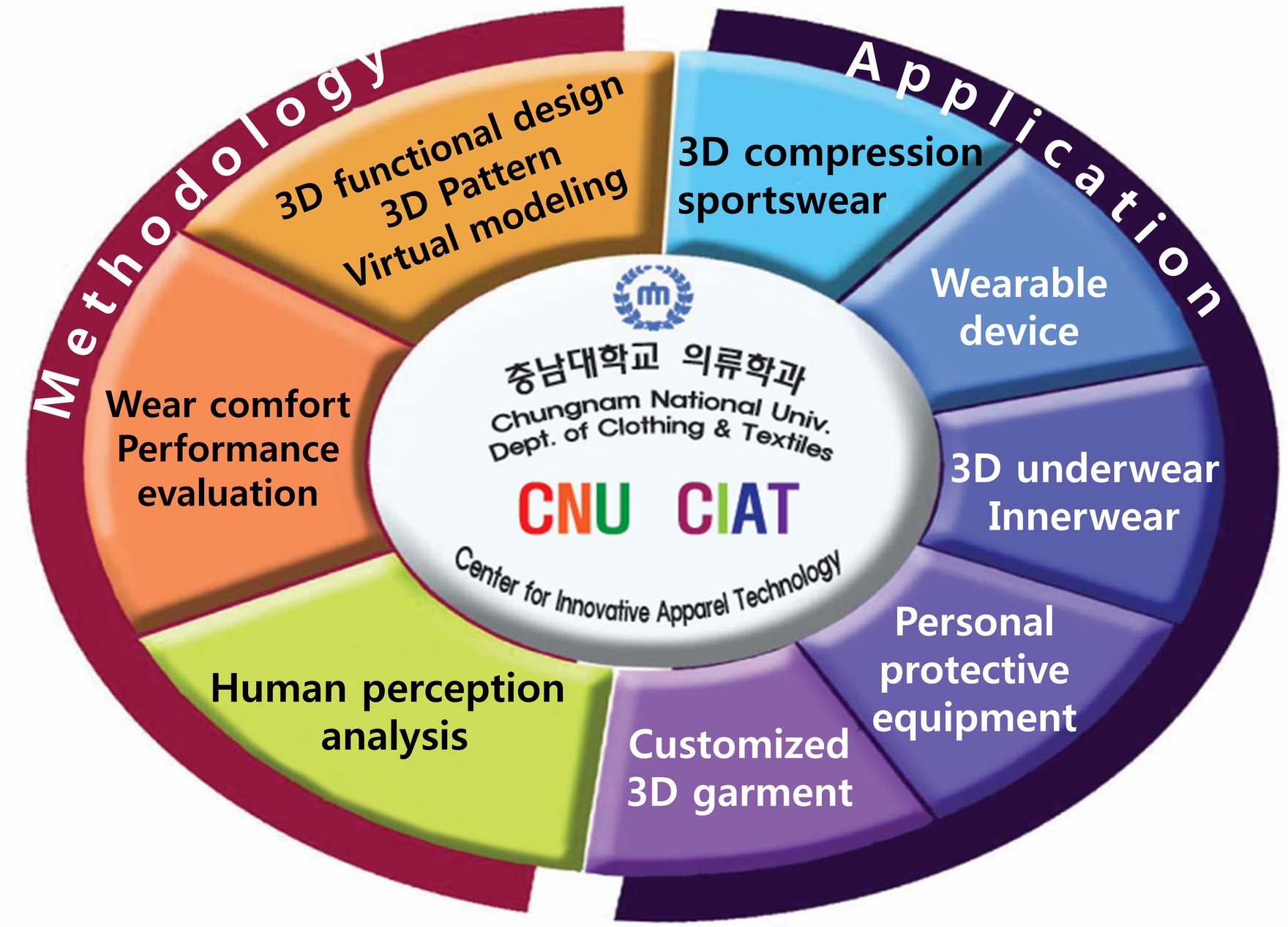
CIAT

Center for Innovative Apparel Technology



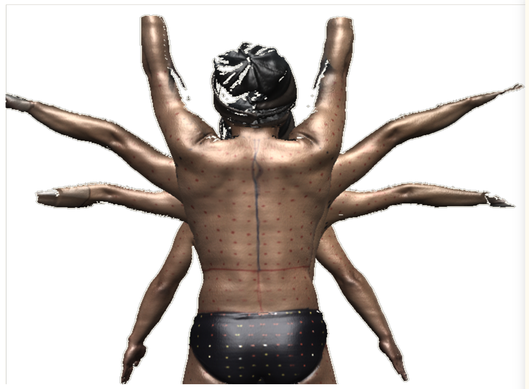
Clothing Comfort Lab : Prof. Kyunghi Hong (khhong@cnu.ac.kr)
Technical Pattern Engineering Lab : Prof. Yejin Lee(yejin@cnu.ac.kr)

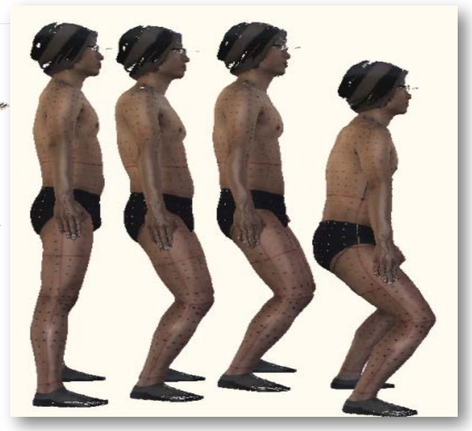
Chungnam National University
Department of Clothing and Textiles

3D Compression Sportswear

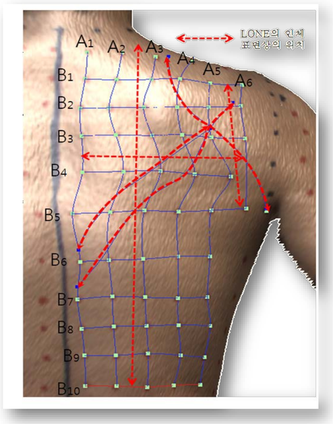
(Funded by the National Research Foundation of Korea)

3D human surface scan

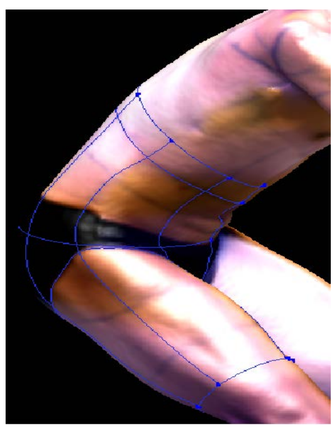


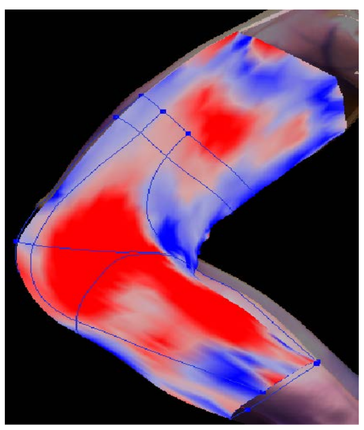


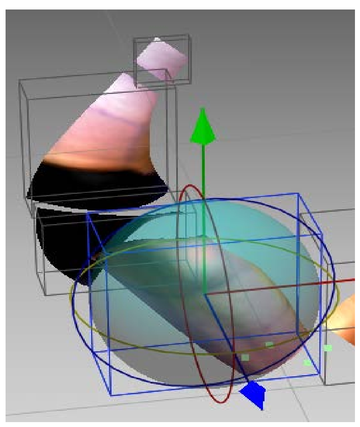
Skin deformation of various posture



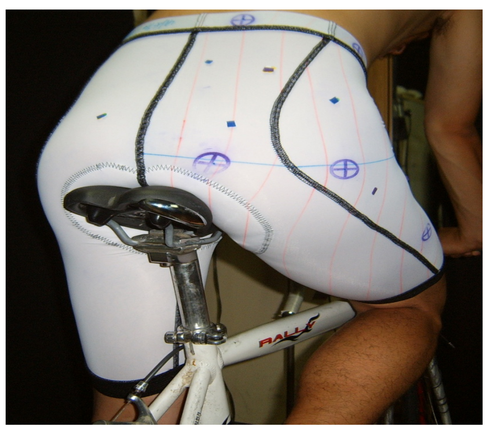
Analysis of skin deformation

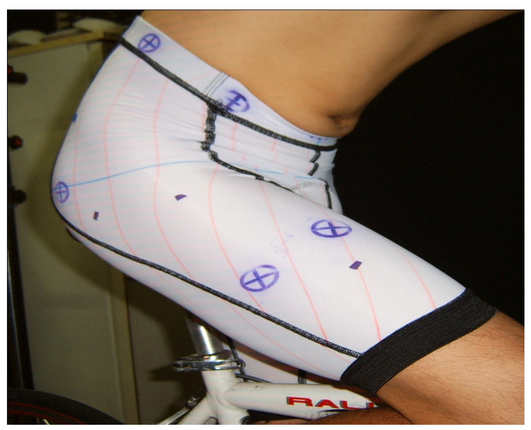




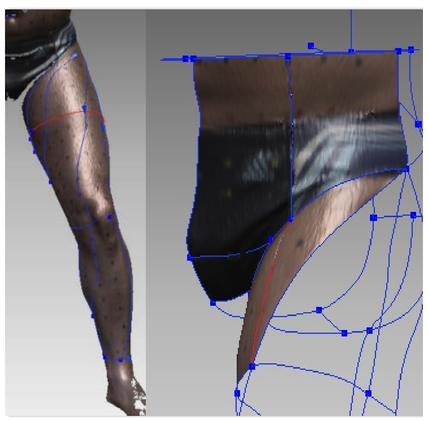


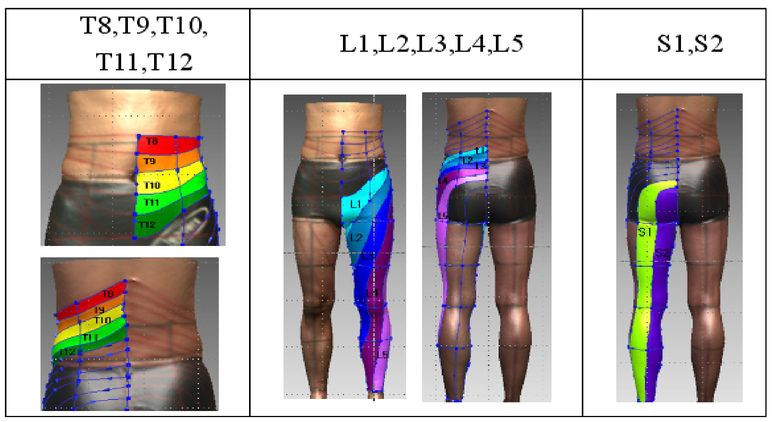
Body surface curvature analysis



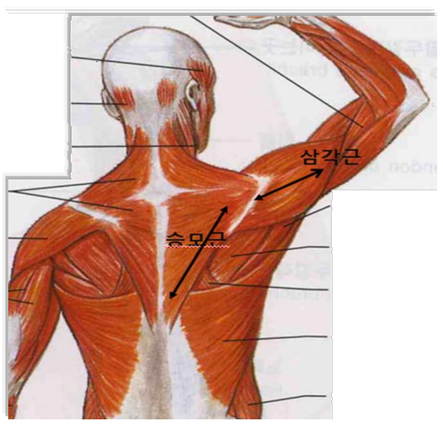


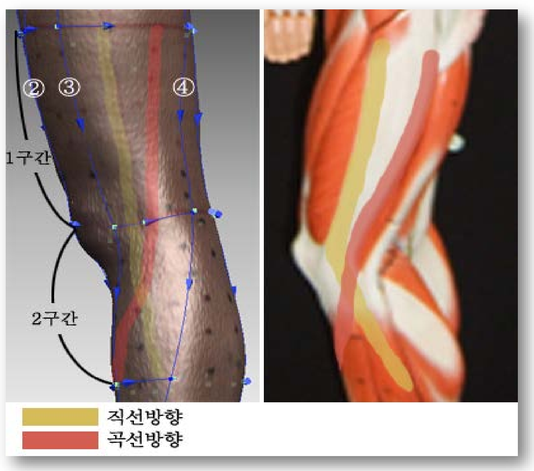
3D cycle pants design



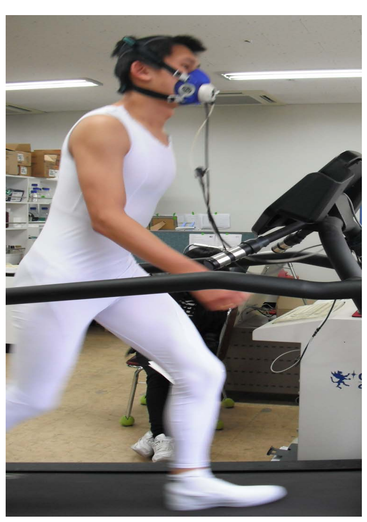


Dermatome analysis depending on knee joint angle





Anatomical analysis



Performance evaluation of functional sportswear

3D compression body-suit design

Commercialized 3D Sportswear

(Partly Funded by the Ministry of Trade, Industry and Energy)

3D Compression base layer for 30/40s Korean male
: LS Networks Co.

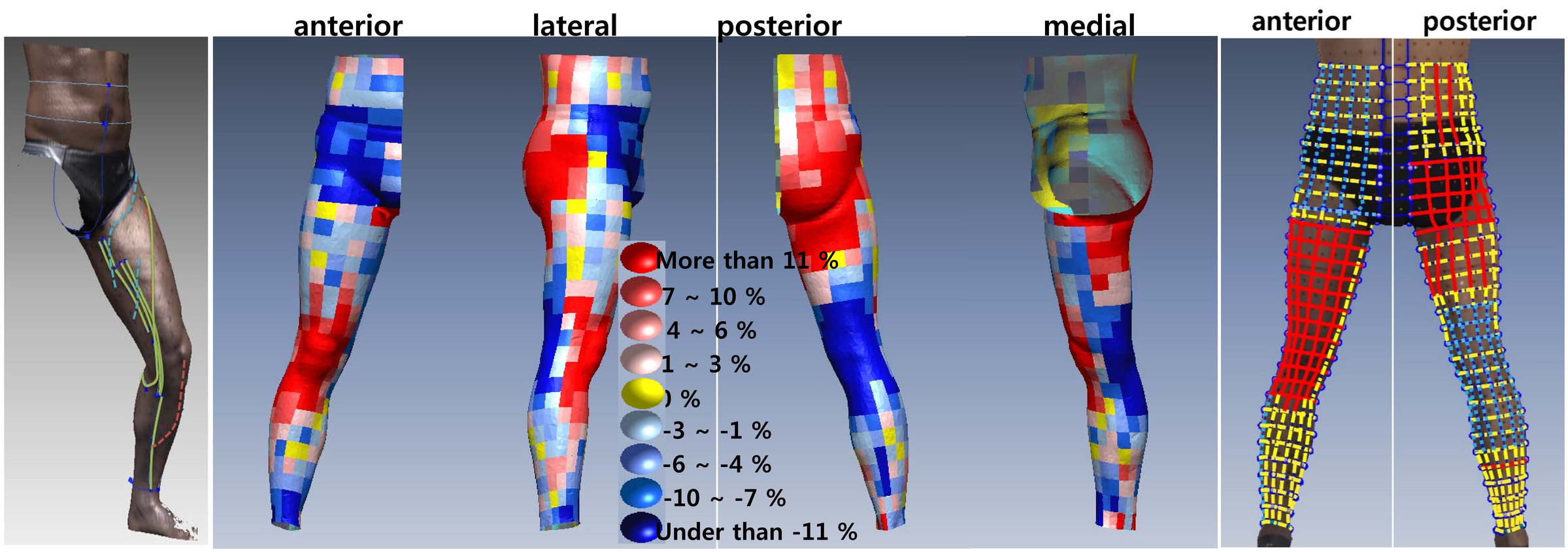
Functional 3D sports underwear
: Copyright ⓒ GOODPEOPLE

Technical base layer using 3D human mapping technology
: Copyright ⓒ GOODPEOPLE

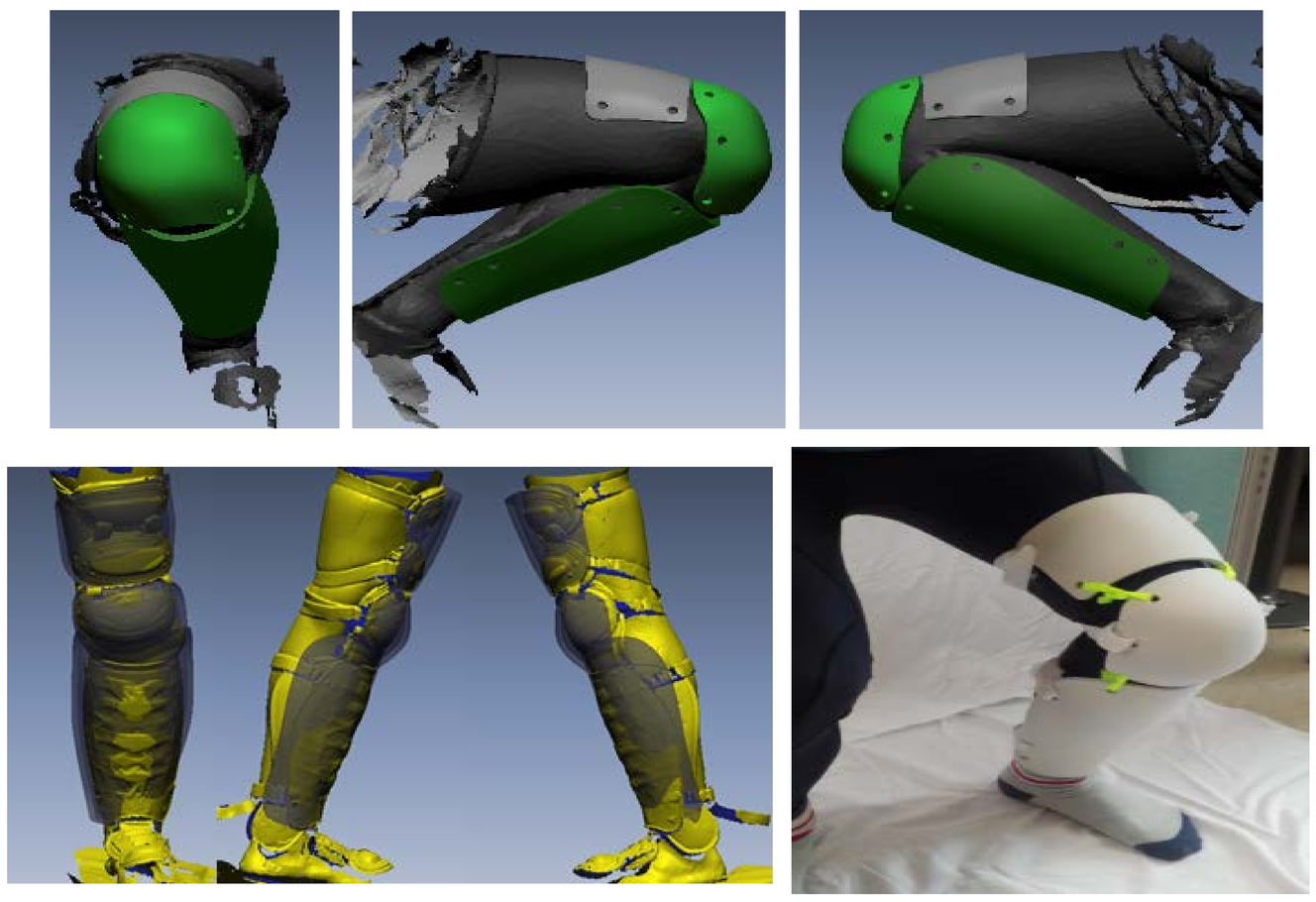
Ergonomic tracking wear for men and women
: SEJUNG CORPORATION

Human Body Skin Mapping & Protector

(Funded by the National Research Foundation of Korea)



3D Skin Length Deformation of Lower Body during Knee Joint Flexion for the Practical Application of Functional Sportswear(Choi & Hong, 2015. Applied Ergonomics, 48, 186-201)

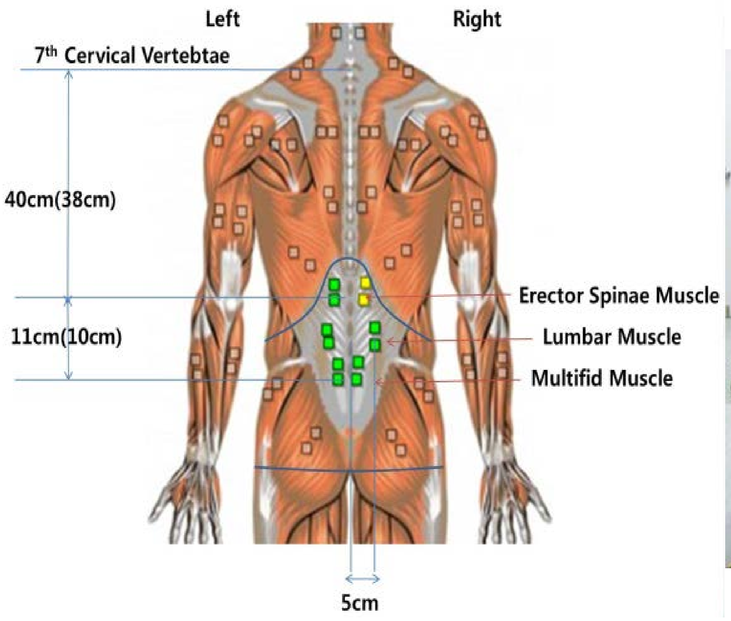


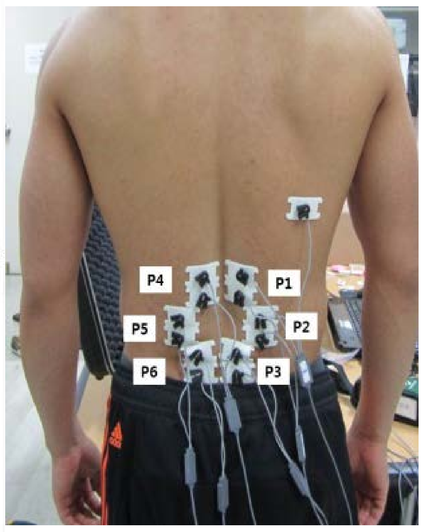
Optimum design solutions of safety leg guards based on biomechanics and skin-muscle deformation

Orthopedic Compression Garment

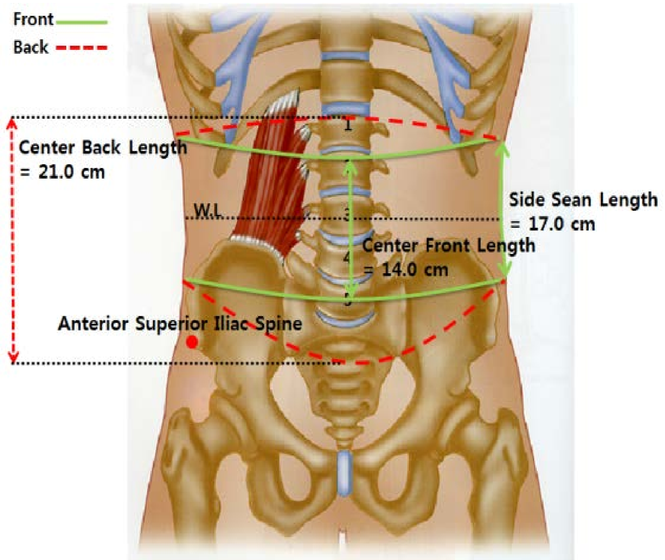
(Funded by the National Research Foundation of Korea)

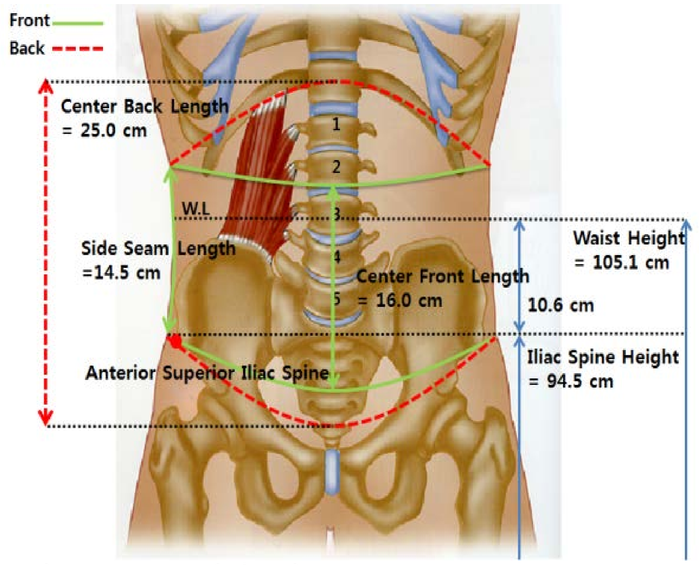
Development of compression garment of soft type for orthotherapy on low back pain and the improvement of asymmetric EMG (Kim & Hong, 2014. Korean Journal of Human Ecology, 23(4), 665-680)



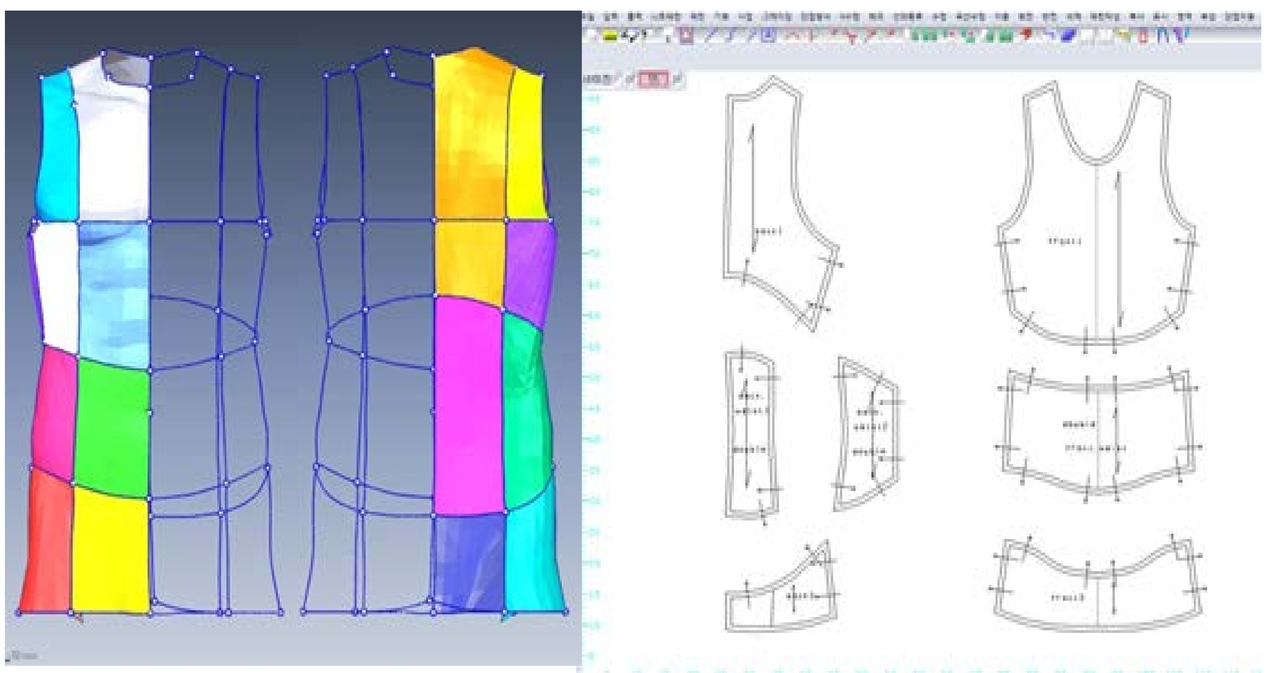


Six locations of electromyogram (EMG) sensors





Waist support belts pattern design considering anatomical configuration

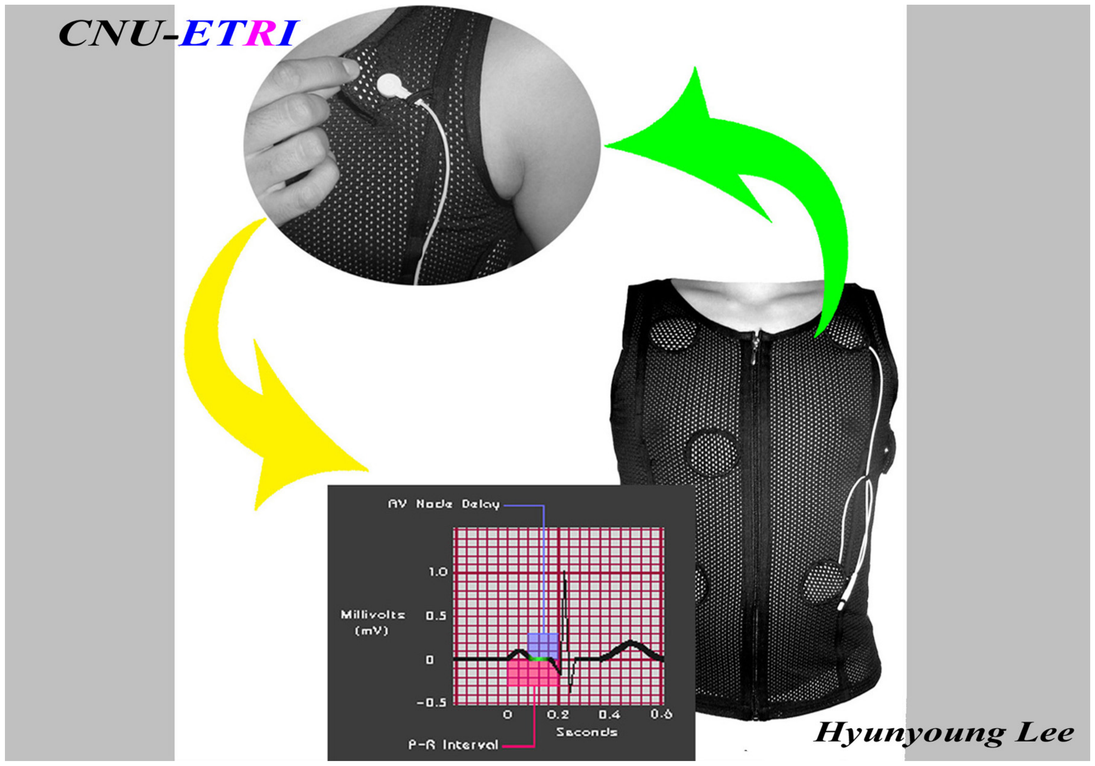


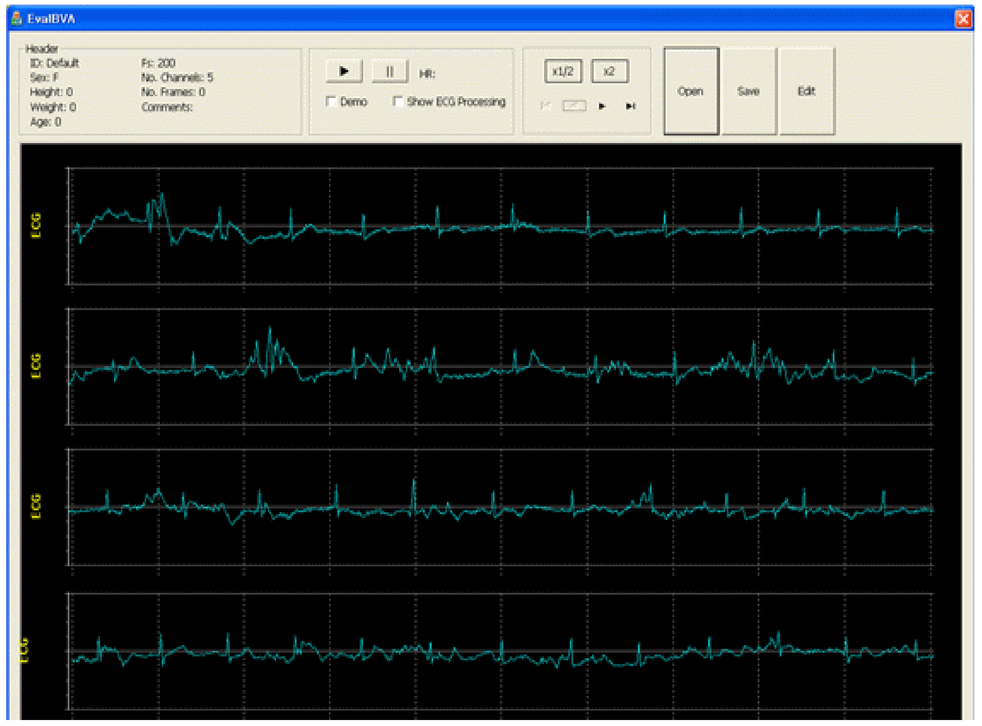
3D pattern design

Prototype of Orthopedic Compression Garment

Future Clothing as Wearable Devices

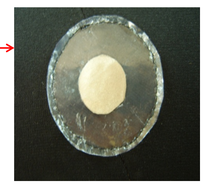
Bio-shirts with ETRI



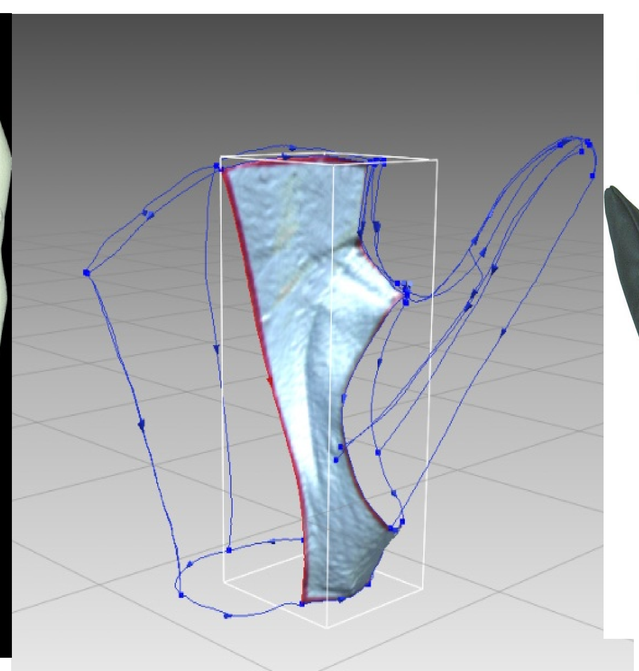


U-Healthcare clothing for silver generation

ECG monitoring dress with ETRI)

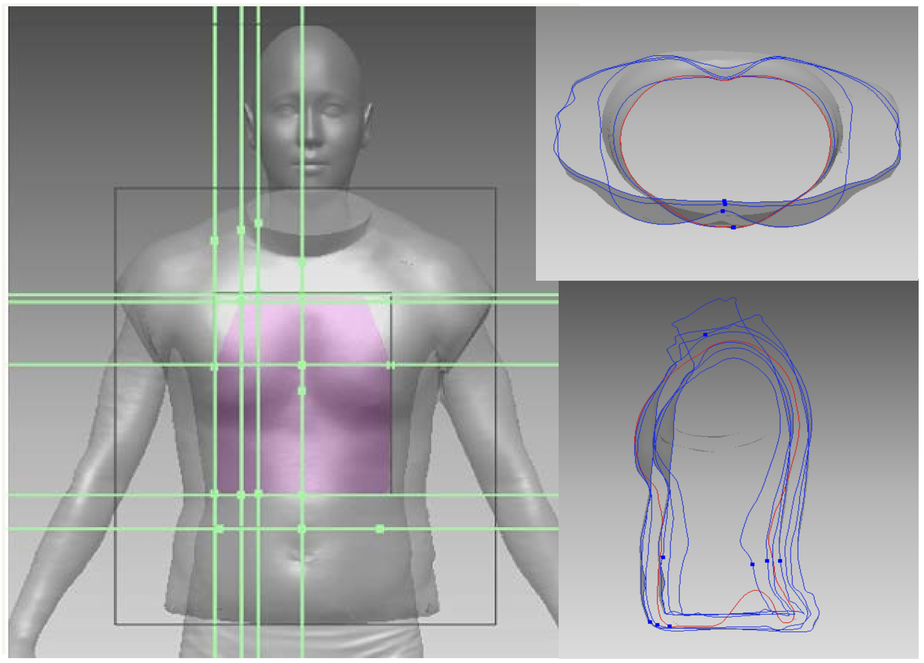


Haptic gloves

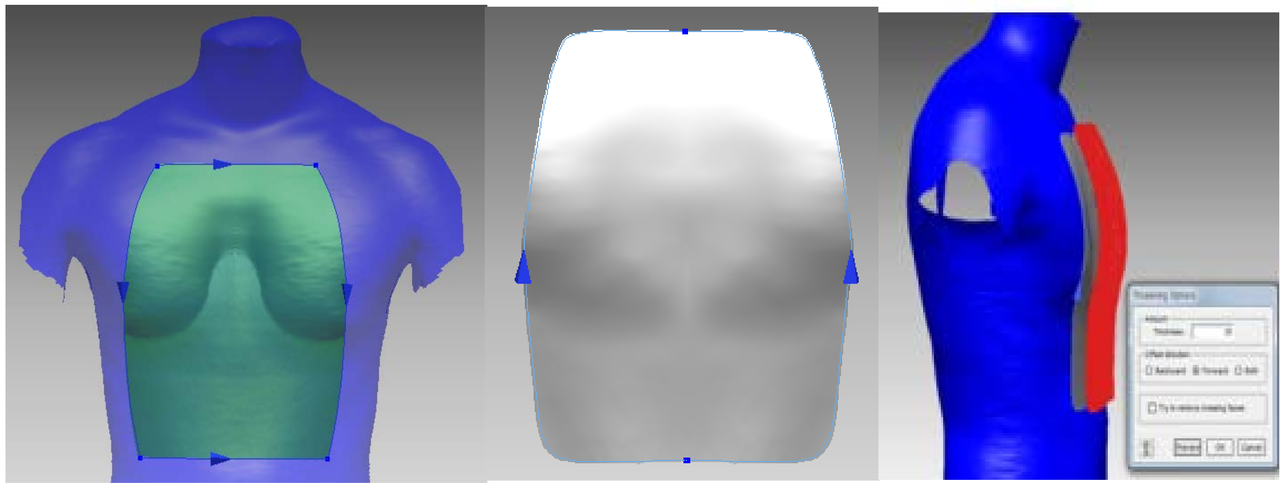


3D Body Armor

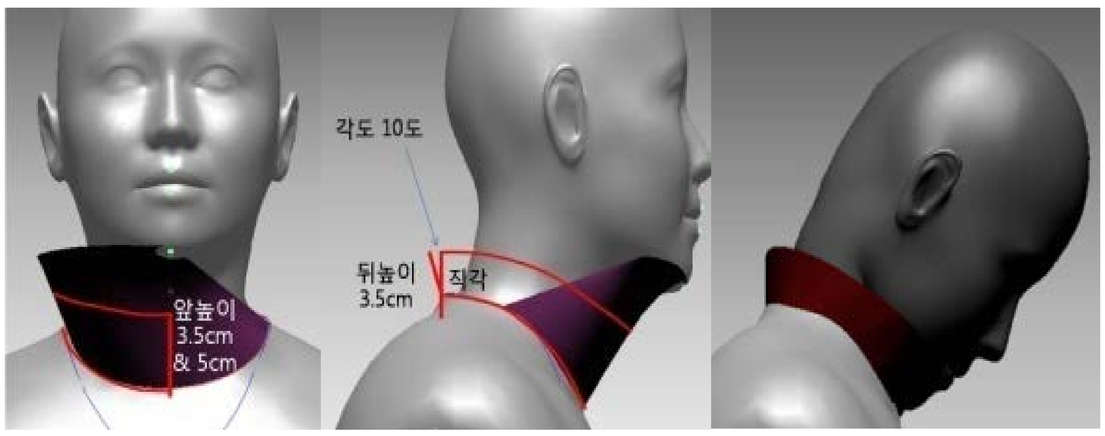
(Funded by the Ministry of Knowledge Economy)



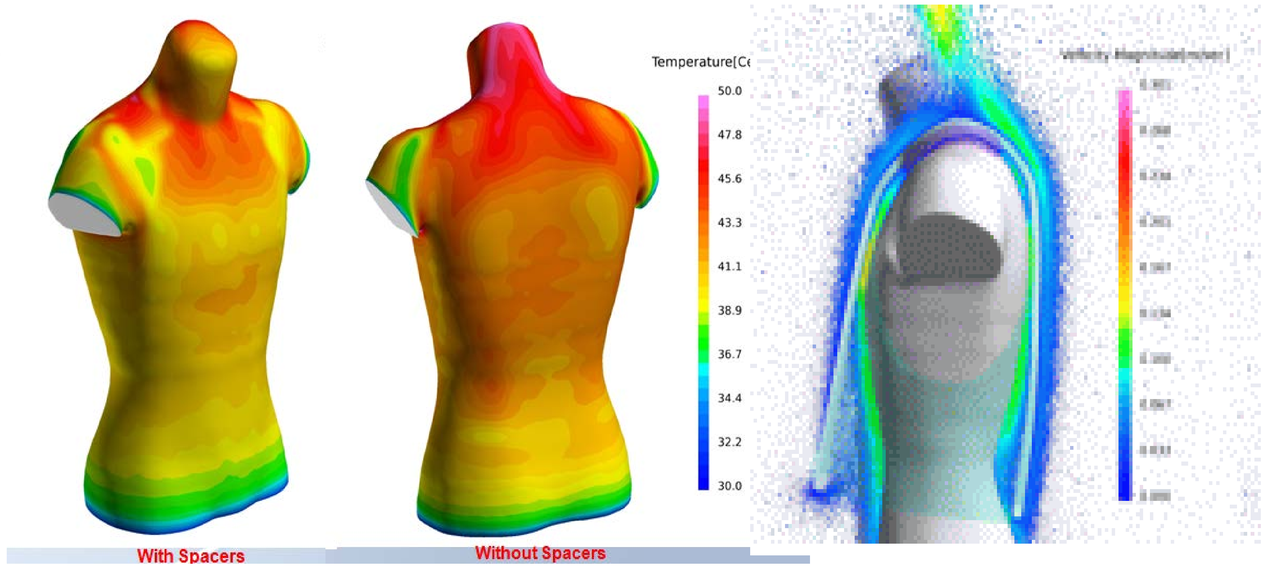
3D body armor pattern development using different thickness of ceramic plates & human body curvature



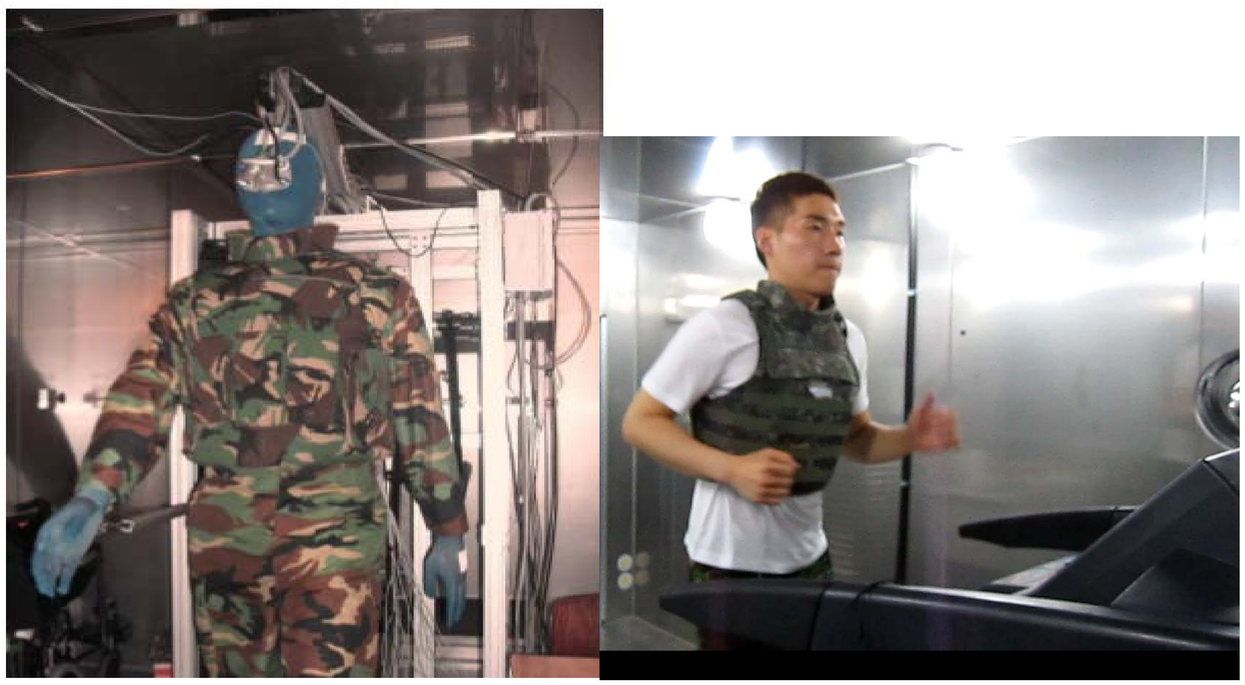
Development of Bullet proof ceramic plates using 3D scanned human shape & modeling program



3D body armor collar modeling considering neck movement



Result of CFD of skin temperature & convection with / without spacer



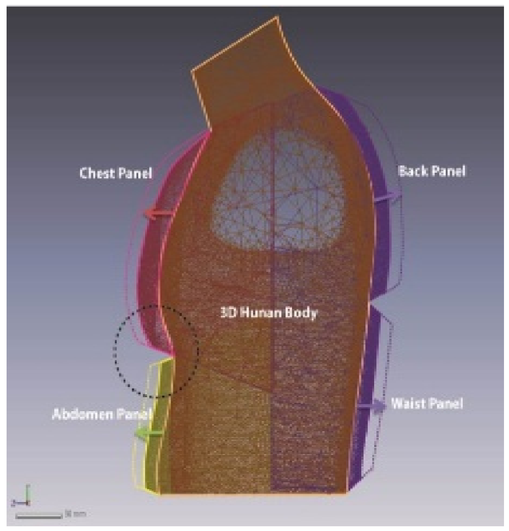
Subject wear test in the chamber

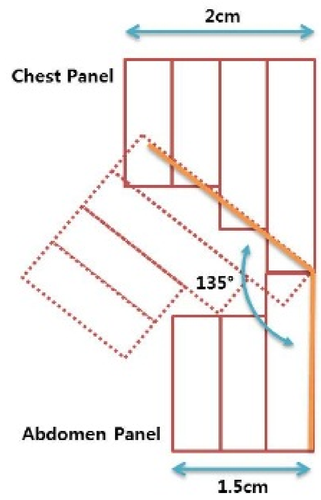
Safety test: pass (NIJ Standard Level ⅢA)

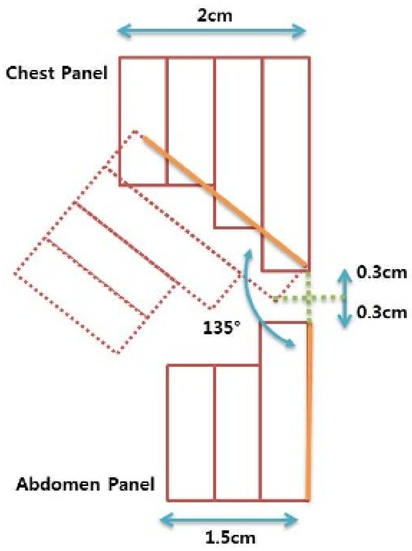
Development and performance evaluation of body armor for wear comfort. (Kim *et al.*, 2012. Journal of the Korean Society of Clothing and Textiles, 36(10), 1050-1057)

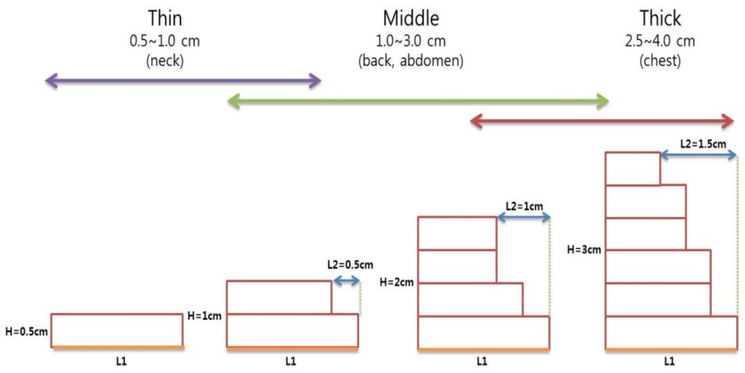
3D Life Jackets

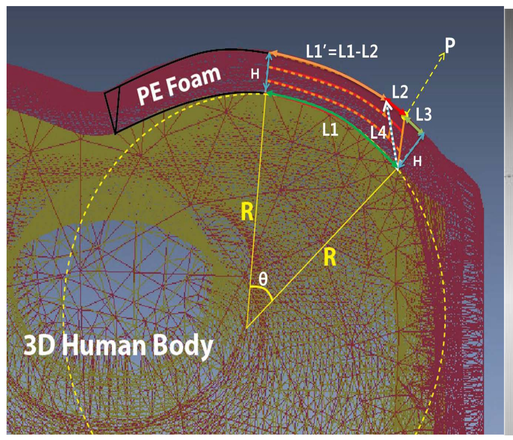
(Funded by the Ministry of Culture, Sports and Tourism)

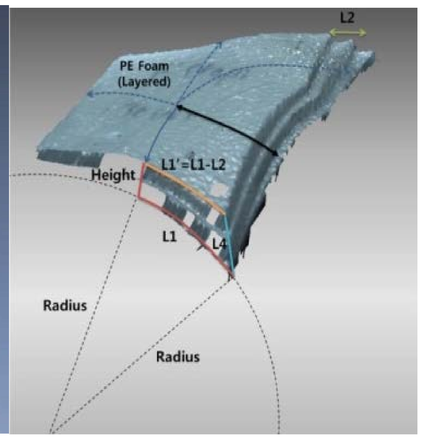








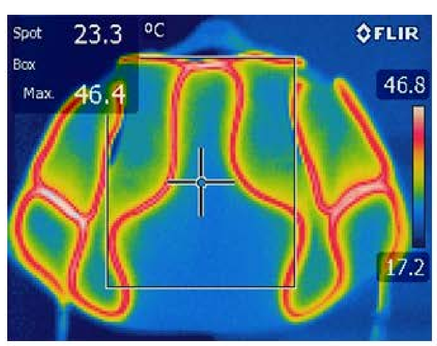




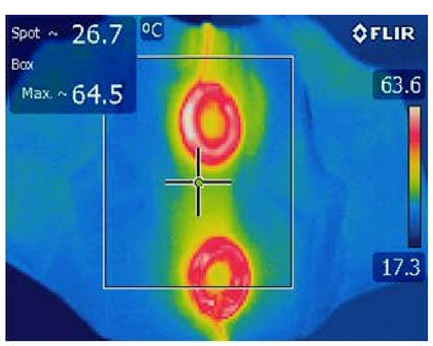
Use of three-dimensional technology to construct ergonomic patterns for a well-fitting life jacket of heterogeneous thickness (Kim *et al.*, 2015. Textile Research Journal, 85(8), 816-827)

Front Back Inside of the open jacket
(Line heating is attached by red tunnels)

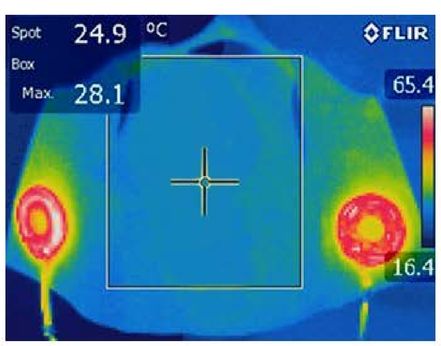
Layout of the Heating Element and Subjective Wear Comfort for the Life Jacket (2014, ECPC)



Type A: Line heating

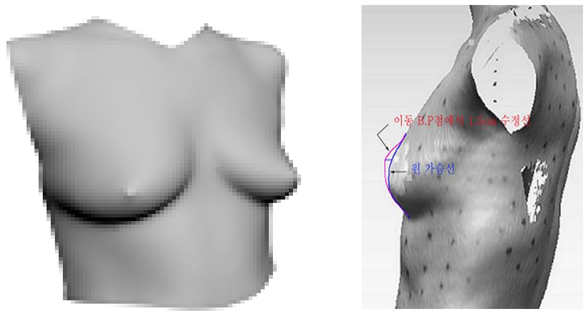


Type B: Areal heating (Center back)



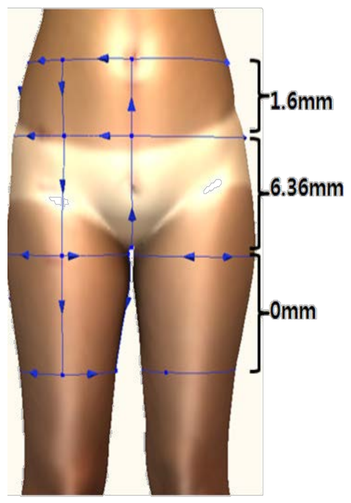
Type C: Areal heating (Abdomen)

Body Shaping & 3D Business pants



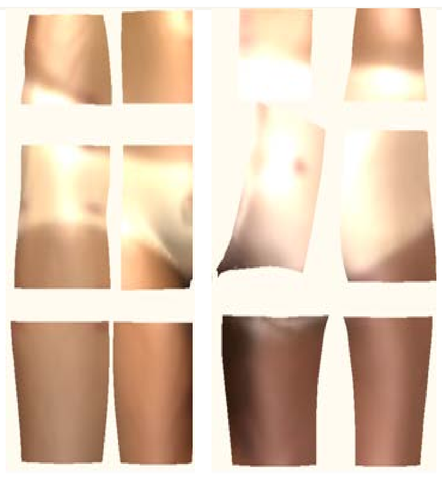
l breast pad development

Body shaping under garment for hip-up and volume-up

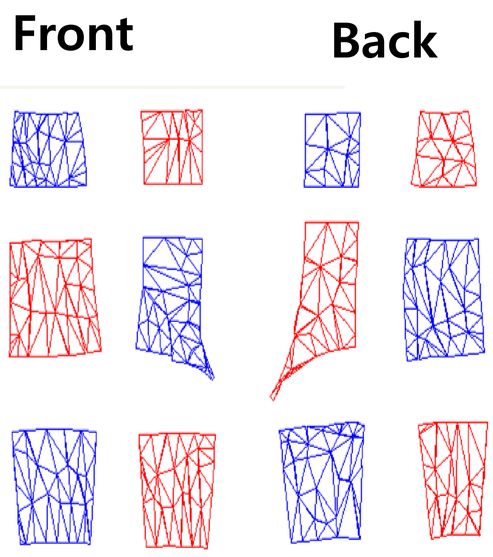


Before offset

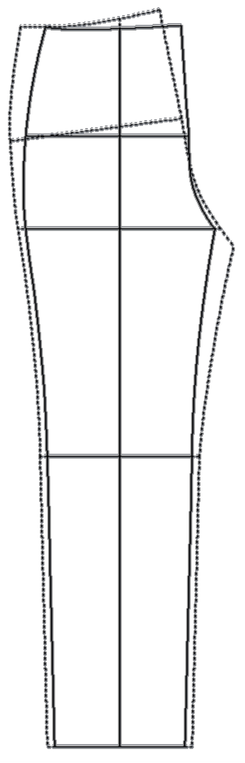
Offset depending on body function



- 2D development of body surface from 3D Offset data



Combining the pattern blocks

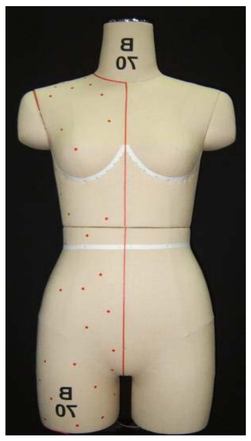
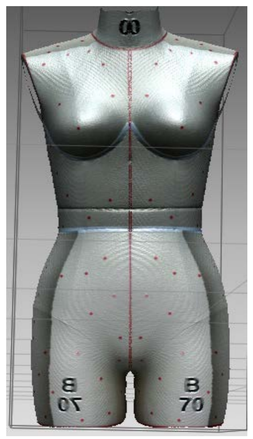
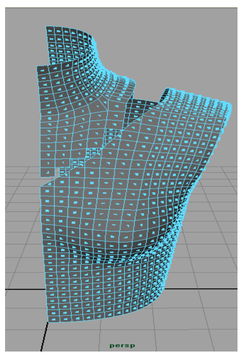
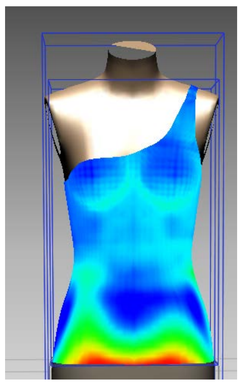
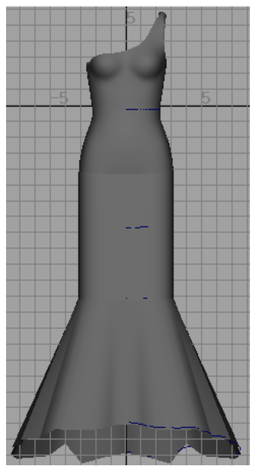
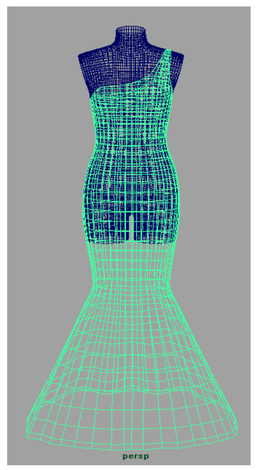
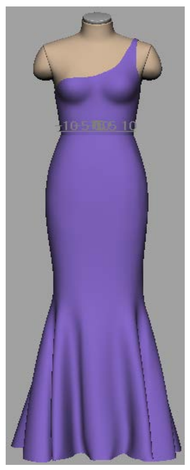
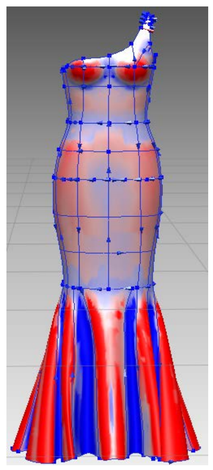
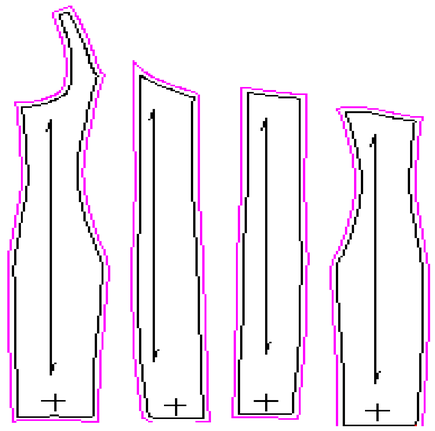


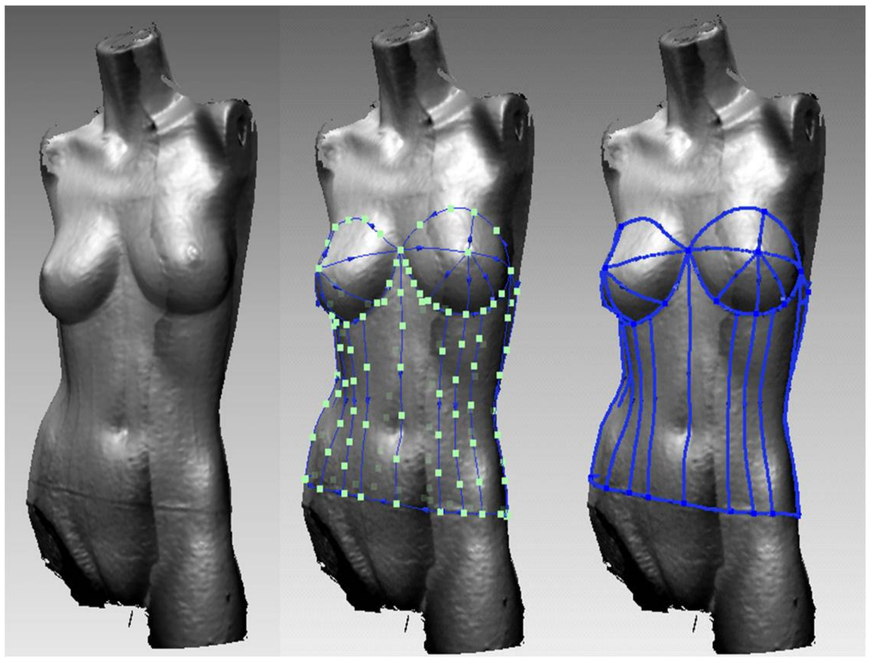
business pants by 3D body data

3D Customized Dress

(Funded by the National Research Foundation of Korea)

3DScan & Modeling	Dress Modeling	Dress Simulation	Dress Pattern making	Actual production & Verification
RapidForm	Maya/ RapidForm XOR	Maya/Clo	2C-AN & Yuka	

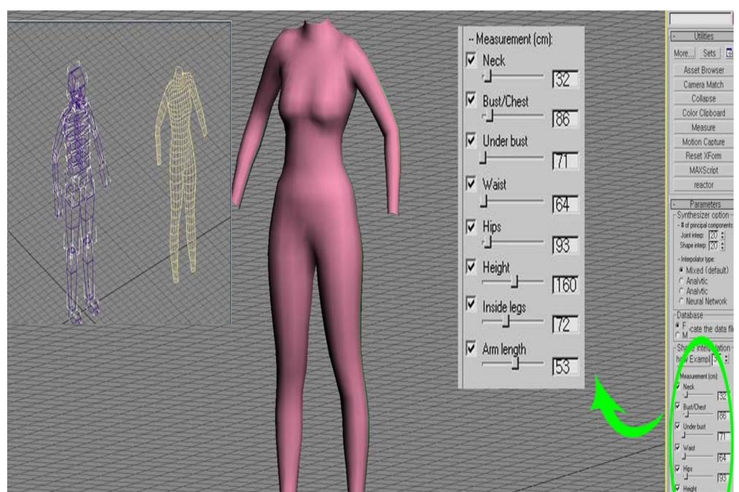












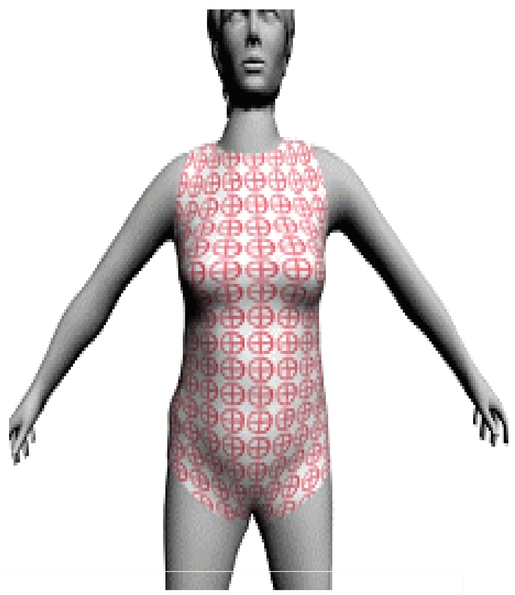

Virtual Clothing & Modeling

(Funded by the National Research Foundation of Korea)

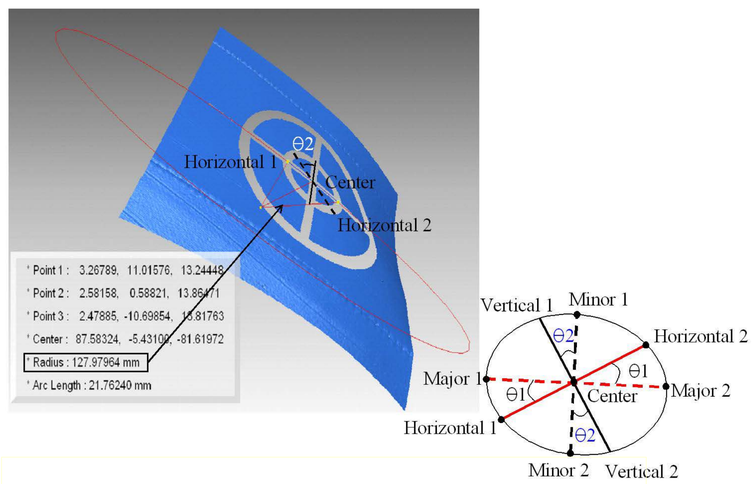
Pattern(DXF import) → Virtual Clothing System → Virtual Sample



Parameterized Human Body Modeling (Hyewon Seo,2004)

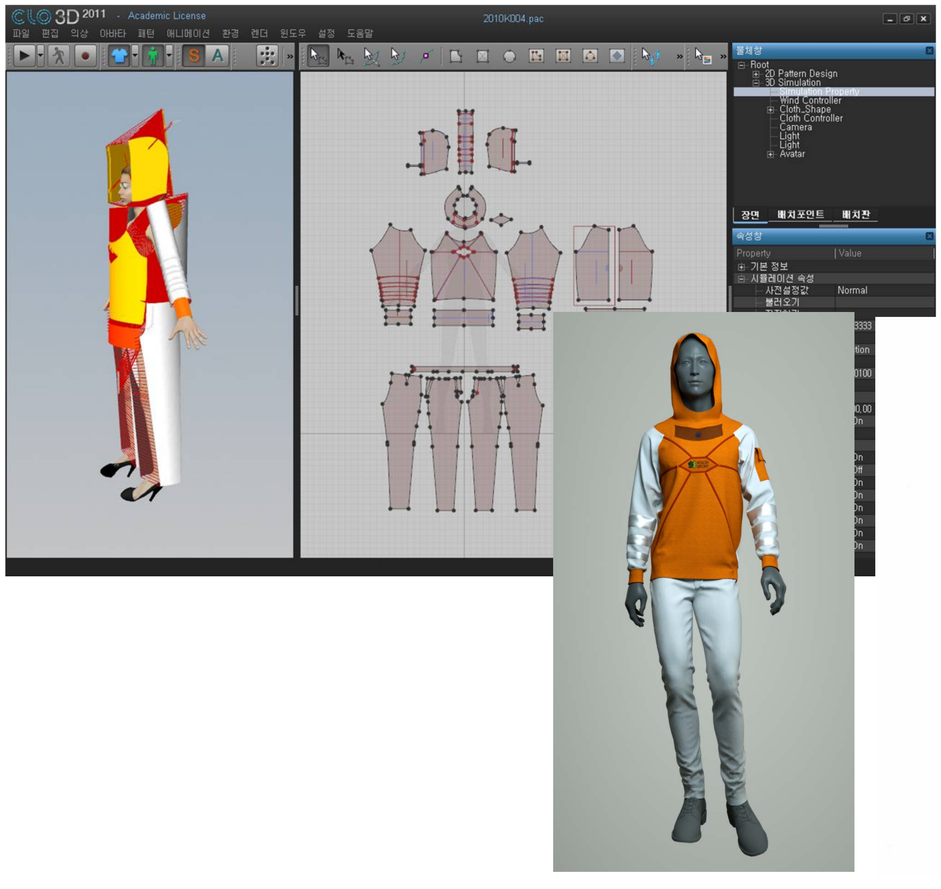


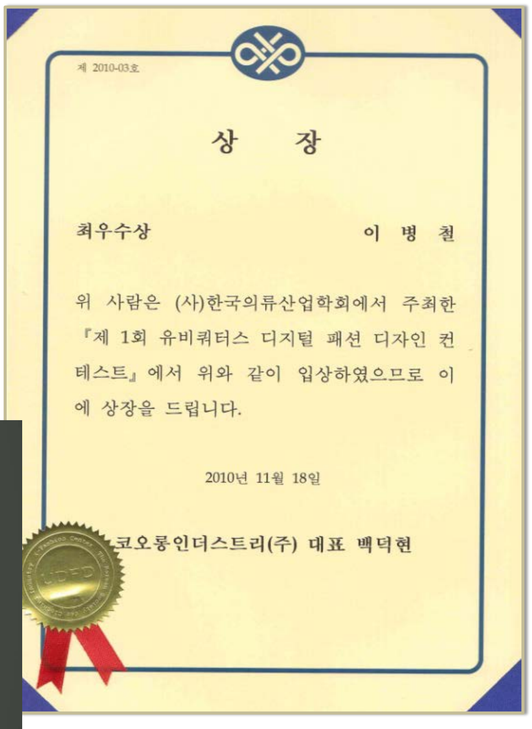
Pressure Simulation



Pressure Predicton

The 1st Ubiquitous design contest award





제 2010-03호

상 장

최우수상 이 병 철

위 사람은 (사)한국의류산업학회에서 주최한 『제 1회 유비쿼터스 디지털 패션 디자인 컨테스트』에서 위와 같이 입상하였으므로 이에 상장을 드립니다.

2010년 11월 18일

코오롱인더스트리(주) 대표 백덕현

Recent Projects

Funding		Title	Period
Private company R&D	ⓒ GOODPEOPLE	Development of multifunctional cool-wear improving moisture transport performance	2013.07.01 -2015.04.30
	ⓒ GOODPEOPLE	Development of functional sports underwear	2012.07.03 -2013.03.03
	LS Networks Co.	Development of compression base layer	2011.10.01 -2011.12.31
	SEJUNG CORPORATION	3D pattern development considering of human's S.O.U.L shape and body movements	2012.03.12 -2012.05.31
Korea Government	Ministry of Culture, Sports and Tourism	Development of life jacket for personal safety	2011.09.01 -2014.08.30
	Ministry of Trade, Industry and Energy	Development of the technical base layer of doing sportswear based on 3D human body mapping to enhance the safety during sporting activities	2013.06.01 -2014.05.31
	Ministry of Knowledge Economy	Optimized design of a ballistic vest to enhance wear comfort	2010.06.01 -2011.05.31
	National Research Foundation of Korea(NRF)	Engineering design guideline of compression suits for elite athlete using skin & muscle system and its effect on performance	2010.05.01 -2013.04.30
		The effect of 3D micro-structure of a fabric surface on the microclimate and heat transfer mechanism of a garment	2010.05.01 -2012.04.30
		Optimum design solutions of safety leg guards upon consideration of sports biomechanics and skin-muscle deformation	2013.06.01 -2016.05.31

Patents

Date	No	Title
2014.12.07	10-1473115	3D pants pattern development using differential offset methods of 3D human body and crotch point determination in sagittal plane
2014.06.16	10-1410629	3D functional underwear and method thereof considering 4D deformation of body surface
2014.04.18	10-2014-0046820	Functional upper garment
2014.04.18	10-2014-0046821	Functional lower garment
2013.12.17	10-1344238	Flotation gear using lines of non-extension and method having the same
2013.07.25	30-2013-0038573	Life jacket for children
2013.07.25	30-2013-0038574	Swimsuit for children
2013.07.03	10-1283917	Bullet proof vest enhanced thermal comfort
2012.10.11	10-2012-0113148	3D Pattern considering shape and motion of S. O. U. L portion for human body
2012.05.25	10-2012-0055790	Flotation gear using lines of non-extension and method having the same
2012.05.25	PCT/KR2012/004163	Flotation gear using lines of non-extension and method having the same
2012.01.11	10-1107182	Full-body haptic suit
2011.07.05	10-2011-0066529	Bulletproof vest enhanced thermal comfort
2011.06.30	10-2011-0065015	Customized ceramic bullet-proof insert using 3D design and a manufacturing method thereof
2011.06.02	10-1040130	Method for detecting skin lines of non-extension

Patents

Date	No	Title
2009.11.26	10-2009-0115130	Method for detecting skin lines of non-extension
2009.10.01	10-2009-0093878	Full-body haptic suit
2007.10.09	10-2007-0836853	Design method of fit clothes using pattern making from 3-dimensional curved surface to 2-dimensional plane
2007.07.19	10-2006-0022848	Prediction of the clothing pressure based on 3D shape deformation and mechanical properties of fabrics
2007.10.09	10-0767278-0000	Design method of fit Clothes using pattern making from3-dimensional curved surface to 2-dimensional plane
2007.09.12	10-0759948-0000	Garment apparatus for measuring physiological signal
2007.07.19	10-0742573-0000	Prediction of the clothing pressure based on 3D shape deformation and mechanical properties of fabrics
2006.07.06	11/481.611	Garment for measuring physiological signal
2007.06.27	10-0734986-0000	Garment for physiological signal measurement
2006.03.10	10-2006-0022848	Prediction of the clothing pressure based on 3D shape deformation and mechanical properties of fabrics
2006.02.14	10-0553844-0000	System for the selection of brassieres depending on breast types, and method thereof
2005.04.15	10-2005-0031438	Prediction of the clothing pressure based on 3D shape deformation and mechanical properties of fabrics
2004.04.10	10-0428487-0000	A manufacturing method thereof brassiere using 3-d measurement and brassiere thereof

Recent Publications

Year	Titles (KCI)	ISSN	vol.	no.	page
2012	2D pattern development of body surface from 3D human scan data using standing and cycling postures	1226-0851	21	5	975
	Engineering design process of tight-fit sportswear using 3D information of dermatomes and skin deformation in dynamic posture	1226-0851	21	3	551
	Development and performance evaluation of body armor for wear comfort enhancement	1738-4524	36	10	1050
2013	Clothing pressure evaluation of girdle and waist nipper and related wearing conditions	1226-8593	16	1	1
2014	Thermal insulation analysis of man's vest in terms of fit and armhole depth	1226-1289	21	2	145
	A study on based on the possibility of quantitative analysis using virtual clothing simulation according to raglan sleeve pattern types	1226-0851	21	2	299
	Effects of 3D compression suits on EEG analysis during and after walking	1225-1151	38	4	440
	Development of compression garment of soft type for orthotherapy on low back pain and the improvement of asymmetric EMG	1226-0851	23	4	665
	Upper back somatotype analysis for development of Hanbok Jeogori pattern of female in late 20s	1226-0851	23	5	891
	Effects of local body heating and cooling on thermogram analysis of the extremity with hot pack	1226-0851	23	6	1205
2015	Selection and design of functional area of compression garment for improvement in knee protection	1226-0851	24	1	97
	Analysis of wearing propensities, wearing comfort, mobility of movement, and 3D shape for advanced baseball leg guards design	1738-4524	39	1	63

Year	Titles (SCI & SCIE)	Publisher		ISSN	vol.	no.	page
2013	Estimating dynamic skin tension lines in vivo using 3D scans	Computer-Aided Design	SCI	0010-4485	45	2	551
	Effects of fit on pressure distribution and momentum of ballistic body armor vest in jump	Textile Research Journal	SCI	0040-5175	83	00	1514
	Development of indirect method for clothing pressure measurement using three-dimensional imaging	Textile Research Journal	SCI	0040-5175	83	15	1594
	Ergonomic mapping of skin deformation in dynamic postures to provide fundamental data for functional design lines of outdoor pants	Fibers and Polymers	SCIE	2197-2201	14	12	2197
2015	3D skin length deformation of lower body during knee joint flexion for the practical application of functional sportswear	Applied Ergonomics	SCI	0003-6870	48		186-201
	Use of three-dimensional technology to construct ergonomic patterns for a well-fitting lifejacket of heterogeneous thickness	Textile Research Journal	SCI	0040-515	85	8	816-827