43_B8.ini'' 1301 -776 -275 1502 2106 1080	En1 -485 -485 -485 -485 -526 -2001	Fn2 -693 405 1921	Fn3 -161 307 2038	ve	rssi=-57, mag=[-1 Battery : Haptic eff Fn 001 Stn 001 Stn Thumb_2 -329 1188 1509	-60, temp=28 ( 75,-126, 186) g 00% ects probe Fn Fn Fn ong Click - 100 Shoulder e e e	2, Vb=4.13 rv=[-0.8,-3 Fn F	39V Vp=3. 1.0, 9.3] lia	976V (69/ a=[ 0.0, 0.0	(69) ), 0.0
Channel 21 (865.62 Save config file teamVR driver configured aunch "Senso_DK3_proce configuration_A4_34_F1_2 Glove IMU data Central Wr A0: -173 A1: -616 - A2: 1892 -2 G3: -156.5	5 MHz) Disconne essing.exe /ini=C: 28_43_B8.ini" 1301 -776 275 1502 2106 1080 6.6 -14.3 4.6 10.5	En1 -485 -2.9 -2.9 -2.9	Fn2 -693 405 1921 -5.9	Fn3 -161 307 2038 2.1	Ve	rssi=-57, mag=[-1 Battery : Haptic eff Fn 001 Stn 001 Stn Thumb_2 -329 1188 1509 -25.1	-60, temp=28 ( 75,-126, 186) g 00% ects probe Fn Fn Fn ong Click - 100 Shoulder e e e e e e e e	2, Vb=4.13 rv=[-0.8,-3	99V Vp=3. 1.0, 9.3] lia	976V (69/ a=[ 0.0, 0.0	(69) ), 0.0
Channel 21 (865.62 Save config file teamVR driver configured aunch "Senso_DK3_proce configuration_A4_34_F1_2 Glove IMU data Central Wr A0: -173 A1: -616 - A2: 1892 -2 G3: -156.5 G4: 44.3 - G5: 0.1 -1	5 MHz) ✓ Disconne essing.exe /ini=C: 28_43_B8.ini" *ist Thumb_1 301 -776 1021 -776 1020 -1080 6.6 -14.3 6.6 -18.6 18.6 18.7 -9.3	Fn1 -485 526 2001 -2.9 17.2 -3.1	Fn2 -693 405 1921 -5.9 1.2 -5.4	Fn3 -161 307 2038 2.1 6.4 -1.5	ve	rssi=-57, mag=[-1 Battery : Haptic eff Fn 001 Str 001 Str 001 Str 1509 -25.1 -0.5 -1.3	-60, temp=28 ( 75,-126, 186) g 00% ects probe Fn Fn ong Click - 100 Shoulder e e e.e e.e e.e e.e	2, Vb=4.13 rv=[-0.8,-3 Fn F	99V Vp=3. 1.0, 9.3] lia	976V (69, a=[ 0.0, 0.0	(69) ), 0.0

Please place your palm on the table for around 5 - 10 seconds (make sure it's flat as depicted on picture) and wait for the next step.

Senso DK3 easy config	urator							122		×
DK3 connector IP address 127.0.0.1	IP port	53452 Dis	connect	Rescan						
Available devices & conne	ction types								-	
SensoDK3 (R) A4:34:F1 SensoDK3 (L) A4:34:F3	1:28:43:F3 rss 1:28:43:B8 rss	i=-64 bat=100 i=-67 bat=98	) fw=0101 ( fw=0101 (R	RF) (0) F) (0)						
Configuration parameters										
Connect by type	Conne	ct by MAC	MAC: A4	4:34:F1:28:43	3:B8				朝朝時	
Main frequency & channel	el	IP configuration	1			1717				
Optimal bands:		Main client c	onnection (JS	SON data)		1777			马马马	
865-868 MHz, 2-GF	SK (EU)	127.0.0.1	5345	1					建建造	
O 902 - 928 MHz, 2-0	FSK (USA)					+		1+2+2+2+3	计正行	1
Auxilary, non-optimized	÷	client : co	nnected			74747	-12-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		1	2-3
O 2400 - 2498 MHz, P	BLE (Global)	Mirroring for	2nd glove			Raise y	your hand a	s shown on	picture	
Channel 21 (865.62	5 MHz) 🗸	127.0.0.1	5345	0		rssi=-53/	/-55, temp=30 C.	, Vb=4.136V Vp=	3.976V (64/6	(4)
						mag=[-1	68,-117, 182] gn	v=[-0.6,-2.8, 9.4]	lia=[ 0.0, 0.0,	-0.1]
Save config file	Disconne	ect glove	Dis	connect glov	e	Battery : 1	100%			
						Haptic eff	fects probe			
oom\/D driver configured						Fn	Fn Fn	Fn Fn V	Vrist Shl	ŧ.
aunch "Senso_DK3_proce	essing.exe /ini=C:	\nsis_senso\cor	nfig_data							-
:onfiguration_A4_34_F1_2	8_43_88.ini"				~	001 Stn	ong Click - 100%			~
Glove IMU data						Thursday 0	Shoulden			
Glove IMU data Central Wr	ist Thumb_1	Fn1	Fn2	Fn3	Fn4	Inumb_2	SHOUTUEL			
Glove IMU data Central Wr A0: -116	ist Thumb_1 316 -767	Fn1 -426	Fn2 -642	Fn3 -168	Fn4 -897	-296	0 0			
Glove IMU data Central Wr A0: -116 A1: <mark>-</mark> 565 -	ist Thumb_1 316 -767 203 <mark>1</mark> 541	Fn1 -426 588	Fn2 -642 461	Fn3 -168 335	Fn4 -897 25	-296 1228	0 0			
Glove IMU data Central Wr A0: -116 A1: -565 - A2: 1912 -2	ist Thumb_1 316 -767 203 1541 121 1001	Fn1 -426 588 2056	Fn2 -642 461 1907	Fn3 -168 335 2044	Fn4 -897 25 1839	-296 1228 1484	0 0 0			
Glove IMU data Central Wr A0: -116 A1: -565 - A2: 1912 -2 G3: -143.2 G4: 20.0	ist Thumb_1 316 -767 203 1541 121 1001 8.1 -12.9	Fn1 -426 588 2056 -3.3	Fn2 -642 461 1907 -0.7	Fn3 -168 335 2044 -7.6	Fn4 -897 25 1839 -4.5	-296 1228 1484 -16.1	0 0 0.0			
Glove IMU data Central Wr A0: -116 A1: -565 - A2: 1912 -2 G3: -143.2 G4: 29.8 G5: -0.1 -1	ist Thumb_1 316 -767 203 1541 121 1001 8.1 -12.9 0.8 0.4 8.8 -2.9	Fn1 -426 588 2056 -3.3 9.3 -4.4	Fn2 -642 461 1907 -0.7 -0.5 -1.7	Fn3 -168 335 2044 -7.6 -3.4 -5.5	Fn4 -897 25 1839 -4.5 -7.2 -3.6	-296 1228 1484 -16.1 -5.3 1.5	0 0 0.0 0.0 0.0 0.0			

Next, raise your hand gradually, without any rotation, and with all the sensors along one line. You have now completed the calibration procedure. Extra notes: Try not to make any random movements during the calibration process. Also please remember to keep your fingers together, as depicted.



If everything is done correctly, you will see this screen.



Now the 11Dvr glove is ready to use.

#### Click 'Disconnect glove' and repeat the same procedure for the other VR glove.

Now that the 11Dvr gloves are calibrated and you can check that everything is working correctly by pressing the 'Run, no calibration' button. Simply put your hands in the same flat position before clicking it, otherwise the 11Dvr Glove will start from a different pose and it will restore proper position during future movements.

If you accidentally calibrate the 11Dvr Glove, in a position other than the horizontal flat pose, or if something wrong happens during tracking, The 11Dvr Glove will eventually return itself to the natural pose, but you can save the time by doing these movements:

- Try to wave the 11Dvr Glove up and down, imagine you are smacking an imaginary table
- Try to wave the 11Dvr Glove in another position, for example imagine you are giving someone a handshake

If you have SteamVR installed on your computer, you do not need to do anything else - the drivers will work immediately after restarting SteamVR.

# 2. Using the 11Dvr Gloves with SteamVR.

As a SteamVR controller, the 11Dvr Glove DK3 uses, not only the skeleton of the hand, but the bindings and render models of the controller. It is possible to use any model, but for sake of compatibility, the pre-default state is a simulation of the Valve Index controller which supports precise hand and finger tracking features.

All the configuration settings for the 11Dvr Gloves can be tuned in configuration files - including haptics, gesture recognition and positioning.

We recommend you to watch <u>demo video</u> from our partners website to see how to use the gestures with the 11Dvr Glovers.

As a brief introduction, here is a list of possible gestures, defined in configuration files.

1. Calibration pose (to correct the direction of the hand)



Place your hand in a horizontal position, as shown in the photo.

After about 1 second, in the case of a successful recognition of this gesture, there will be a continuous vibration. You can define the proper position at any time. End of this gesture is changing pose to any other.

2. Click "System" button



This pose with hand directed up is a simulation of the event "click system" = /input/system/click

### 3. Button "B"



Quickly move your thumb down (please do not bend it). This will simulate /input/b/click.

### 4. Button "A"



As for "B" - move your thumb quickly down, with a slight bend. This will result in /input/a/click.

## 5. Trigger



Bend your index finger. As a result, value /input/trigger/value will be changed from 0 to 1 (click / shot in games)

### 6. Grip



Bend your middle finger.

As a result, /input/grip/force value will be changed from 0 to 1. Usually it is used for grabbing and squeezing in games.

7. Moving hand farther



Result will be changing the position of the hand. This gesture can be used to interact with objects located far from the typical reach.

## 8. Moving hand close



Opposite gesture, to make the hand close to the observer.

#### 9. Thumbstick



Move your thumb quickly down and 'click' it onto your index finger which is slightly bent. Will result in switching the thumbstick on, and changing its values. As confirmation of the switching state from off to on, there will be pulsing of vibration for thumb.

Then you can change the position of the thumb, to change X and Y values of the thumbstick.



To end this gesture just move up your thumb, or relax your index finger. See videos on the of our partners site for more details (<u>demo video</u>).

If you're not planning to use 11Dvr Gloves in any other way than in the SteamVR environment, further reading of this manual will not be useful for you.

# 3. Short information for developers

In case if you prefer to use 11Dvr Glove directly without SteamVR for your Unity / Unreal software, as working example you can download and unpack SensoInteractionsDemo.exe Launch SensoInteractions.exe and check it with **right** glove



All the time while your VR glove is connected and works you can see additional console application

C:\nsis_senso\Senso_DK3_processing.exe	_	×
FPS 95/ 95 rssi=-48		^
FPS 94/ 94 rssi=-45		
FPS 96/ 97 rssi=-45		
FPS 94/94 rssi=-45		
FPS 96/ 96 rssi=-45		
FPS 95/ 97 rssi=-45		
FPS 99/ 99 rssi=-45		
FPS 96/ 97 rssi=-45		
FPS 93/ 96 rssi=-44		
FPS 98/ 98 rssi=-44		
FPS 98/ 99 rssi=-46		
FPS 94/ 97 rssi=-46		
FPS 93/ 94 rssi=-43		
FPS 97/ 99 rssi=-44		
FPS 95/ 98 rssi=-46		
FPS 95/ 97 rssi=-45		
FPS 97/ 98 rssi=-46		
FPS 92/ 96 rssi=-46		
Glove is connected (0)		
FPS 0/ 1 rssi=-46		
Glove is connected (0)		
FPS 2/ 8 rssi=-45		
FPS 99/101 rssi=-45		
FPS 93/ 94 rssi=-44		
FPS 97/ 99 rssi=-44		
FPS 34/ 36 rss1=-43		
FPS 92/94 rssi=-43		
FPS 98/98 rss1=-43		
FPS 1// 1/ rss1=-43		
		~

This application, Senso\_DK3\_processing.exe, and connector Senso\_DK3\_connector.exe are necessary for working with VR gloves.

Senso\_DK3\_GUI.exe itself is a useful tool for visualisation and first time quick start but it isn't necessary and, probably, in your projects you'll not use it but rather prefer to start everything manually from your project.

After first time calibration procedures you'll have additional files in your Senso\_DK3 directory

configuration\_A4\_34\_F1\_28\_43\_D0.ini and calibration\_a4\_34\_f1\_28\_43\_d0.dat (these letters and numbers depends on MAC address of your glove)

Anytime you need to work with VR glove you just have to launch Senso\_DK3\_processing.exe with parameters like

Senso\_DK3\_processing.exe /ini=configuration\_A4\_34\_F1\_28\_43\_D0.ini (make sure that Senso\_DK3\_connector.exe is working and visible in the system tray). For disconnecting VR glove put it into standby mode and close Senso\_DK3\_processing.exe

All the parameters are configurable via config file or keywords, so you can choose freely IP addresses and ports, bands and other parameters.

## 3. Technical manual

The 11Dvr DK3 glove has six Bosch BMI160 sensors for fingers (one per each finger and two for thumb), main central sensor Bosch BNO055, 5 LRA vibration motors and Texas Instruments haptic controller DRV2605.

Wrist module is a separate part which has Bosch BMX055 IMU sensor, one LRA vibration motor and DRV2605 as well.

Wrist module provides USB 2.0 connectivity which can be used for transferring data from and to the glove as well as via radio interface, and also can be used for firmware update.

For the radio transport the 11Dvr Glove uses TI CC1350 MCU which is capable of supporting almost any sub 1GHz frequency, including 863-868, 902-928 and 2400-2500 ISM bands.

For the discovering and broadcasting purposes the 11Dvr Glove uses BLE 4.0 channels 37,38,39 in BLE packets format, therefore the glove can be visible as any other Bluetooth device but without possibility to connect over BLE transport.

For transferring data after connection handshake on channels 37-39 the 11Dvr Glove uses sub-1GHz configurable channels (863-868 or 902-928 bands depending on country).

Check local regulations to use proper bands in your area.

ISM 2400 band is also available for use but not recommended due to poor quality of the signal and interference with other devices like WiFi.

Software pack consists of three main components

- Senso\_DK3\_GUI.exe
- Senso\_DK3\_processing.exe
- Senso\_DK3\_connector.exe

Senso\_DK3\_connector.exe is a low-level transport part which provides connectivity via USB or radio interfaces.

Is it possible to run Senso\_DK3\_connector on one computer and other modules on another because all of them use IP/UDP transport for connection to each other.

Senso\_DK3\_processing is the main computation module which receives all low-level data from Senso\_DK3\_connector and transforms it into JSON data packets.

It allows multi clients connectivity, so many applications can work with the same glove at the same time.

Senso\_DK3\_GUI is a tool for quick start configuration processes and raw visualisation & basic haptic tests.

For proper working Senso\_DK3\_processing requires configuration file with all necessary parameters including glove address (or type), USB or radio transport, ISM band and channel etc.

An alternative solution is to launch Senso\_DK3\_processing with proper keywords in the command line, though the configuration file is more detailed.

Several Senso\_DK3\_processing can be launched at the same time in order to use several VR gloves (right and left, for example)

Each Senso\_DK3\_processing instance should be configured with different IP ports because no application can share the same IP/port pair with others, therefore users software should connect to each Senso\_DK3\_processing instance.

As an alternative it's also possible to configure one Senso\_DK3\_processing instance as a data collector and route other Senso\_DK3\_processing instances to this one. It allows having one connection point.

Before using a VR glove it requires fast calibration procedures. It can be done every time or just once.

Radio interface is provided by RF USB adapters. Each adapter can be used as part of the whole mesh network or standalone.

Available options are these :

- one adapter with two (or more) gloves Pros : using just one RF channel for all gloves, less equipment

Cons : less FPS per each glove, blind radio spots.

- one adapter per each glove
- Pros : best FPS per each glove

Cons : requires RF channels for each glove, separated by 1MHz interval at least

- two adapters for one or two gloves

Pros : one RF channel for all gloves, best radio quality (software MIMO), less blind RF spots

Cons : less FPS per each glove

We recommend the last option for best radio coverage. All these options can be configured with the configuration file of Senso\_DK3\_processing module.

In theory it is possible to build a big mesh network with many RF adapters to cover huge areas and seamless connectivity.

Typical distance of good reception quality is about 3-5 meters but it depends on circumstances.

For sub-1GHz bands it is possible to assign several radio channels simultaneously with real time switching between them.

# 4. Examples

Senso\_DK3\_processing.exe /ini=configuration\_A4\_34\_F1\_28\_43\_D0.ini

Launch Senso\_DK3\_processing with configuration file "configuration\_A4\_34\_F1\_28\_43\_D0.ini"

Example of configuration file MAC A4:34:F1:28:43:D0 #usb server 127.0.0.1 53452 0 server 127.0.0.1 53452 1 client 127.0.0.1 53450 SET\_RF 902 FSK 10000 30 50 SET\_CH 198 198 198 198 SET\_CH 198 198 198 198 SET\_TM 4 -70 -99 0 save\_calibration 1 debug 1

These parameters are doing these things :

- connection will be with Senso DK3 glove with MAC address A4:34:F1:28:43:D0
- it uses Senso\_DK3\_connector running on localhost (127.0.0.1) port 53452 (default value)
- it uses up to two RF adapters at the same time for best MIMO connectivity (two lines server 127.0.0.1 53452 0 and server 127.0.0.1 53452 1 where 0 and 1 are index of RF adapters on computer)
- it accepts incoming connection on port 53450 (default for Senso Unity/Unreal plugins)
- it uses base frequency 902 MHz and 2-GFSK coding scheme
- It uses channel 198 for all slots which gives result frequency 902 + 0.125\*198 = 926.75 MHz
- save\_calibration 1 will perform calibration procedure just one time and save calibration data into file. To perform calibration procedure again, just remove calibration\*.dat file in working directory.
- debug 1 is basic printout (set more for more details)

Example of configuration file for USB connectivity

MAC A4:34:F1:28:43:D0

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usb server 127.0.0.1 53452 0 server 127.0.0.1 53452 1 client 127.0.0.1 53450 save\_calibration 1 debug 1

Example of configuration files for two gloves

configuration\_A4\_34\_F1\_28\_43\_D0.ini \_\_\_\_\_ name SensoDK3 MAC A4:34:F1:28:43:D0 #usb server 127.0.0.1 53452 0 server 127.0.0.1 53452 1 client 127.0.0.1 53450 mirror 127.0.0.1 53451 hand right SET\_RF 902 FSK 10000 30 50 SET\_CH 198 198 198 198 SET\_TM 4 -70 -99 0 save\_calibration 1 debug 1 configuration\_A4\_34\_F1\_28\_43\_E0.ini \_\_\_\_\_ name SensoDK3 MAC A4:34:F1:28:43:E0 #usb server 127.0.0.1 53452 0 server 127.0.0.1 53452 1 client 127.0.0.1 53451 mirror 127.0.0.1 53450 hand left SET\_RF 902 FSK 10000 30 50 SET CH 198 198 198 198 SET\_TM 4 -70 -99 0 save calibration 1 debug 1

Parameter mirror is used to route traffic between two instances, so the user's application can connect to any of the 53450 or 53451 ports and have all the data for all gloves at the same time.