Multifocal System for Real Time Tracking of Dynamic Facial and Body Features (MULTIFACE)

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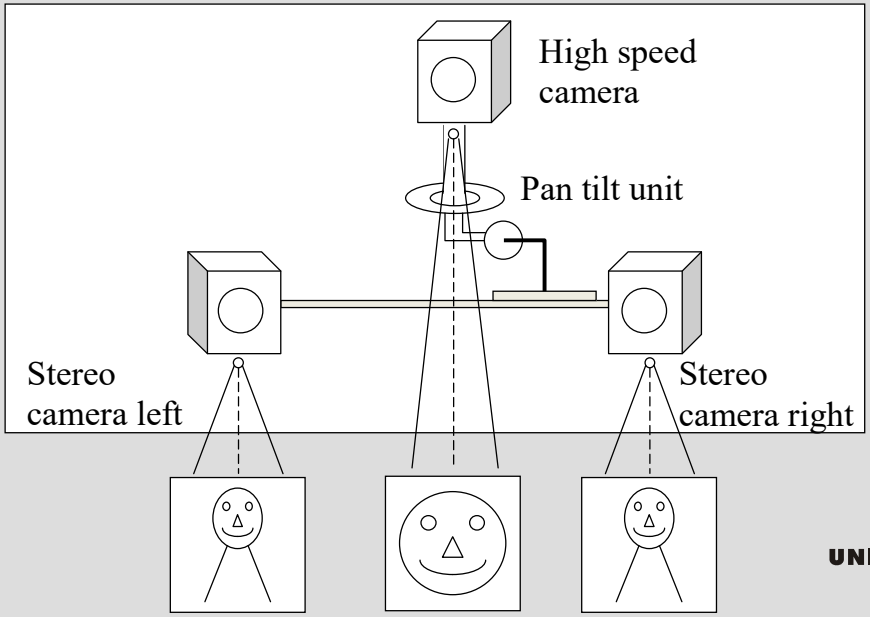
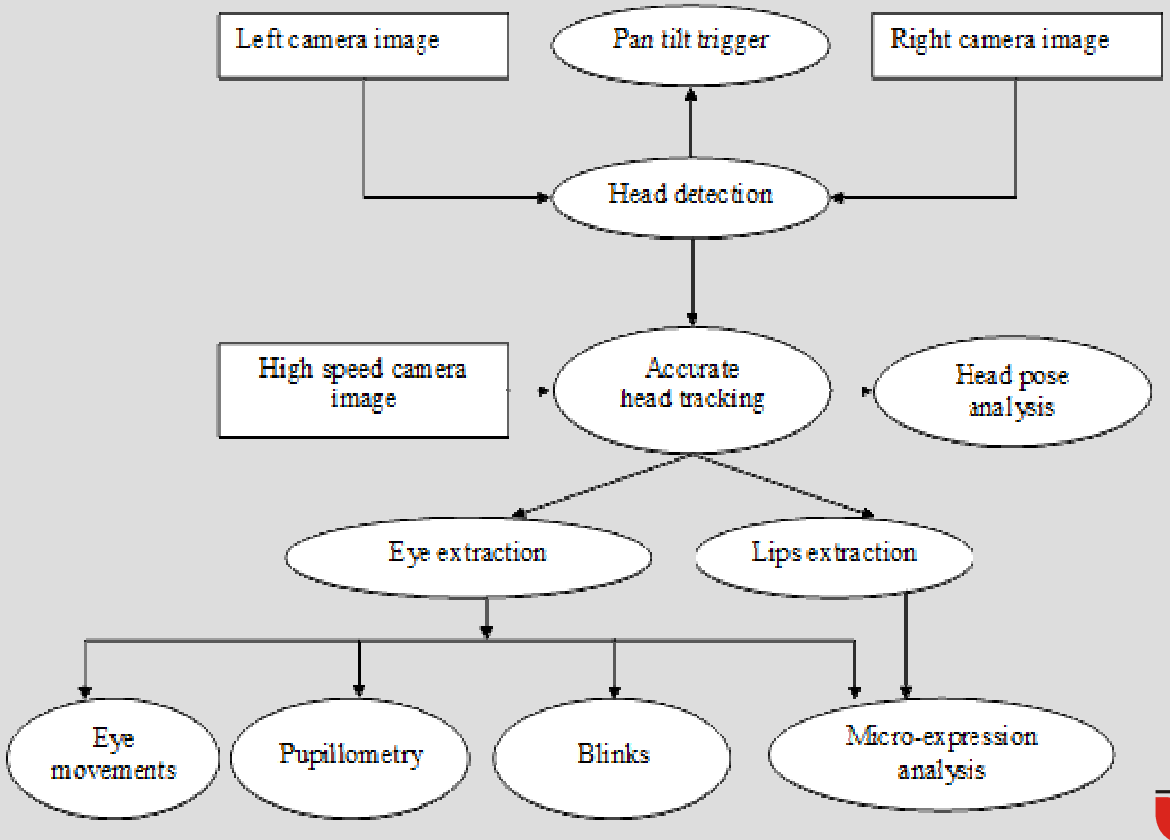
Main objective

- design original sensorial systems, models and detection algorithms, for tracking the head and facial features, for indoor and outdoor environments without constraints on the user behavior



Proposed Solution Outline



Objectives - Activities – Milestones (1)

Year	Objectives	Activities	Deliverables
2016	O1. Setup of the multifocal sensorial system	A1.1. Setup of the multifocal sensorial system (O1)	Multifocal sensorial system implemented, calibration tools, optimized stereovision algorithms for measuring head and facial features, algorithms for head geometry and pose tracking based on original models, scientific papers manuscripts, patent submission, stage report.
	O2. Development of an efficient sensorial system calibration methodology	A1.2. Development of a preliminary calibration methodology for the multifocal sensorial system (O2) A2.1. Development of an efficient calibration technique, requiring minimum user input (O2)	
	O3. Stereovision for head and face tracking	A2.2. Improving the stereovision algorithms for accurate measurement of the human face (O3)	
	O4. Head geometry and pose modeling and tracking using stereo information	A1.4. Design of models for head geometry and position, and for facial features (O4) A2.3. Design and implementation of algorithms for head geometry and pose tracking (O4)	
	O7. Dissemination	A2.5. Preliminary results dissemination (O7)	

Objectives - Activities – Milestones (2)

Year	Objectives	Activities	Deliverables
2017	O4. Head geometry and pose modeling and tracking using stereo information	A3.1. Testing and validation of head and facial features tracking algorithms (O5)	Optimized algorithms for head and facial features tracking, application demonstrator, published scientific papers.
	O5. Detection and tracking of facial features	A2.4. Design and implementation of algorithms for facial features recognition and tracking (O5) A3.1. Testing and validation of head and facial features tracking algorithms (O5)	
	O6. Demonstrator applications	A3.2. Development of a demonstrator application (O6)	
	O7. Dissemination	A1.5. Patent application (O7) A3.3. Dissemination of final results (O7)	

Challenges

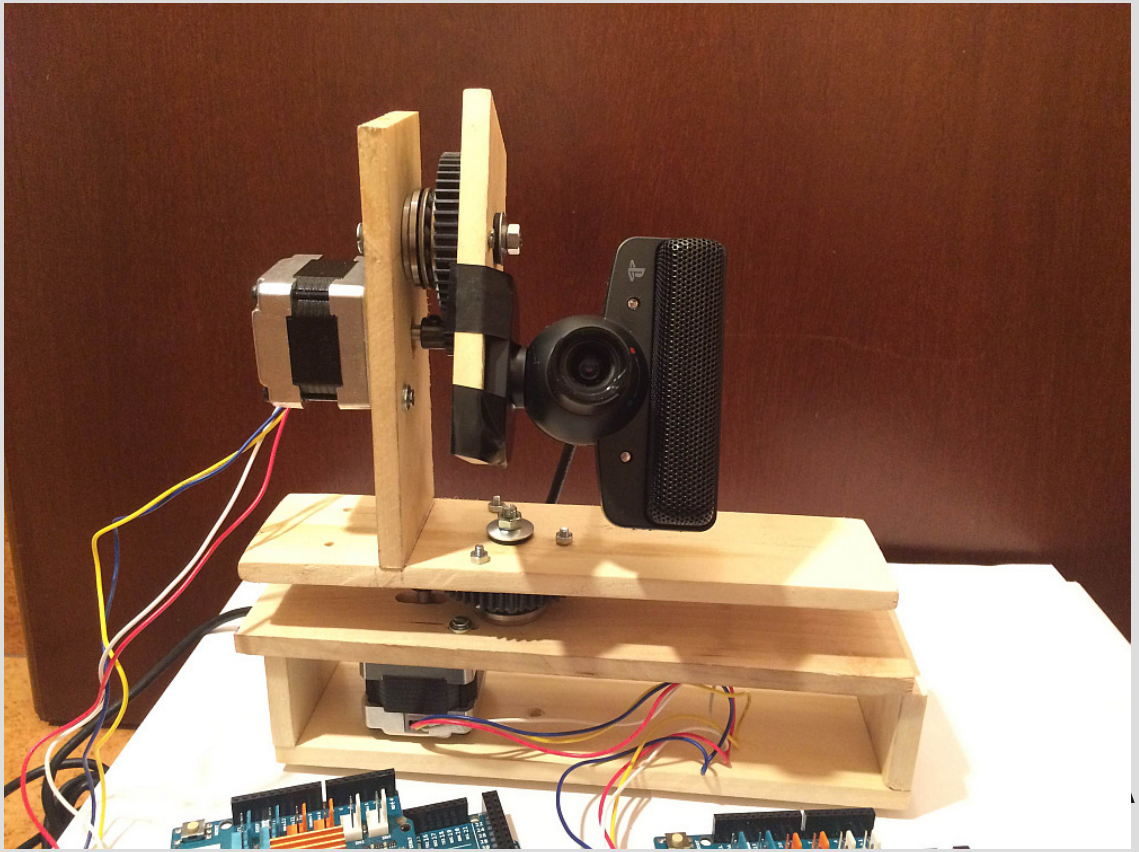
- building of the multifocal image acquisition system
- calibration of the three cameras and the pan/tilt unit in a common world reference frame
- design of an eye tracker that can cope with temporal eye occlusions and different head attitudes
- design accurate motion detection and tracking algorithms for micro-expression detection
- design micro-expression detection algorithms that allow the users to move their heads freely or where other facial movements are present

Results (1)

- Building the multifocal imaging system
  - Camera pair for stereovision: 2x MANTA G419B Ethernet camera
  - Development of a fast stereovision algorithm for real-time scene reconstruction without the need of a GPU or a hardware acceleration board
  - Purchasing of a color high speed camera for face observation and fast movement detection of facial features (**in progress**)

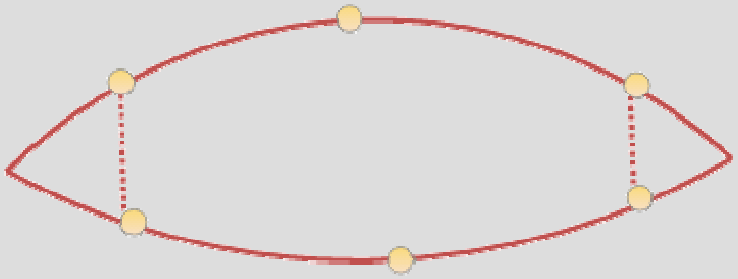
Results (2)

- Building the pan-tilt rig (to hold the high speed camera)



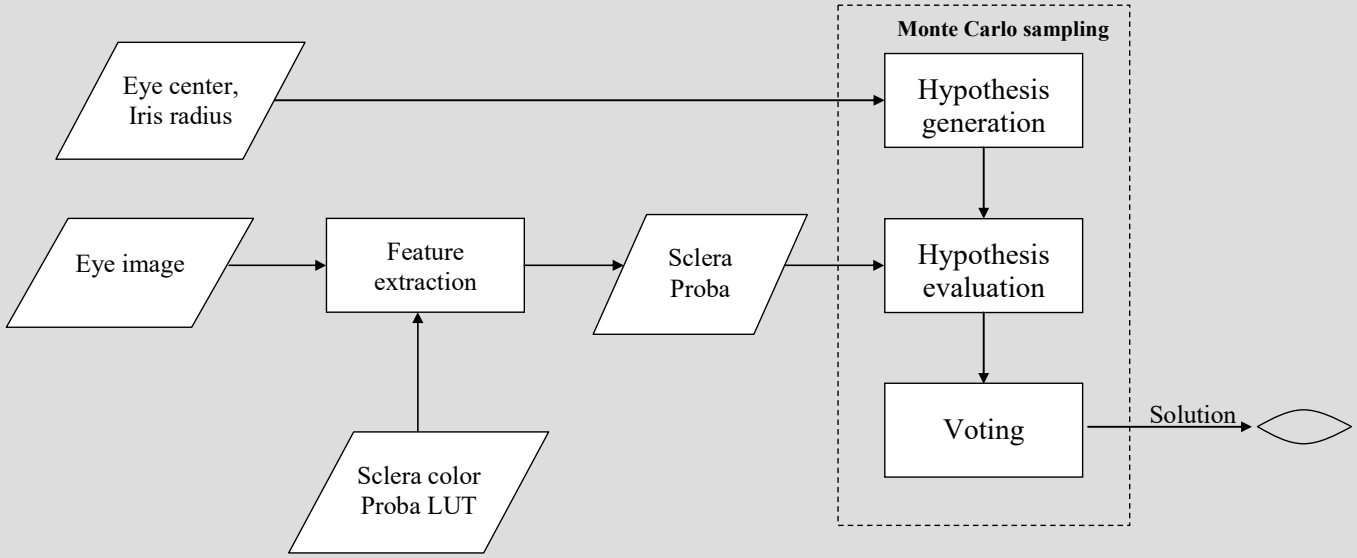
Results (3)

- designed and implemented a real time eye detector based on Fast Radial Symmetry Transform (FRST)
- fast iris segmentation algorithm
- designed a new model for representing the eye shape using 6 control points and 2 parabolas



Results (4)

- an original Monte Carlo method for extracting the eye shape using the proposed model



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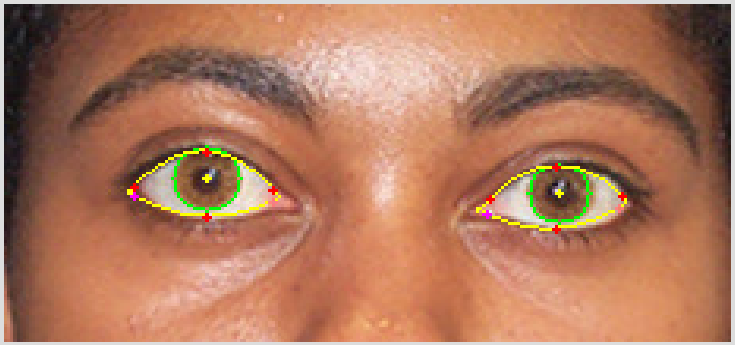
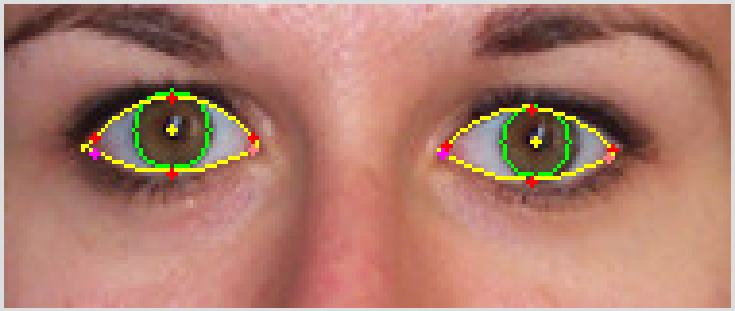
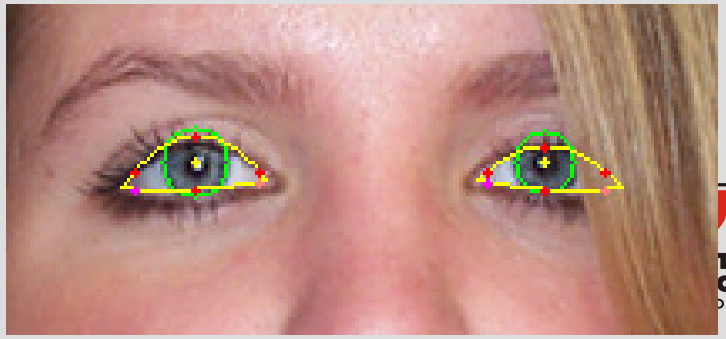
Results (5)







Center for Vital Longevity Face Database

(310 images - accuracy 88.7 %)

Next steps

- Finalizing the setup of the imaging system
- Design and implementation of a body and head tracker based on stereovision
- Extraction of static and dynamic facial features parameters (eye movement, microexpressions, etc)
- Development of applications based on the observed features: attention monitoring, person identification, etc.

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