Individualisation of Multifunctional, Concealed Body Armour's Design Acronym: SECRET

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General information about project

The project is realised according to the Agreement No. DOBR-BIO4/045/13067/2013 concluded by the project leader Institute of Security Technologies MORATEX and the National Centre for Research and Development on 23.12.2013, on the execution and funding the project for the state security and defence.

The Consortium:

- Institute of Security Technologies MORATEX – PROJECT LEADER,
- Central Institute for Labour Protection – National Research Institute,
- Protective Equipment Plant MASKPOL SA,
- Police Academy in Szczytno,
- Military Institute of Armament Technology.

The project execution period: 23.12.2013 - 22.12.2015

Total cost of project realisation: 1000 000 Euro

Introduction

The main objective of the project „Individualization of multifunctional, concealed body armour (ballistic vest) design" is to develop a procedure for individualization of the construction of concealable ballistic vest to be worn under the clothing, based on the 3-dimensional (3D) scanning technology.

3D scanning technology involves the use of a novel non-contact method of acquiring the anthropometric data, which is the most accurate method of human body measurement.

Application of this method allows for fast, professional determination of the size and shape of the ballistic vests, taking into account the specifics of an individual wearer's silhouette. Such a vest protects the most vital internal organs of the user against wound from firearms bullets and is intended for discrete personal protection.

An essential part of the process of the vest individualization, will be the use specialized software that allows for automatic adjustment of standard templates to individual user dimensions. Another software will enable the visualization of the product and assessing the degree of fit and drape on the avatar, that simulates the body shape of individual user. The vest should ensure increased user comfort and freedom of movement due to proper anatomical design.

The special clothing products of the ballistic vest type are usually stiff, hardly adjustable to the individual shape of an user. Applying the 3D scanning technology will enable achieving the best fitting a vest to the individual size of user, respecting the characteristics of the wearer's physique.

Currently, in order to match a ballistic vest to the needs of an individual user, the right size of vest is selected from the manufacturer's offer, who mostly offer 3 up to 5 sizes of a product. The vests are usually equipped with a special fastening system, that adjusts properly vest. The project proposes a method, which takes the laser measurement of the human figure into account, and supports automatic adjustment of standard templates to individual user profile, will refine the process of developing a vest tailored to the needs of an individual customer and significantly reduce the time of manufacturing such a vest. This method brings also a number of other benefits that will be presented during the project.

It will be developed also the procedures of privacy protection that will ensure the protection of storage and processing of gathered data according to related polish and EU law documents.

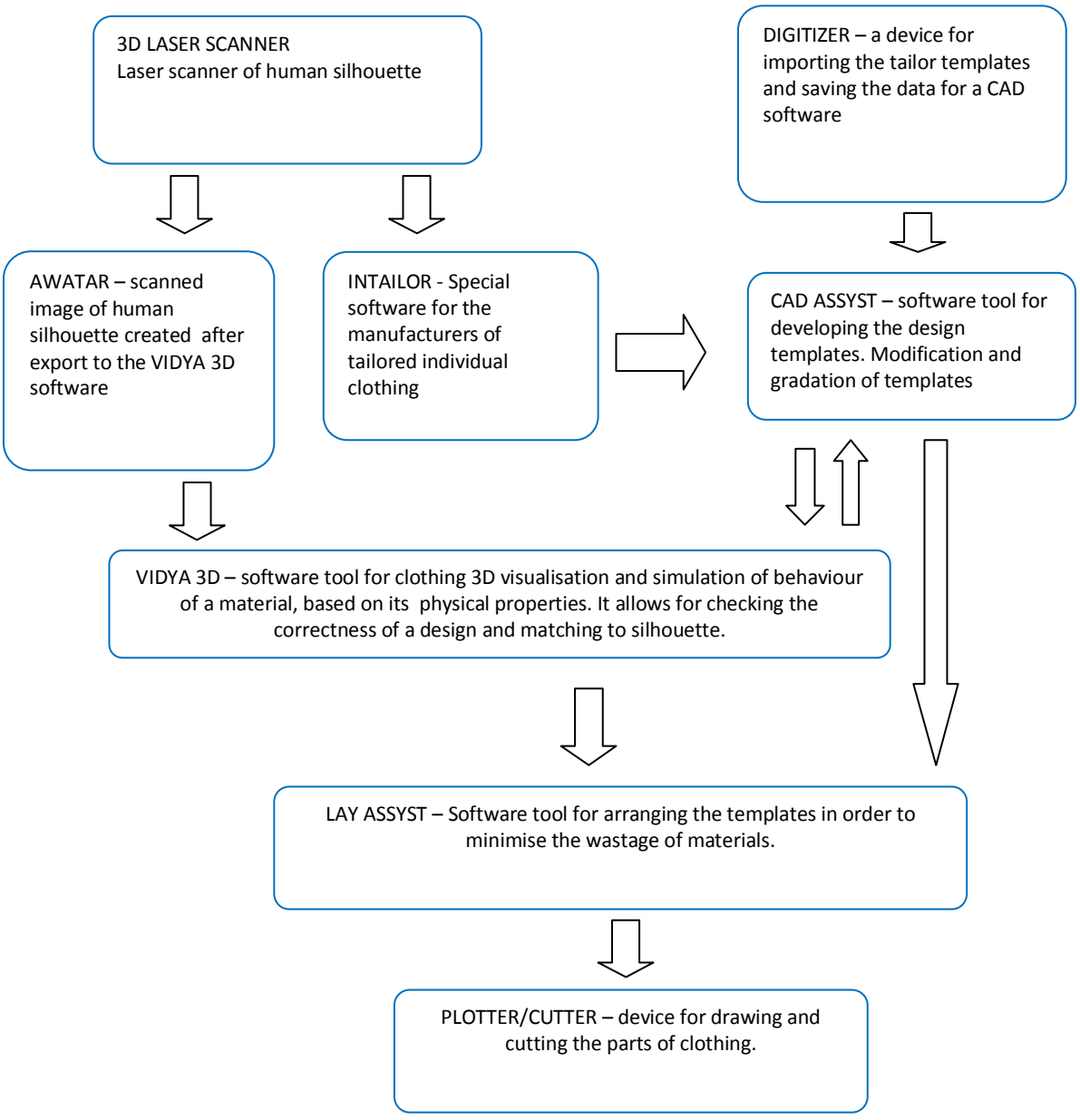
It is expected that results of the project – the implementation of new products, new innovative technology and procedure solutions, will reduce the number of adverse events in production of chosen personal equipment.

The main objective of the project: to develop a procedure for personalisation of the developing and construction of multi-functional concealed ballistic vests based on the three-dimensional (3D) scanning technology.

The final results of the project realisation will be:

- multi-functional concealed vests bullet-, knife-, stab- and/or needle-proof, tailored to the dimensions of individual users, made using modern techniques of scanning the human figure and the designing as well as making-up the vest,
- application of optimal solutions in material and design, which additionally support the functionality of developed ballistic vests, while minimizing their weight,
- technical documentation for the vests
- guidelines for proper selection of functionalities of the protective vests,
- the procedure for the individualization of the vests design, which will be the basis for the implementation of the principles of designing the protective products for an individual user into the processes of production (entrepreneur) and logistics (end user) in an unified and repeatable manner.
- procedure to ensure the protection of personal and biometric data of individuals undergoing the measurements with a 3D scanner.

Characteristics of the process of developing and designing the clothing



3D scanning advantages

- rapid and precise measurement – 300 individuals may be measured within 8 hours by the scanner. The laser technology ensures proper measurement. The permissible measurement deviation of ±1mm.
- rinimum returns and corrections - the nature of the measurement allows for reducing the number of errors, compared to traditional measurements
- data accessible for subsequent orders - especially important feature for regular customers, allows for avoiding the cost of re-measuring on collection change.
- faster execution of orders – shorter time of measurement; tables with the resulting data are transmitted over the Internet immediately after processing, which allows you to shorten order completion time by up to 25%
- automatic data analysis - when using scanning service, sizing and matching a clothing product for an individual user is done in an automated way, always by the same rules as defined by the customer.

Software for clothing 3d visualisation advantages

- the possibility of a virtual try-on the templates on virtual model that simulate silhouette of a wearer, previously measured on a 3D scanner,
- the real-time simulation provides a possibility of the interactive modification,
- allows for checking the correctness of a design and matching to silhouette,
- allows for rapid modification of templates and immediate checking the introduced changes without sewing the model
- simulates the properties of a material, texture, thickness, stiffness and colour,
- regards the production technologies of clothing,
- gives a realistic picture of drapes, pleats, folds, pliability of material
- allows for matching the attire, stress, clearances and ductility of fabrics
- allows for changing the fabrics, colours, accessories, applications,
- allows for using the Avatar Motion Tool – a software tool for generating the animation sequences of any movement of avatar (unique feature) for the 3D simulation

Some benefits of using the 3d-scanning technology

- it is anticipated that the development and implementation of manufacture methods with the use of 3D scanner and 3D visualisation software will contribute to the popularization of state-of-the-art techniques, and to modernizing the apparel industry, including the clothing for uniformed organisations
- data acquired from anthropometric measurements with a 3D scanner will be found useful for the computer systems for designing clothes and will enable rapid developing the templates of clothing according to individual or selected, standard dimensions of human body.

Keywords body armour, ballistic vest**,** 3D scanning technology, human body measurement, procedures of privacy data protection