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The LEAPFROG Project

LEAPFROG

LEAPFROG – Leadership for European Apparel Production From Research along Original Guidelines

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

Innovative Fabric Preparation

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Automatic interliner assembly

A new concept for an automated joining method and equipment for the attachment of interlining fabrics to the outer fabric layer was developed and tested.

This innovative fusing methodology was specifically developed to provide both a greater flexibility in the design of garments and a higher degree of automation in the production process.

The main innovative feature of the concept is the application of laser welding technologies to reliably and efficiently join several layers of interliners as well as interliner and outer fabric.

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Fabric Stiffening Agents

Extensive tests were carried out to study the application of a wide range of chemicals as permanent stiffening agents for fabrics to support handling operations and simplify joining processes in garment manufacturing..

It was specifically studied how such permanent stiffening would allow maintaining pre-defined shapes in the final garment (e.g. in plastron and shoulder parts). The stiffening agents' effects were analyzed through Fabric Assurance by Simple Testing (FAST).

Further research and development work will be necessary to integrate the results obtained into safe and reliable industrial processes.

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Stimuli Sensitive Polymers

A special stimuli sensitive polymer was developed with the purpose of integrating it into yarns and fabrics for their active shaping by application of an external stimulus such as heat.

This polymer and the fiber obtained from it was then thoroughly investigated for its yarn and fabric processing characteristics.

A number of bobbins of yarn were produced with a significant continuous length of monofilament. This yarn was used to produce samples of stimuli sensitive fabrics (see result 4 below).

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Shape Memory Fabric

A great number of different woven fabric samples were produced based on the combination of stimuli sensitive polymer yarns with various types of standard fabrics.

This innovation could allow the use of active materials in various textile applications, particularly to achieve 3D mouldable fabrics.

An interesting and highly innovative way of actuating fabrics could be demonstrated, but further research work will be necessary to increase reliability and economic viability and to identify suitable product applications.

Contact: Grado Zero Espace, Filippo Pagliai, leapfrog@gzespace.com

Automated Garment Manufacturing

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Reconfigurable robotic handling devices

Various tools and systems for automated handling of fabric cut parts were developed for use of picking fabrics from flat surfaces, transferring them into a controlled vertical position and delivering them to subsequent production steps.

The developed robotic picking device is able to reliably grasp cut parts at controlled points and to transfer them to specifically prepared hangers for onward transport in an overhead conveyor system.

The system embeds high-flow vacuum picking modules with onboard micro-compressors. Fabric parts are grasped and handled by multi-functional fingers removing problems related to fabric porosity limiting existing vacuum systems. The clamps are actuated using Shape Memory Alloys.

Contact: University of Genoa PMARlab, Rezia Molfino, molfino@dimec.unige.it

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Cutting table with automatic unloading

Is a 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 to know the exact position of each cut part and its suitable picking points. It takes decisions on what parts are to be picked up and where these have to be delivered to.

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 represents the first step in a fully automatic chain of reliable and accurate handling of fabric parts.

Contacts: Lectra S.A., Philippe Bousquet CAM Solutions R&D Manager, p.bousquet@lectra.com;
University of Genoa PMARlab, Rezia Molfino, molfino@dimec.unige.it

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Intelligent transportation system

An intelligent overhead transportation system has been developed to carry garments or fabric parts in an automated clothing factory.

It is based on the use of 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 the next quickly and with a high degree of precision.

Innovative features include an intelligent motion controller embedded in very limited dimensions; a new compact power drive; a high performance motor with permanent synchronous magnets; use of the Zigbee technology to ensure safe and robust communication; use of RFID tags to guarantee identification of items carried by the trolley.

Contact: ROBOX SPA, Roberto Montorsi, r.monotrsi@robox.it

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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, ClausPeterEberhardt@kuka-innotec.de

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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 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.

Contacts: Adjustable Mould: Moll – office for modern sewing technology GmbH, Philipp Moll, ph.moll@moll.ac, Mould actuation system: D’Appolonia, Andrea Pestarino, andrea.pestarino@dappolonia.it

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Reconfigurable mould

The Reconfigurable Mould is a working table made of a matrix of pin elements, assembled on actuators and connected to a membrane, able to generate desired 3D shapes of textile panels.

It 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 consist of the special membrane top of the system and the architecture of the pins head, which enable fast and accurate 3D shaping of flexible panels.

Contact: STAM Srl, Roberto Landò r.lando@stamtech.com

Virtual Garment Prototyping

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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's behaviour during manufacturing (and use).

The tool's major functions allow: identifying and measuring the fabric's mechanical properties; modelling of multi-layered materials; identifying variables able realistically represent the behaviour of simulated garments; creating fabrics behaviour models or selecting materials according to a behaviour expectation.

The Manufacturability prediction is available as a web-service for use in the early clothing design stages. It enables a more reliable selection of fabrics based on the prediction of their behaviour such as draping, manufacturing and use.

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CVP – Collaborative Virtual Platform

This web platform enables online collaboration between all actors involved in the design/prototyping phase of a new collection (product managers, designers, pattern makers, marketing personnel).

It enables integration of remotely located 3D CAD systems, virtual fabric libraries, 2D CAD/CAM systems for the exchange of multimedia content (2D patterns, fabric data, etc). It further 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. It enhances team creativity and performance and shortens significantly time-to-market

Contacts: Athens Technology Centre SA, Dr. Andreas Kalligeris, a.kalligeris@atc.gr; Browzwear International Ltd, Yaron Goldstein, yaron@browzwear.com

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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 system allows for the interactive resizing of virtual bodies, adapting the animation to the new morphology. Garments are simulated in real-time and are interactively resizable. It further provides video functionality to record high quality simulation results.

Contact: MIRALab – University of Geneva, Nadia Magnenat-Thalmann, thalmann@miralab.unige.ch

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3D Garment design and 2D flattening software

The 3D Design Module, to be integrated into commercial design software, 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 Collaborative Virtual Platform (CVP).

Major innovative elements are an accelerated design and product development cycle; true-to-life garment modeling, 3D Design tools for product design & development and innovative communication channels (through the CVP) for reduced time-to-market, improved product quality, reduced product development cost enhanced product marketing.

Contact: Browzwear International Ltd, Yaron Goldstein, aron@browzwear.com

The extended Smart Garment Organisation

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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

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Product Tracking System

The Product Tracking System (PTS) is a new kind of product data tracking system, which offers a flexible 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 Morgenstern, mirko.morgenstern@txtgroup.com

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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 characterization 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-denkendorf.de; Color Web GmbH by Peppermint, Hervé Francois, h.francois@color-web.de; Hugo Boss AG, Thomas Köpp

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Web Service Integration Framework

The is an application 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 application is able to connect to other involved systems/services using the Web Service Integration Framework with standardized interface technology (Web Services) to make a pre-calculation of material consumption.

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

Knowledge Exchange Infrastructure

The Knowledge Exchange Infrastructure is an interoperability method and software to support ICT and industry experts in setting up e-business collaborations.

It provides tools covering different phases of interoperability of electronic communication within a company: from documents design (OntoMODA ontology and Ontology Explorer) to the Message exchange passing through the Company profile (CPP 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 modelling and the e-business collaboration set-up.

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LEAPFROG

The LEAPFROG Project

LEAPFROG is a large scale EU collaborative research project promoted by the European textile and clothing industry to develop breakthrough technologies.

The project intends to bring the apparel industry to higher levels of automation, productivity and quality in manufacturing and greater efficiency in value creation along the clothing supply chain by means of: innovative fabrics preparation processes, automated garment assembly, virtual 3D garments design and prototyping, improvement of smart networking and knowledge management in the value chain.

LEAPFROG aims to sustain the largest possible part of the apparel value chain in Europe by addressing its most crucial competitive challenges. It will demonstrate the real possibility of transforming this industry by means of technological and organisational innovation based on the application of latest research results and new business models.