AGENCE NATIONALE DE LA RECHERCHE

Presentation of the funded projects in 2010 for the « Blanc international SIMI 3 » Program

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Project title	3D Face Analyzer – 3D face-based Automatic recognition of facial attributes (expressions, age, gender, ethnicity)

Abstract

Human face conveys a significant amount of information, including information about head orientation, the identity, emotional state, gender, age, ethnic origin, education level, etc., and plays important role in face-to-face communication between human. The use of these facial clues during interaction is made possible by the remarkable human ability to recognize and interpret faces and facial behaviors. The present project aims at automatic interpretation of 3D face images so that contactless human-computer interaction based on typical user's facial attributes, such as facial expressions, gender, age and ethnic origin, can be developed for an improved HCI.

While most of the face attribute sensitive applications are still unfathomable, especially in the field of human-computer interaction, one can already figure out some simple direct applications, including for instance reliable face recognition, user's affect recognition based on facial expression, age and gender specific human computer interaction, etc.

From a scientific perspective, machine-based recognition of facial attributes is also a challenging problem for multiple research communities, including machine learning, computer vision, neurosciences, etc. For instance, age estimation from facial images is not a classic learning problem as typically the aging progress is unpredictable over the time and different people age in different way while temporal learning data are usually very rare. Indeed, apart from biological factors, external factors as diverse as ethnicity, climatic conditions, food intake, mental stress, etc. also contribute towards aging effects, it is thus natural to expect different individuals to age differently. For all these reasons, automatic interpretation of face images has attracted increasing interest from several research communities in the recent years. However, most of these works are mainly based on the analysis of 2D texture face images although studies have shown that facial attributes such as the aging, gender or ethnicity are not only revealed by the 2D textures, but also has close relationship with the 3D morphology of the human faces.

The project 3D Face Analyzer proposes to join the effort of two French teams (ECL Liris and USTL LIFL) and two

Chinese teams (Beihang Irip and NCUT IIP) having each significant expertise in face processing and targets reliable recognition of facial attributes on 2.5D or 3D face models, thus making use of face 3D morphology, texture and landmarks at the same time. While developing 3D analysis-based techniques directly aiming at recognition of facial attributes, we also want to make forward knowledge on some underlying fundamental issues, e.g. stability of discrete geometric measures and descriptions (curvature, distance, etc.) across variations in terms of model resolution and precision, 3D non-rigid surface registration and matching in the presence of noisy data. Another important aim of the project is the identification and collection of significantly representative resources of 3D face models in facial expressions, age and gender for the purpose of training and testing.

Partners	LIRIS LIFL Beihang University North China University of Technology
Coordinator	Liming Chen LIRIS liming.chen@ec-lyon.fr
ANR funding	202 142€
Starting date and duration	36 months
Reference	10-INTB-301
Cluster label	

Project title	**FIREFLIES – Flexible Relaying in Interference-Limited Cellular Network**
Abstract	Future cellular networks will be interference limited, which impedes network operators to offer increased spectral efficiency and bandwidth, as well as to guarantee specific per user quality-of-service (QoS) demands. While the adoption of relay stations in the next-generation cellular networks will become a reality, little is known about the potential gain of relaying in a multi-user (and cellular) environment. Understanding the triple roles of interference mitigation, bidirectional multiplexing, and user cooperation of relaying in a cellular network is crucial for us to develop efficient transmission strategies.
Partners	SUPELEC PKU (China)
Coordinator	Mérouane Debbah SUPELEC merouane.debbah@supelec.fr
ANR funding	201 226 €
Starting date and duration	36 months
Reference	10-INTB-302
Cluster label	

Project title	**PFlower – Parallel Flow Recognition with Multi-Core Processor**
Abstract	The proposed project has a total of five work packages: four technical work packages (WP1, WP2, WP3, and WP4) and one support work package (WP5), laid out over 3 years. WP5, the Project management and dissemination work package, supports the technical work packages by providing the coordination needed for the project and by planning the dissemination of the ideas coming out of the project. On of the four technical work packages (WP4) is dedicated to experimental work. WP1 is dedicated to building dedicated hardware's for the goals of the project. WP2 will target the development and the implementation of the algorithms needed for distributing the recognition tasks among processors. WP3 is of a more prospective nature. Its goal is to use data mining techniques as well as traffic modeling approach in order to find shortcuts that will highly reduce the complexity of the recognition task. • WP1- Flow recognition systems • WP2- Parallel signature matching algorithms • WP3- Behavioral modeling and data mining • WP4- Experimentation and evaluation • WP5 – Management and dissemination: The project will organize 4 workshops (two in France and two in China). These workshops will have three main parts: a tutorial-like part that will consist in detailed presentations describing for the partners (and most likely for people from outside the project) general issues related to the topic of interest of the project; a presentation of research results obtained in the context of the project. The last part will be dedicated to management meeting of the overall project as well as coordination meeting that are specific to each of the work packages. Moreover, we will build a website and a cooperative publishing environment in form of a wiki for publishing shared archives, collected raw data sets, and open source software and helping in cooperative writing of project reports. Inside this project, two cosupervsied (cotutelle) Phd will be funded and several cross visits of researcher from China and France will be organized.
Partners	LISTIC INRIA institute of Computing Technology, Chinese Academy
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ANR funding	272 461€

Starting date and duration	36 months
Reference	10-INTB-303
Cluster label	

Project title	CooPerCom – Cooperative Perception and Communication in vehicular technologies
Abstract	The inclusion of new embedded technologies in vehicular applications is precluded by several constraints and requirements among which optimizing solutions and finding trade-offs between 1) safety, 2) low-cost, 3) manufacturability, 4) environment friendliness 5) and standard policies and regulations. In the proposed project we intend to put emphasis on the safety aspects of the requirements while keeping in mind the other issues. One of the major concerns related to the introduction of new technologies in vehicular applications is safety. Apart from HMIs (Human Machine Interfaces) and driver's distraction issues, safety is directly related to the level of reliability and robustness of the sensors and systems involved. In fact, one of the major challenges in industry is to achieve and guarantee a very high level of reliability and robustness of on-board equipments to insure sufficient safety at a cost low enough to enable large deployment and mass production in the automotive industry. The collaborative and distributed approach we propose for building an extended vehicular perception in clusters of vehicles address this problem. One of the main objectives of this proposal is to determine how we can improve those reliability and robustness aspects of the embedded systems and sensors which are becoming ubiquitous, more numerous and more complex over time. As the number of sensors and systems increases, the challenge of insuring sufficient reliability and thus a high level of safety is becoming overwhelming. In addition, vehicular environment is highly dynamic and thus requires a high level of connectivity, which in turn requires reliability and robustness as well. Robustness is linked to the capability of the systems to adapt and adjust their performance/behaviour according to the situation and environment at hand. These adaptation and learning capabilities are directly related to safety as well. Among the sub-objectives, we have in mind to explore and develop intelligent signal and information processing tools to take advantage of the presence of multiple vehicles and inter-vehicles communications capabilities to gather information from multiple sources, validate individual data pieces, assess their level of uncertainty and exploit potential redundancies in order to mitigate risk of unexpected failures and optimize reliability and robustness. In order to exploit various sources of information available from surrounding vehicles, we need to consider cooperative and distributed approaches that will rely on emerging information processing and

	communications tools. The proposed ANR-NSERC project is presented from the Canadian side by a team of researcher from the Université de Sherbrooke (Profs. Denis Gingras PI, Soumaya Cherkaoui) and the University of Toronto (Prof. Shahrokh Valaee) and supporting organization such as the Networked Vehicle Association Canada (NVA), Canadian Advanced Technology Alliance (CATA), the Montreal-based company Opal-RT and Transport Canada. From the French side, the team is composed of the mixed INRETS-LCPC laboratory LIVIC (Dr Dominique Gruyer PI, Dr Sébastien Glaser, Steve Pechberti), the Université d'Evry Val D'Essonne (Prof. Vincent Vigneron) and the Université de Paris-Sud (Dr. Alain Lambert).
Partners	INRETS IEF IBISC CIVITEC Sherbrooke Toronto
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ANR funding	394 087 €
Starting date and duration	36 months
Reference	10-INTB-304
Cluster label	