

Title of the doctoral program

Management, Production and Design

Title of the research activity

Methodologies and Tools for 3D Human Face and Body for Diagnostic and Security Purposes

Short description of the research activity

In recent years, medical and security sectors have focused their attention to issues related to 3D modelling.

The considerable potential that three-dimensional models are able to provide, especially to medical diagnostic operations, has greatly stimulated experimental studies in this direction. Different clinical settings (maxillofacial, orthopaedic, dental,...) have seen the emergence of several experiments aimed at the development of methodologies and three-dimensional acquisition tools able to provide the user with three-dimensional morphologically and clinically significant models. At present, despite the level of skills acquired in 3D scanner in the industry is significantly advanced, procedures and techniques for analysing the achieved three-dimensional information and supporting the diagnosis are not in-parallel developed.

Also, the need of security in face recognition applications such as geographical borders and identification of subjects during bank transfer operations requires accurate methods and addresses research for this task. Furthermore, with the widespread usage of public video-based systems (CCTV) there are nowadays all the requirements for gaining more and more reliable security tools that could be responsive to this demand. The advantage of 3D approach is that it can guarantee this reliability. Facial landmark extraction, i.e. the automatic localization of typical points of the face called landmarks, provides a univocal mapping of the face, independently on age and camouflages. This can be only partially gained through bi-dimensional tools.

Thus, a progress in the tools towards 3D has been successfully performed, but protocols of usage are still missing. This proposed doctoral research will try to bridge this gap. In particular, the research aims to acquire body parts through the use of non-invasive systems for both diagnostic and security purposes. Specifically, the research should be oriented primarily to the acquisition of faces, given their high morphological complexity, in order to develop a three-dimensional capturing tool (3D scanner) to make the necessary surveys about the subjects (patients...) in exam. Then, face and body parts will be studied, modelled, and formalized according to the purpose of the study. Whatever is the application, the research project should be carried on with the collaboration of an orthopaedists or a plastic surgeon, who are the actual expert in the field.

Scientific responsible (name, surname, role, email)

Enrico Vezzetti, Associate Professor, enrico.vezzetti@polito.it

Number of vacancies for XXXI cycle (3 years program)

1

Specific requirements (experiences, skills)

The candidate should have a Mathematical or Computer Science Background. Computer Vision, Statistics and Computer Graphics experiences represent a good starting point. Any knowledge in Differential Geometry will be appreciated, although not requested.

Website of the research group (if any)