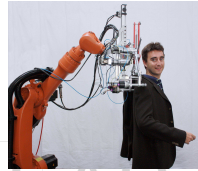


COVER PAGE

#### Acknowledgements



**Disclaimer**  
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[www.leapfrog-eu.org](http://www.leapfrog-eu.org)

#### Innovative Fabric Preparation



#### Automated Garment Manufacturing



#### Virtual Garment Prototyping

#### The extended Smart Garment Organisation

LEAPFROG

- Automated Interliners Assembly
- Fabric Stiffening Agents
- Stimuli Sensitive Polymers
- Shape Memory Polymers
- Reconfigurable robotic handling device
- Cutting table with automatic unloading
- Intelligent transportation system
- Visual Motion Planner
- Adjustable mould
- Reconfigurable mould
- Material property prediction
- Self-optimising Virtual Platform
- Virtual Tools
- 3D garment design and 3D measuring software
- Smart Network Modelling
- Product Tracking System
- Enter @ Work
- Web Service Integration Framework
- Knowledge Exchange Infrastructure
- The LEAPFROG Project

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#### Overview of final project results

The LEAPFROG Integrated Project was undertaken to develop concepts and technologies which would radically modernize and ultimately transform the clothing sector into a demand-driven, knowledge-based, high-tech industry. Coordinated by EURATEX and with the support of the European Commission's 6th Research Framework Programme, the 37 partners International Consortium has exploited recent advances in a broad area of scientific-technological fields ranging particularly:

- nanotechnology and polymeric material science,
- robotics and innovative fabric joining techniques,
- 3D computer graphics and animation
- e-business and management research.

The LEAPFROG research and development work has reached a number of its objectives to develop radically innovative technological and organisational solutions for the (textile &) clothing business of the 21st Century.

It has the potential to lead to an innovation and new business development cycle involving a great number of textile, clothing, machinery and service companies in Europe.

Several results will be available for commercial exploitation shortly after the project conclusion, others require additional research to realize their full innovation potential and to bring them in the form of proven technology into industrial application.

This brochure provides a quick overview on some of the major results achieved in the project's four Research Areas namely: Innovative Fabric Preparation, Automated Clothing Production, Virtual Prototyping and smart enterprise networking and supply chain integration. More details and information on additional results can be obtained directly from the provided points of contact or the project's website [www.leapfrog-eu.org](http://www.leapfrog-eu.org)

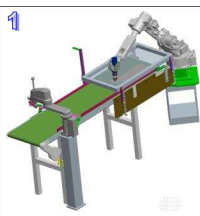
[www.leapfrog-eu.org](http://www.leapfrog-eu.org)

#### LEAPFROG Innovative Fabric Preparation

##### Automatic Interliners Assembling

It is an automated joining method and equipment for the attachment of interlining fabrics to the outer fabric layer.  
It is an innovative fusing methodology for the interlinings and the outer fabrics developed to provide greater flexibility in the design of garments and a higher degree of automation.

The final goal is to overcome the limits of current interliner application, by applying innovative laser welding technologies.  
Contacts: D'Appolonia, Tanya Scalia tanya.scalia@dappolonia.it; TWI, Ian Jones ian.jones@twi.co.uk

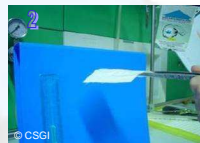


##### Stiffening Agents

Permanent stiffening agents are chemicals applied in garments production to simplify the manufacturing process and reduce the number of parts to be sewn.

With further research, they lead to significant improvements in the manufacturing process, fabrics handling and assembling.  
Permanent stiffening allows maintaining a pre-defined shape (e.g. in plastron and shoulders). Stiffening agents effects were analyzed through Fabric Assurance by Simple Testing (FAST).

Contacts: CSGI, Pierandrea Lo Nostro pln@csgi.unifi.it; CITEVE, Lúcia Rodrigues L.Rodrigues@citeve.pt



#### LEAPFROG Innovative Fabric Preparation

##### Stimuli Sensitive Polymers

Stimuli sensitive polymer is synthetic material developed for use in the textile-garment manufacturing process.  
Such polymer and the associated fibers developed for textile applications offer active shaping properties to the fabric and yarn processing capability.  
The polymer produces innovative yarns bobbins with a significant continuous length of monofilament.

Contacts: UCAM, Eugene Terentjev emt1000@cam.ac.uk; Centexbel, Geert Hebbrecht Geert.Hebbrecht@centexbel.be



##### Shape Memory Fabrics

Is a woven fabric samples based on stimuli sensitive polymers.

The fabric overcomes the current capacities of textile construction and actuation, particularly in comparison with common practice in yarn spinning.  
The innovation allows the use of active material in textile applications, particularly to achieve 3D mouldable fabric.

Contact: GZE, Filippo Paglia [leapfrog@gzespace.com](mailto:leapfrog@gzespace.com)



**EAP FROG Automated Garment Manufacturing**

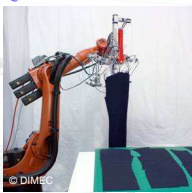
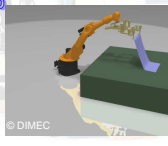
**Reconfigurable robotic handling devices**

Technology for automated handling of cut fabric parts in garment manufacturing use to collect fabrics from flat surfaces and deliver them to following production steps. The robotic hand grasps textiles and makes them to a special hanger, the group hand-hanger reconfigures positioning the hanger clamps to desired points on the fabric part, picks the part and connects to the hanger. The robotic hand embeds high-flow vacuum picking modules with micro-compressors onboard. Fabric parts are grasped and handled by multi-functional fingers. Fabric porosity is not a problem as for other vacuum systems. Clamps are actuated using SMA.

Contact: University of Genoa PMARlab, Rezia Molino, [rezi@mimc.unige.it](mailto:rezi@mimc.unige.it)

**Cutting table automatic unloading**

Is a possible cutting table of the future, a system based on robotized grippers grasping cut fabrics from a cutting table. The robot is integrated with the cutting table, knowing the cut parts exact position and manufacturing steps. It takes decisions on what parts are to be collected and where have to be delivered. The system integrates Leapfrog innovations allowing automatic unloading of the fabric parts from the cutting table. It replaces a time consuming operation which is today done manually and achieve accurate handling of firm fabrics. The system allows fabric automatic processing to the following garment manufacturing sections in the company. Lectra: Philippe Bousquet CAM Solutions R&D Manager, [p.bousquet@lectra.com](mailto:p.bousquet@lectra.com); University of Genoa PMARlab, Rezia Molino, [molino@mimc.unige.it](mailto:molino@mimc.unige.it)


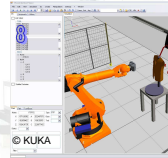
**EAP FROG Automated Garment Manufacturing**

**Intelligent transportation system**

An overhead intelligent transportation system fitted to carry garments or parts of garments in the automated clothing factory. It is an intelligent trolley, always knowing its position and receiving commands through a radio link, according to the commands received the trolley is able to move from one position to another one quickly and with a high degree of precision. Innovative features include: an intelligent motion controller embedded in very limited dimensions; a newly generated compact power drive, a high performance motor with permanent magnets synchronous; use of the ZigBee technologies which ensures very safe communication; use of RFID tags which allows certain identification of items carried by the trolley. Contact: ROBOS SPA, Roberto Montorsi [r.montorsi@robos.it](mailto:r.montorsi@robos.it)

**Visual Motion Planner**

The Visual Motion Planner (VMP) is a software package to generate executable robot programs for path guided processes "at the push of a button". In LEAPFROG VMP is used for sewing of garments. Robotic sewing applications today require expensive "teach-in" of the garment's seam. The new software VMP creates robot programs automatically by combining CAD data of garments with templates of robot programs. Following "virtual testing", these programs are transferred to and executed by the robot. Three special features are enabled by the VMP: 1) from CAD to robot program "at the push of a button"; 2) "easy to use" even for unskilled operators; 3) easy to implement" of new functionality due to Plug-In-structure. Contact: KUKA InnoTec GmbH, Claus-Peter Eberhardt, [ClausPeter.Eberhardt@kuka.de](mailto:ClausPeter.Eberhardt@kuka.de)


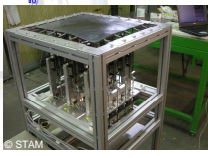
**EAP FROG Automated Garment Manufacturing**

**Adjustable Mould**

The Adjustable Mould is a vertical mannequin-like engineered structure designed to firmly hold textile cut parts allowing for their automatic sewing by a robot-guided sewing machine. The Adjustable Mould is able to automatically adapt its dimensions according to the size or shape of the piece to be sewn based on CAD data input. The prototype developed in the project is designed to support the automatic sewing of jackets. The Adjustable Mould is a key component of a complete system for the realisation of fully automatic sewing operations of garments by means of a robot-guided sewing machine freely movable in 3 dimensions and support tools able to place and hold fabric pieces accurately and firmly in the 3-dimensional shape of the final product. Adjustable Mould: Moli, Philippe Moli, [pm@moli-nanotechnology.de](mailto:pm@moli-nanotechnology.de) AM actuators engineering: D'Appolonia, Andrea Pestarino [andrea.pestarino@dappolonia.it](mailto:andrea.pestarino@dappolonia.it)

**Reconfigurable Mould**

The Reconfigurable Mould is working table made of a matrix of pin elements, assembled on actuators and connected to a membrane, able to reproduce the 3D shape of textile panels. The Reconfigurable Mould reproduces in real time the 3D shape of the fabric panels, enabling clamping in the proper position and without creasing in order to help the joining process. The main innovation consists in the membrane on top of the system and the architecture of the pins head, which enable to reproduce the 3D shape of textile panels, clamping them in the proper position without creasing, to help their joining process. Contact: STAM Srl, Roberto Landi, [r.landi@stamtech.com](mailto:r.landi@stamtech.com)

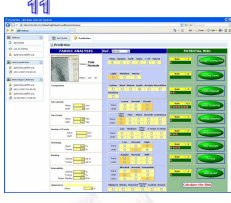

**EAP FROG Virtual Garment Prototyping**

**Manufacturability prediction**

The manufacturability prediction tool is an application based on a large fabric library including the analysis of different types of materials completed by a decision making tool to predict the fabric behaviour. The tool major functions allow: identifying and measuring the fabric mechanical properties; modelling of multi-layered materials; identifying variables able to represent the behaviour of simulated garments; create fabrics' behavioural models, to select materials according to a behaviour expectation. The Manufacturability prediction is available as a web-service for use in the early cloth design stages. It enables a better selection of the fabrics based on the prediction of their behaviour such as draping, manufacturing and use. Contacts: IFTH Eric Boudon [eboudon@ifth.org](mailto:eboudon@ifth.org); Hohenstein Martin Rupp [m.rupp@hohenstein.de](mailto:m.rupp@hohenstein.de)

**CVP – Collaborative Virtual Platform**

Web platform enabling online collaboration between all actors involved in the design/prototyping phase of a new collection (product manager, designers, modelists, marketing personnel). It enables integration of remotely located 3D CAD systems, fabric libraries, 2D CAD/CAM systems for the exchange of multimedia content (2D patterns, fabric data, etc). Includes facilities, such as virtual meetings and online showrooms. E-collaboration combined with virtual prototyping can lead to 60% reduction of design and prototyping time, as well as up to 75% reduction of the number of physical samples. Enhances team creativity and performance and shortens significantly time-to-market. Contacts: Athens Technology Centre SA, Dr A. Kalligeris, [a.kalligeris@atc.gr](mailto:a.kalligeris@atc.gr); Browzwear International Ltd, Yaron Goldstein, [yaron@browzwear.com](mailto:yaron@browzwear.com)



**EAP FROG Virtual Garment Prototyping**

**Virtual TryOn**

The Virtual TryOn is a real-time platform enabling consumers to evaluate physically simulated 3D garments on a 3D digital representation of their own body. The consumers are able to customize a 3D template body to fit their specific morphology. This avatar can then be dressed with a 3D garment which is accurately simulated based on physical parameters. The VTO allows for the interactive resizing of virtual bodies, adapting the animation to the new morphology. Garments are simulated in real-time and interactively resizable. It provides video functionality to record high quality simulation results. Contact: MIRALab - University of Geneva, Nadia Magnenat-Thalmann [thalmann@miralab.unige.ch](mailto:thalmann@miralab.unige.ch)

**3D Garment design and 2D flattening software**

The 3D Design Module, finally supplied by VStitcher, is an advanced 3D design application that streamlines the entire product life-cycle. It enables a 3D simulation of garments on a 3D parametric human figure. The 3D Design Module will provide 3D Simulation of garment fit on deformable human bodies, 3D design tools and flattening process to 2D patterns through data collaboration with the CVP platform. Major innovative elements: accelerates design and product development cycle; offers true-to-life garment modeling, 3D Design tools for product design & development, communication channels through the CVP; reduces time-to-market; improves product quality; reduces product development costs, supplies marketing materials, increases revenues. Contact: Browzwear International Ltd, Yaron Goldstein, [yaron@browzwear.com](mailto:yaron@browzwear.com)

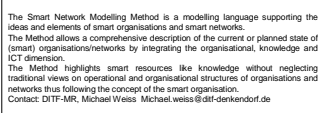

**EAP FROG The extended Smart Garment Organisation**

**Smart Network Modelling**

The Smart Network Modelling Method is a modelling language supporting the ideas and elements of smart organisations and smart networks. The Method allows a comprehensive description of the current or planned state of (smart) organisations/networks by integrating the organisational, knowledge and ICT dimension. The Method highlights smart resources like knowledge without neglecting traditional views on operational and organisational structures of organisations and networks thus following the concept of the smart organisation. Contact: DITF-MR, Michael Weiss [Michael.weiss@ditf-denkendorf.de](mailto:Michael.weiss@ditf-denkendorf.de)

**Product Tracking System**

The Product Tracking System (PTS) is a new kind of product data tracking system, which offers a full data collection based on individual data structures. Based on defined data structures, user rights and set points, the PTS collects individual data along the value chain. Deviations from set points are immediately treated by an Event Manager. Because of the flexible architecture of the PTS users can autonomously define the data structures for data collection. Users create set points and user-rights for business partners to share or restrict access of collected data. Contact: TXT e-solutions GmbH, Mirko Morgenstem [mika.morgenstem@tsgroup.com](mailto:mika.morgenstem@tsgroup.com)

**LEAP FROG** The extended Smart Garment Organisation

**Color @ work**

Color @ Work is a virtual colour reference model to communicate colours and a tolerance model to compare the produced colour with the communicated colour. It supports the communication and characterisation of colours (reference model) as well as checking of colours (tolerance model) based on the L\*a\*b\*-colour model and measurements with a spectrophotometer.

The virtual colour reference model and the tolerance model enable reliable reproduction of colours in distributed design and production landscapes by providing a characterisation of colours and a reference for translation between data sender and receiver.

Contact: DITF-MR, Alexander Artschwager, Alexander Artschwager@ditf-mr.de; Color Web GmbH by Peppermint, Hervé François, h.francois@color-web.de; Hugo Boss, Thomas Kipp

**Web Service Integration Framework**

The cost system is a software providing material optimisation at early garment development stages by integrating major systems like PDM or CAD involved in the development process. It connects the various systems involved in garment development via a Web Service Integration Framework to get the most current data available for prediction of material consumption.

For all phases of the product development cycle the cost system is able to connect to other involved systems/services using the Web Service Integration Framework with standardised interface technology (Web Services) to make a pre-calculation of material consumption.

Contact: Assyst GmbH, Martin Lades, martin.lades@assyst-intl.com

**LEAP FROG** The extended Smart Garment Organisation

**Knowledge Exchange Infrastructure**

The Knowledge Exchange Infrastructure is an interoperability method and software to support ICT and industry experts in setting e-business collaboration. It provides tools covering different phases of interoperability of electronic communication within a company: from documents design (ControlQDA ontology and Ontology Explorer) to the Message exchange passing through the Company profile (CPF Editor) and Collaboration Agreement (CPA MatchMaker).

Major innovative feature is the use of new communication technologies and standards, like ontologies and ebXML framework, to develop software reducing mistakes and misunderstanding risk, speeding up the process of data modeling and the e-business collaboration set-up.

Contact: ENEA, Piero De Sabata, piero.desabata@enea.it

**The Leapfrog Project**

LEAPFROG is a large scale research project promoted by the European textile and clothing industry to develop breakthrough technologies. It moves industry towards rapid customised manufacturing by means of: explored new fabrics-processing, automated Garment Manufacturing, 3D garments design and virtual prototyping, improvement the supply chain integration. Leapfrog sustains clothing production in Europe addressing the high labour costs in garments manufacturing, time and cost intensive steps, spread inefficiencies in the overall supply chain. It demonstrates the capacity of an 'old' traditional manufacturing sector to respond to global competitions challenges by means of innovation, other sectors technologies and European creativity.

**In cooperation with**

Logos of partner organizations including ANTEX, CITEV, DAIPOLOPOLIA, Stam, MIRAL, L. L. L., KUKA, office for machine sewing technology, ROBOX, ATE, DIM, HUGO BOSS, bivalno.com, EURATEX, TWI, and others.

[www.leapfrog-eu.org](http://www.leapfrog-eu.org)

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