Tracking hands and hand-object interactions

Antonis Argyros

Computer Science Department, University of Crete (CSD - UoC)

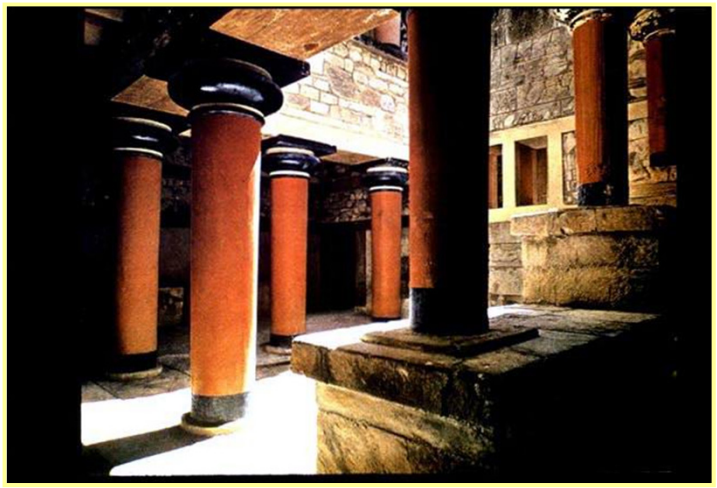
and

Institute of Computer Science, Foundation for Research and Technology – Hellas (FORTH)

http://www.ics.forth.gr/~argyros

Xperience Summer School
Majorca, Spain
October 2013

Archaeological sites

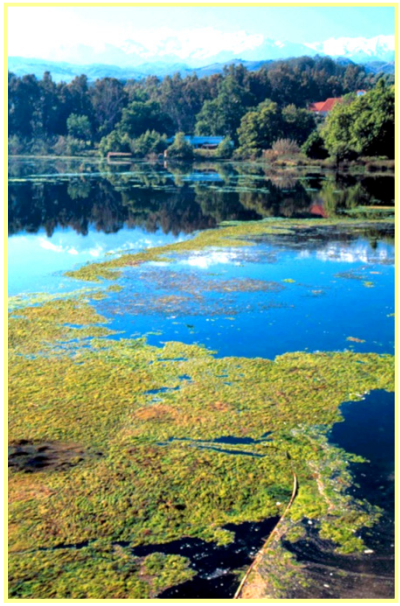


Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Olive groves, vineyards, beautiful landscapes

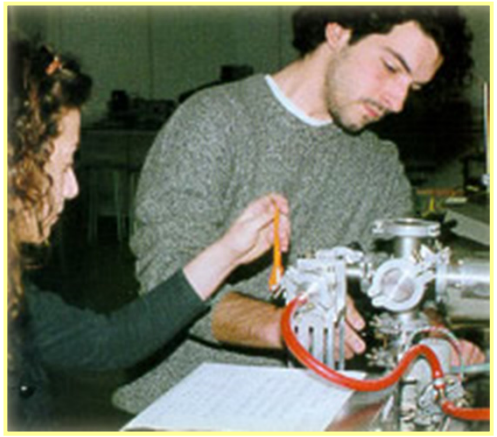


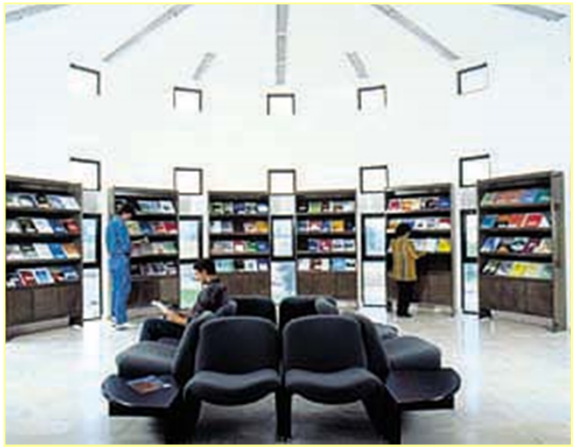





Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

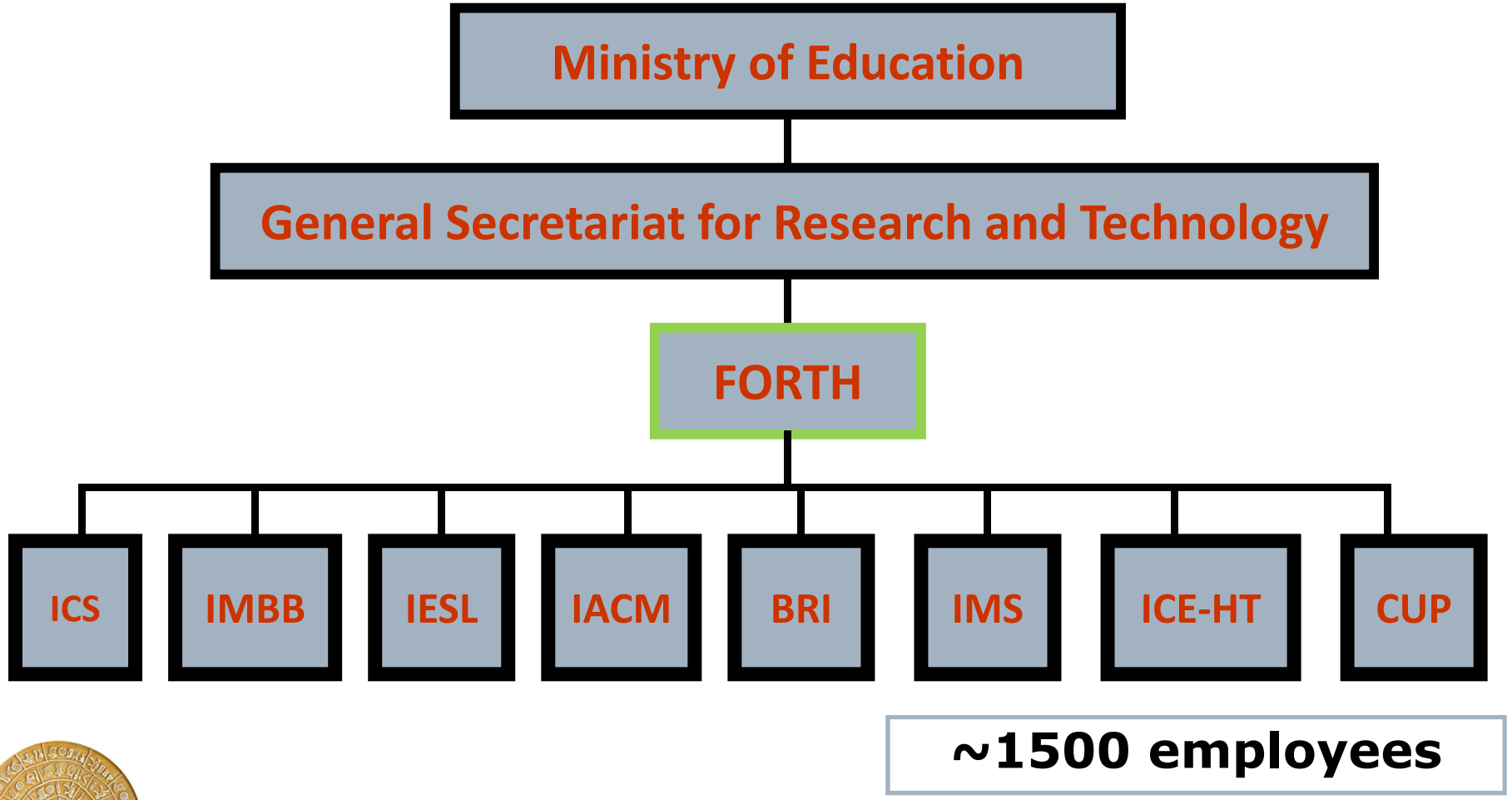
FORTH and University of Crete





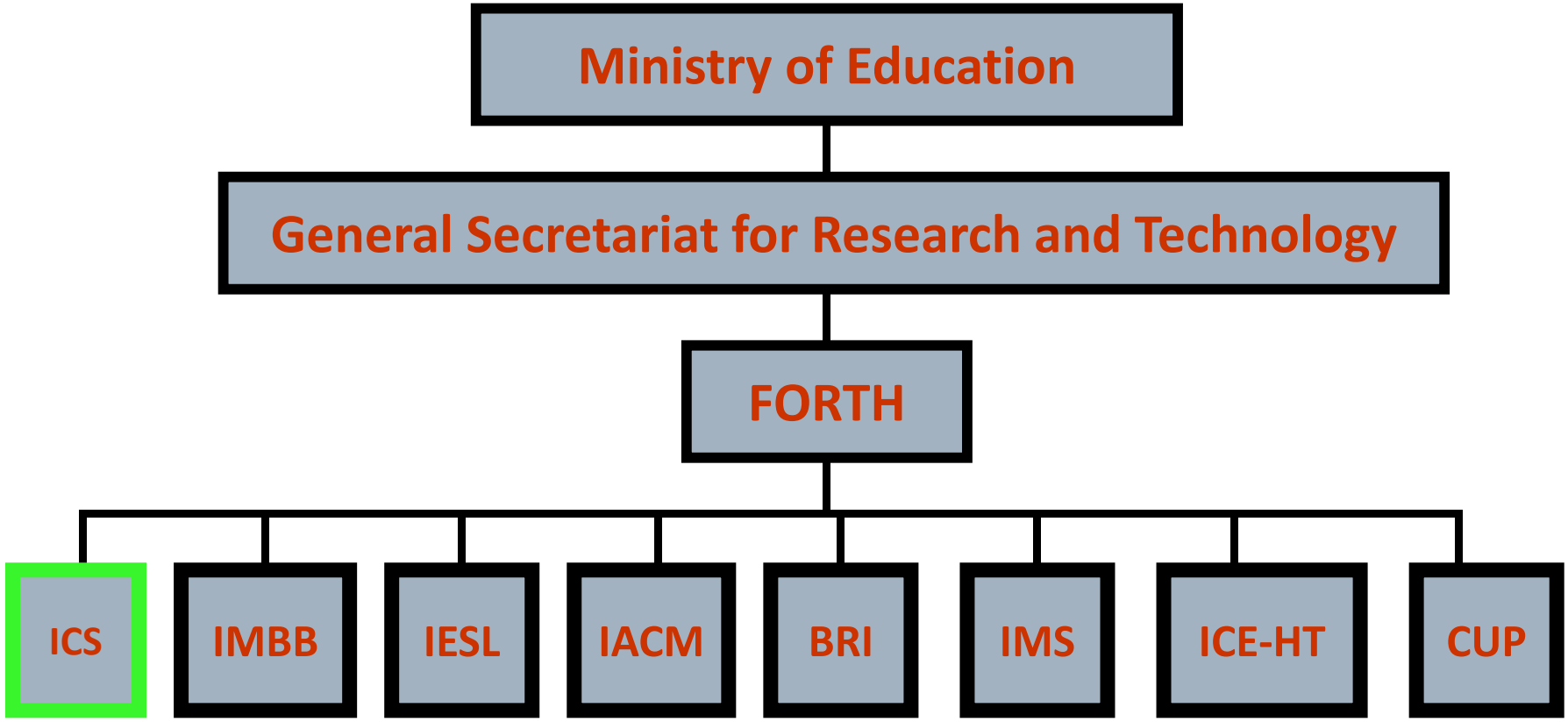
Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Foundation for Research and Technology - Hellas (FORTH)



Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

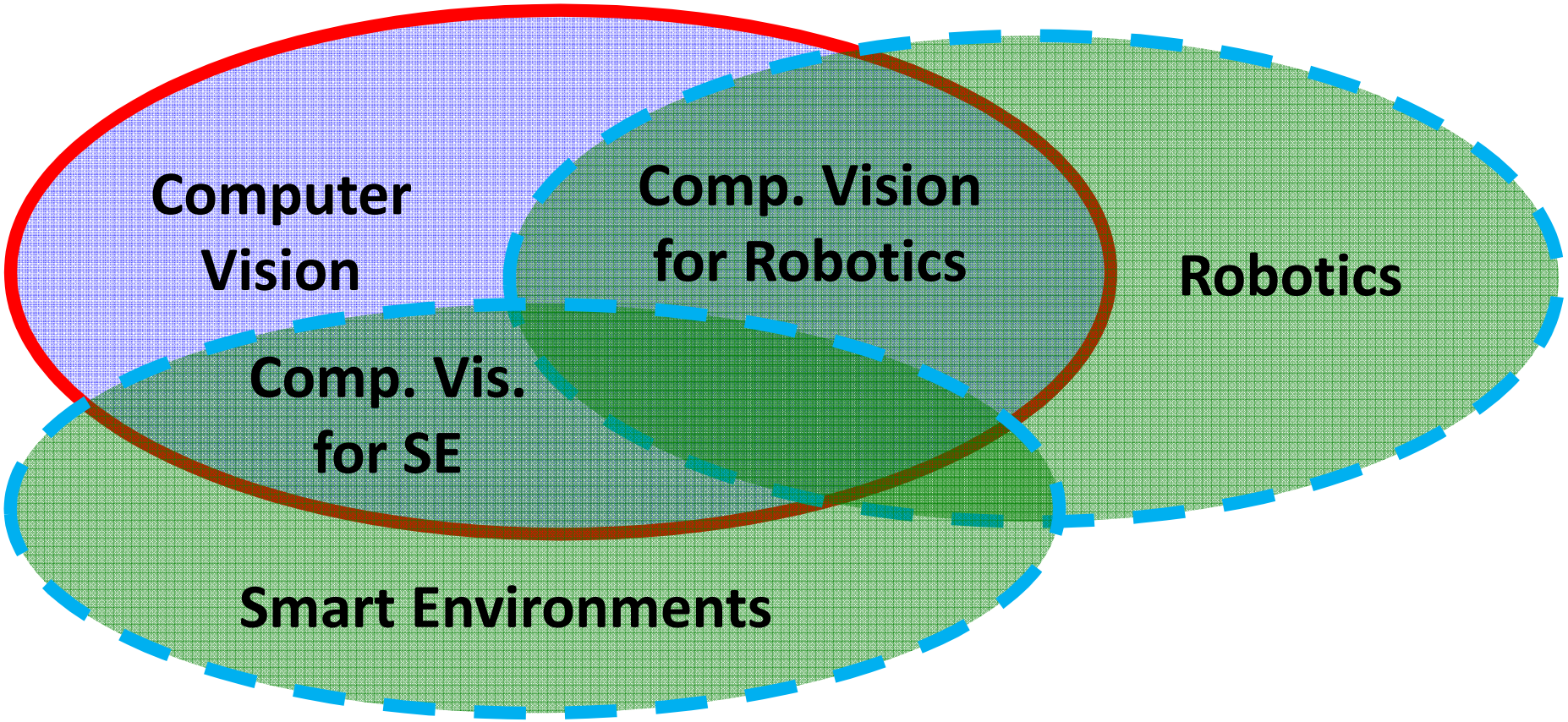
Institute of Computer Science (ICS)



~250 employees

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

My research interests



Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

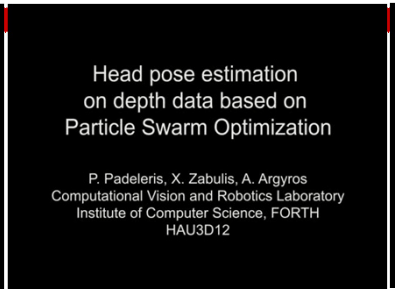
Research interests and activities

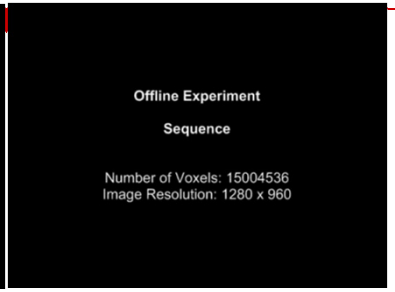
- **Core vision problems**
  - Tracking (2D/3D, rigid/articulated objects, …)
  - Shape representation and matching
  - Structure and Motion estimation (sparse bundle adjustment library)
  - …
- **Computer vision in applications**
  - Vision for robotics
    - Human-robot interaction
    - Vision-based robot navigation
  - Vision for Ambient Intelligence Environments

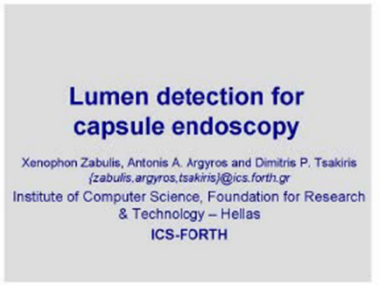
Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

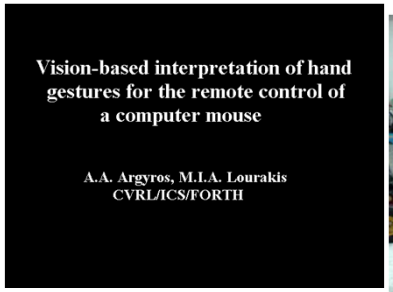
Activities…

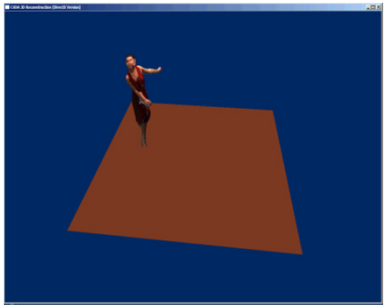

Real-time Tracking of Multiple Skin-colored Objects with a Possibly Moving Camera
A.A. Argyros, M.I.A. Lourakis
CVRL/ICS/FORTH

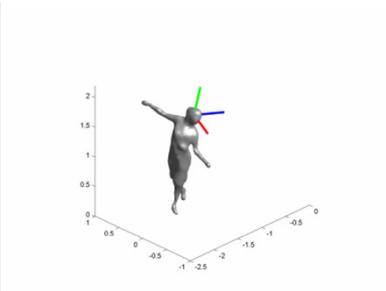

Head pose estimation on depth data based on Particle Swarm Optimization
P. Padeleris, X. Zabulis, A. Argyros
Computational Vision and Robotics Laboratory
Institute of Computer Science, FORTH
HAU3D12

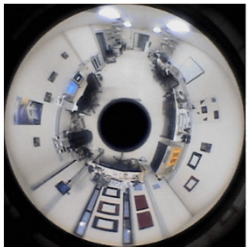

Offline Experiment
Sequence
Number of Voxels: 15004536
Image Resolution: 1280 x 960


Lumen detection for capsule endoscopy
Xenophon Zabulis, Antonis A. Argyros and Dimitris P. Tsakiris
{zabulis,argyros,tsakiris}@ics.forth.gr
Institute of Computer Science, Foundation for Research & Technology – Hellas
ICS-FORTH

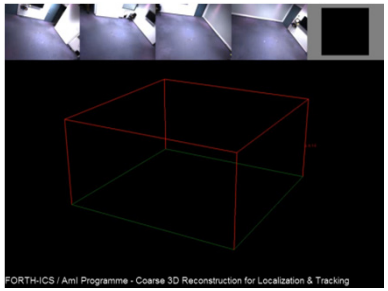

Vision-based interpretation of hand gestures for the remote control of a computer mouse
A.A. Argyros, M.I.A. Lourakis
CVRL/ICS/FORTH

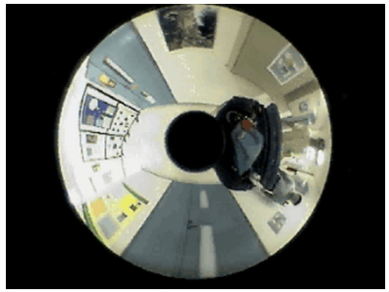






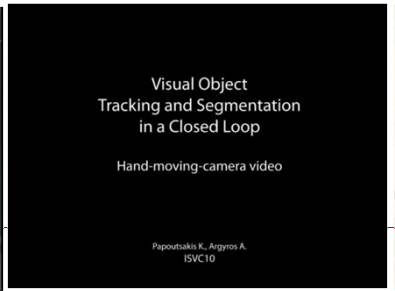

features count: 499

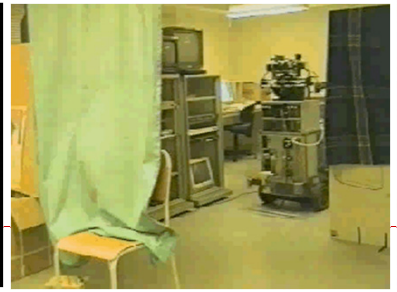

FORTH-ICS / AmI Programme - Coarse 3D Reconstruction for Localization & Tracking




ActIPret


30 7 2002
19:44:45


Visual Object Tracking and Segmentation in a Closed Loop
Hand-moving-camera video
Papoutsakis K., Argyros A.
ISVC10




Moving to a goal position...


30 7 2002
19:18:25

Have a look at:

http://www.ics.forth.gr/~argyros/research.htm

Problem statement

Given markerless visual observations of a hand-object(s) interaction scenario, track the whole scene in 3D

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Problem statement

Given markerless visual observations of a hand-object(s) interaction scenario, track the whole scene in 3D

Freely moving hand(s) interact with a number of rigid 3D objects

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Problem statement

Multicamera setup, stereo, RGB-D camera, …

Given markerless visual observations of a hand-object(s) interaction scenario, track the whole scene in 3D

Freely moving hand(s) interact with a number of rigid 3D objects

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Problem statement

Do not interfere with the action!

Multicamera setup, stereo, RGB-D camera, …

Given markerless visual observations of a hand-object(s) interaction scenario, track the whole scene in 3D

Freely moving hand(s) interact with a number of rigid 3D objects

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Problem statement

Do not interfere with the action!

Multicamera setup, stereo, RGB-D camera, …

Given markerless visual observations of a hand-object(s) interaction scenario, track the whole scene in 3D

- 3D pose of the hand(s) and the object(s)
- Full articulation for the hand(s)

Freely moving hand(s) interact with a number of rigid 3D objects

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Is this an interesting problem?

- **Theoretical interest**
  - Humans solve it, could technical systems solve it, too?
  - Solutions can probably prove useful in other, interesting, similar problems

- **Practical interest** in supporting the interpretation of human activities
  - Understanding grasping and manipulation
  - Sign language understanding
  - Games, virtual/augmented reality
  - Human-Computer Interaction / Human-Robot Interaction
  - …

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Is this an easy problem?

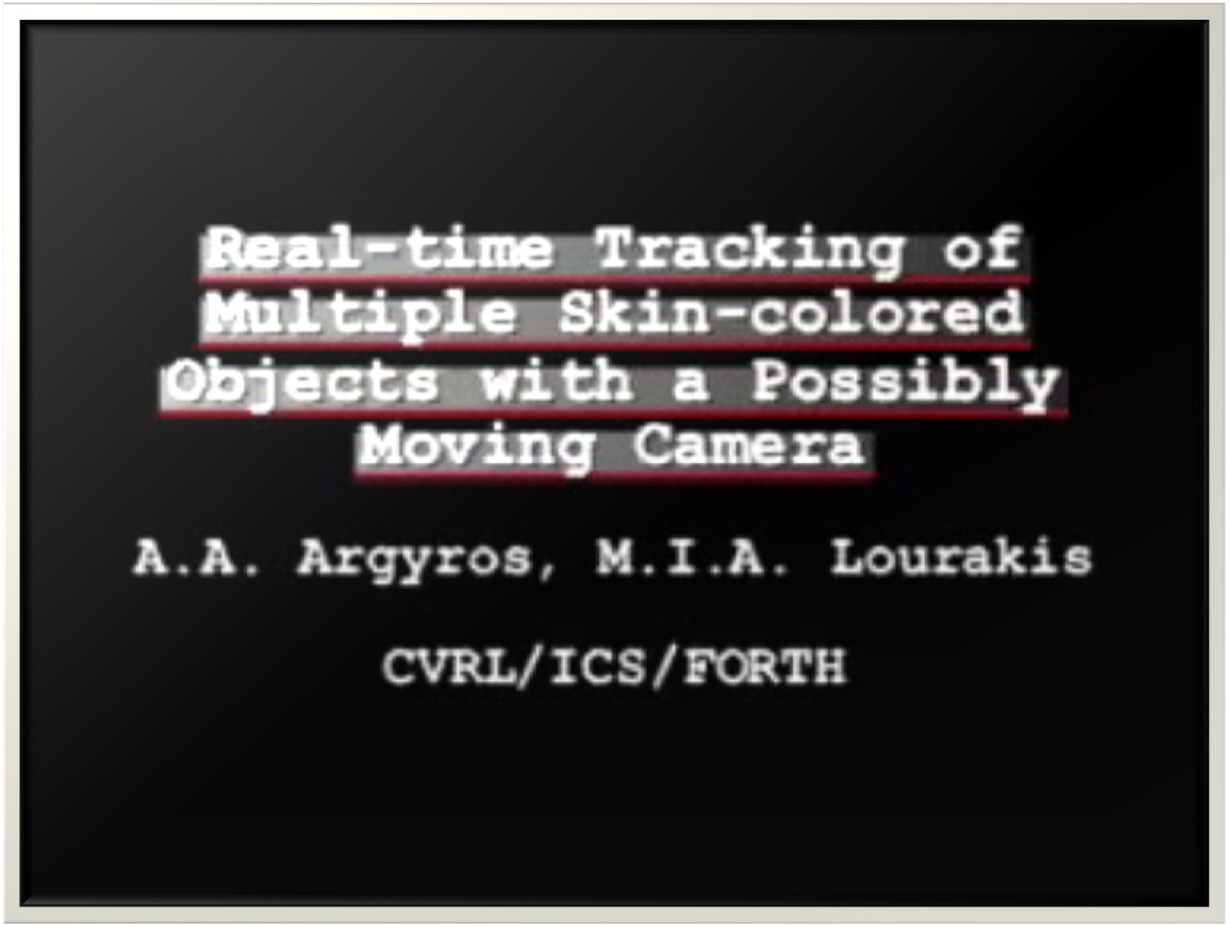
- Not really…
- A problem with high dimensionality…
- … that needs to be solved based on relatively poor observations
  - Chromatically uniform appearance of the hand
  - Severe self occlusions
  - Severe hand/object occlusions
    (in case of hand/object interaction)
  - Distant views
  - Rapid hand motions

Our work on this problem…

Emphasis on
“what” and **“why”**
rather than on **“how”**

Detection and tracking of hands in 2D

2D hand detection and tracking



A.A. Argyros, M.I.A. Lourakis, “Real time Tracking of Multiple Skin-Colored Objects with a Possibly Moving Camera”, in proceedings of the European Conference on Computer Vision (*ECCV’04*), Springer-Verlag, vol. 3, pp. 368-379, Prague, Chech Republic, May 11-14, 2004.

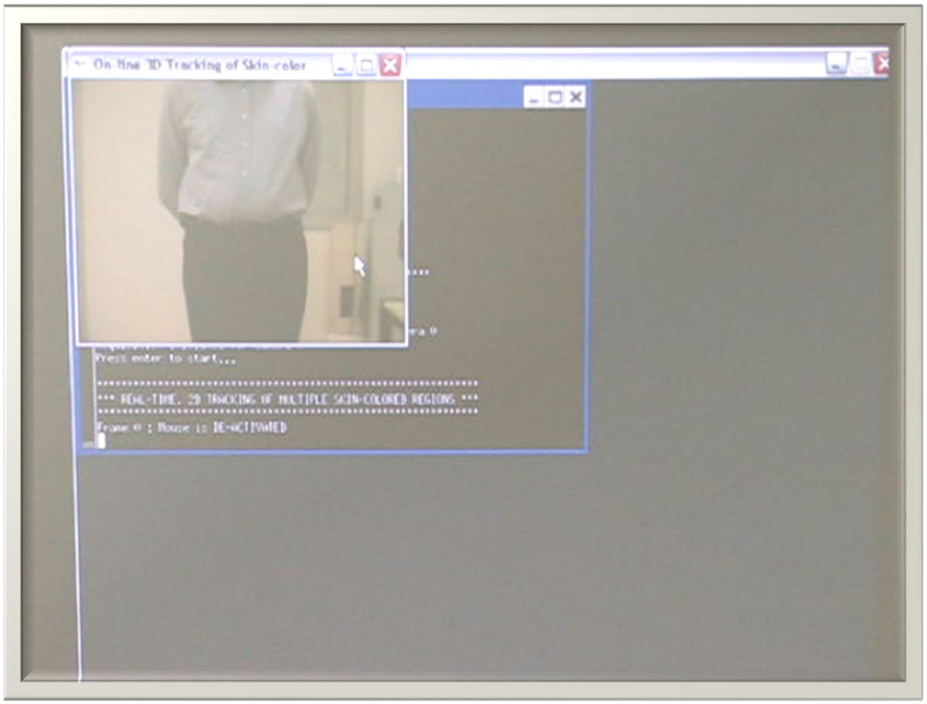
Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Finger detection

A.A. Argyros, M.I.A. Lourakis, “Vision-based Interpretation of Hand Gestures for Remote Control of a Computer Mouse”, in proceedings of the *HCI’06* workshop (in conjunction with *ECCV’06*), LNCS 3979, Springer Verlag, pp.40-51, Graz, Austria, May 13th, 2006. ***Recipient of the “Best Paper Award”.***

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

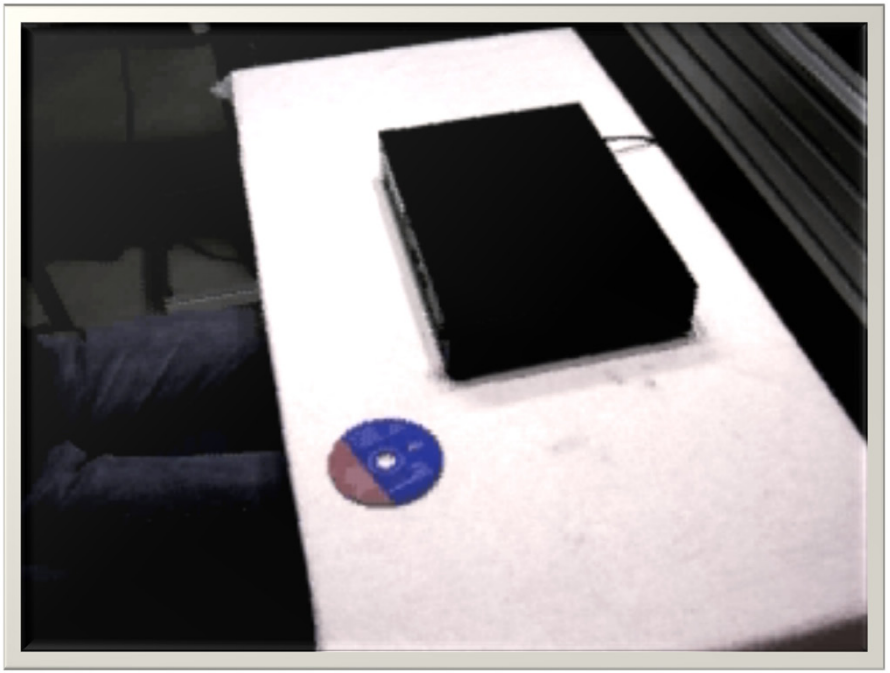
Simple HCI and HRI

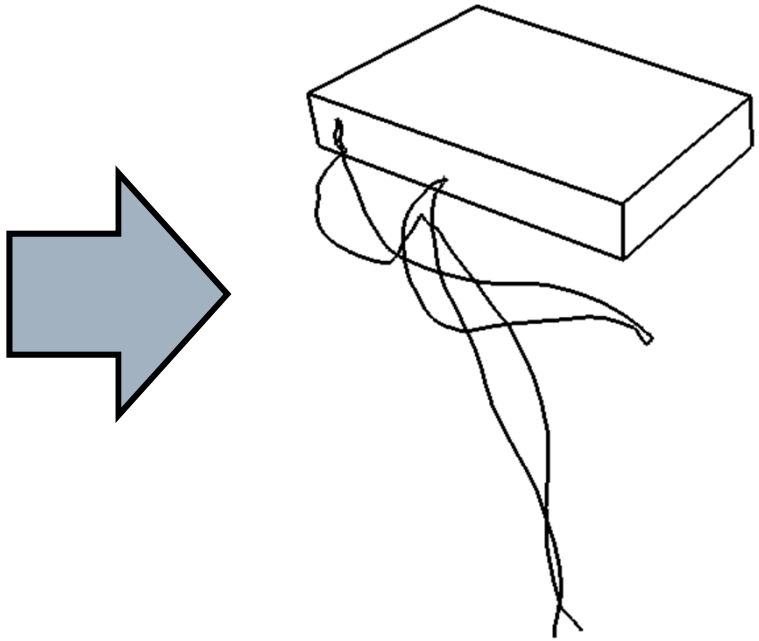


A.A. Argyros, M.I.A. Lourakis, "Vision-based Interpretation of Hand Gestures for Remote Control of a Computer Mouse", in proceedings of the *HCI'06* workshop (in conjunction with *ECCV'06*), LNCS 3979, Springer Verlag, pp.40-51, Graz, Austria, May 13th, 2006. ***Recipient of the "Best Paper Award".***

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Activity interpretation

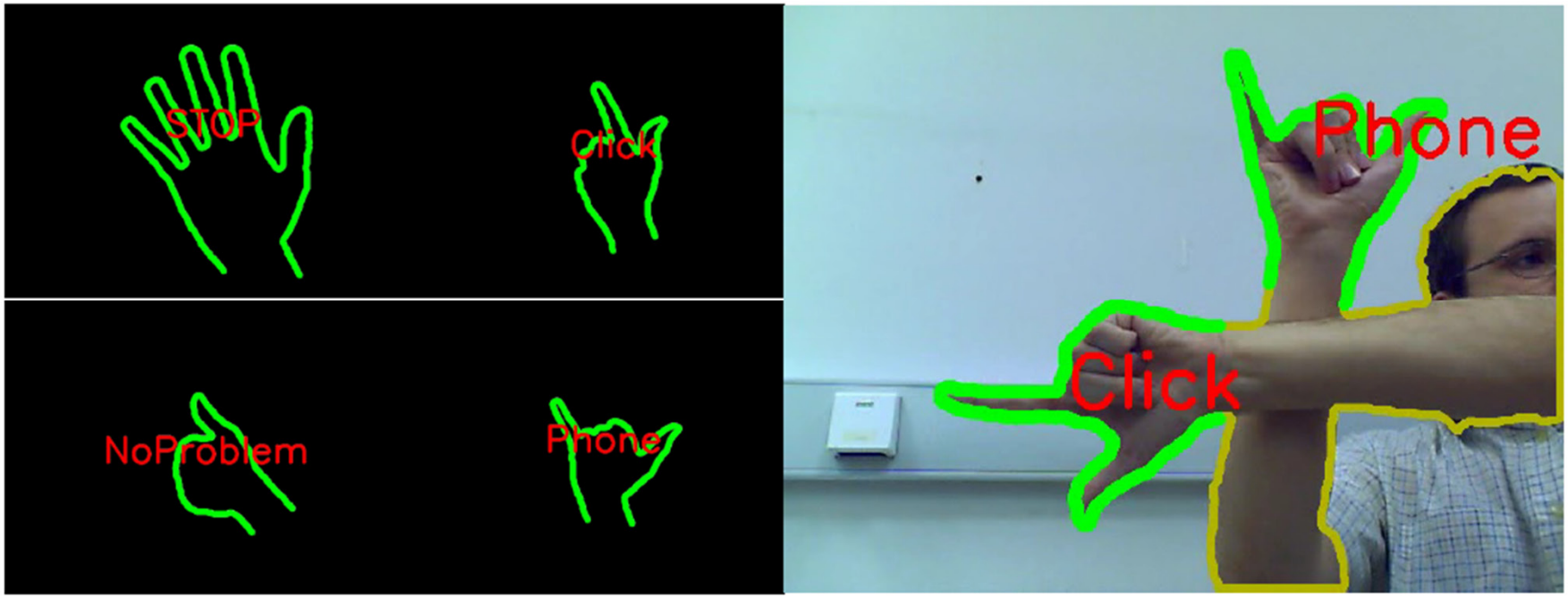




A.A. Argyros, M.I.A. Lourakis, "Binocular Hand Tracking and Reconstruction Based on 2D Shape Matching", in proceedings of the International Conference on Pattern Recognition 2006 (*ICPR'06*), Hong Kong, China, 20 – 24, August 2006.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Deformation tolerant partial shape matching



D. Michel, I. Oikonomidis, A.A. Argyros, “Scale invariant and deformation tolerant partial shape matching”, in Image and Vision Computing (IVC), Elsevier, vol. 29, issue 7, pp. 459-469, June 2011.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Deformation tolerant partial shape matching

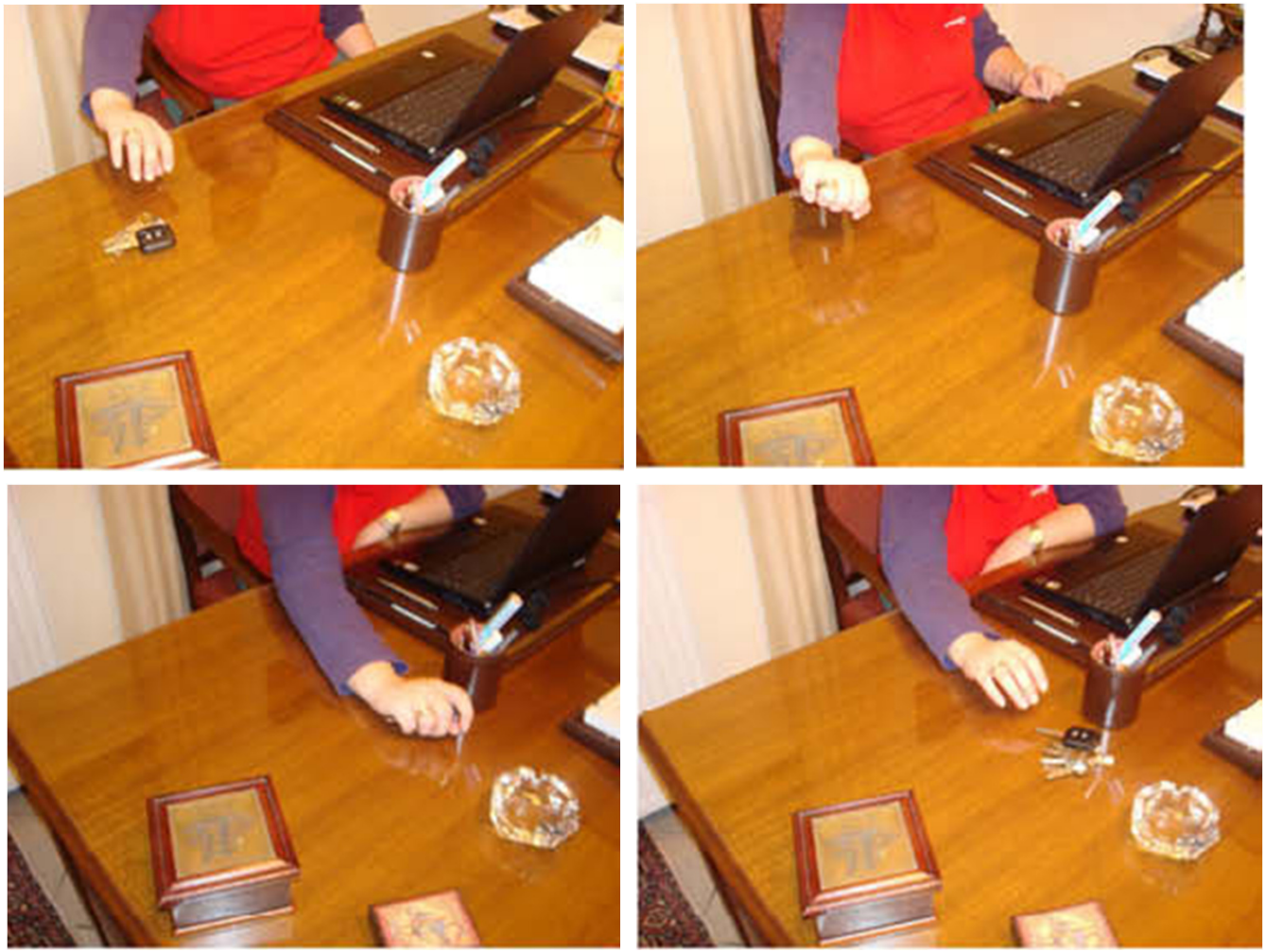
Interpreting hand postures

Interpreting human body postures

D. Michel, I. Oikonomidis, A.A. Argyros, “Scale invariant and deformation tolerant partial shape matching”, in Image and Vision Computing (IVC), Elsevier, vol. 29, issue 7, pp. 459-469, June 2011.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Tracking in the presence of severe occlusions?

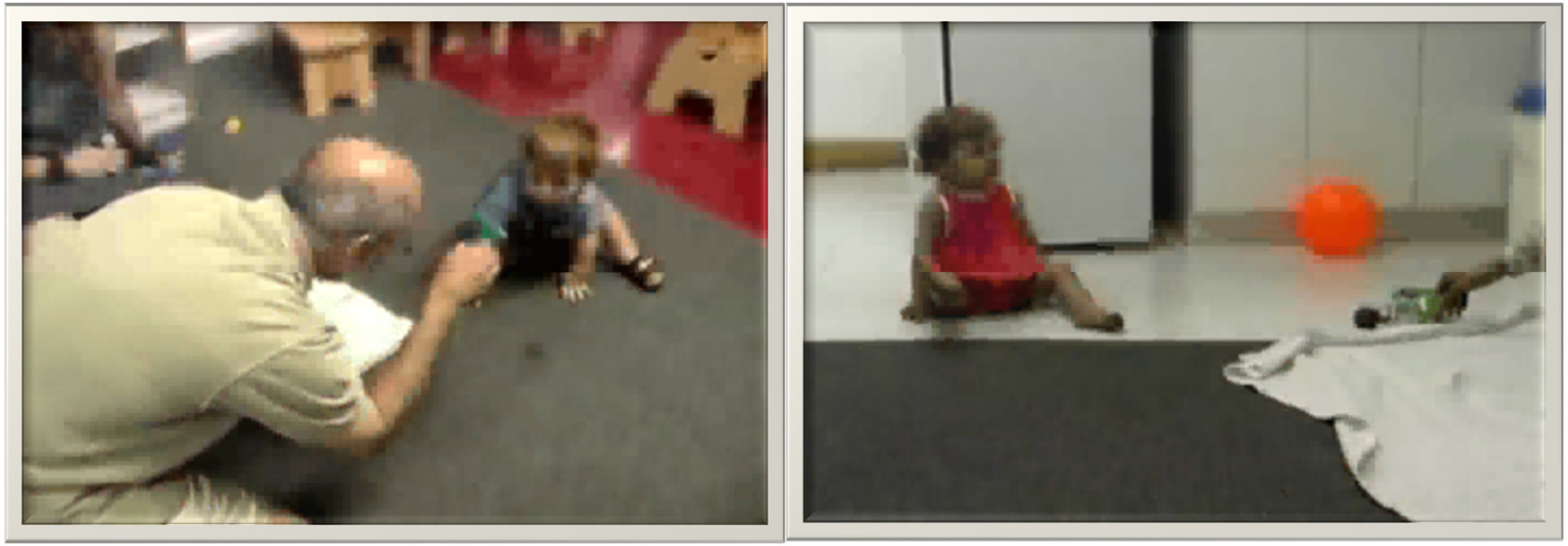


V. Papadourakis, A.A. Argyros, “Multiple Objects Tracking in the Presence of Long-term Occlusions”, in Computer Vision and Image Understanding (CVIU), Elsevier, vol. 114, issue 7, pp. 835-846, 2010.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Tracking in the presence of severe occlusions

Object permanence: the understanding that objects continue to exist even when they cannot be seen, heard, or touched. Studied in the field of developmental psychology (Jean Piaget)

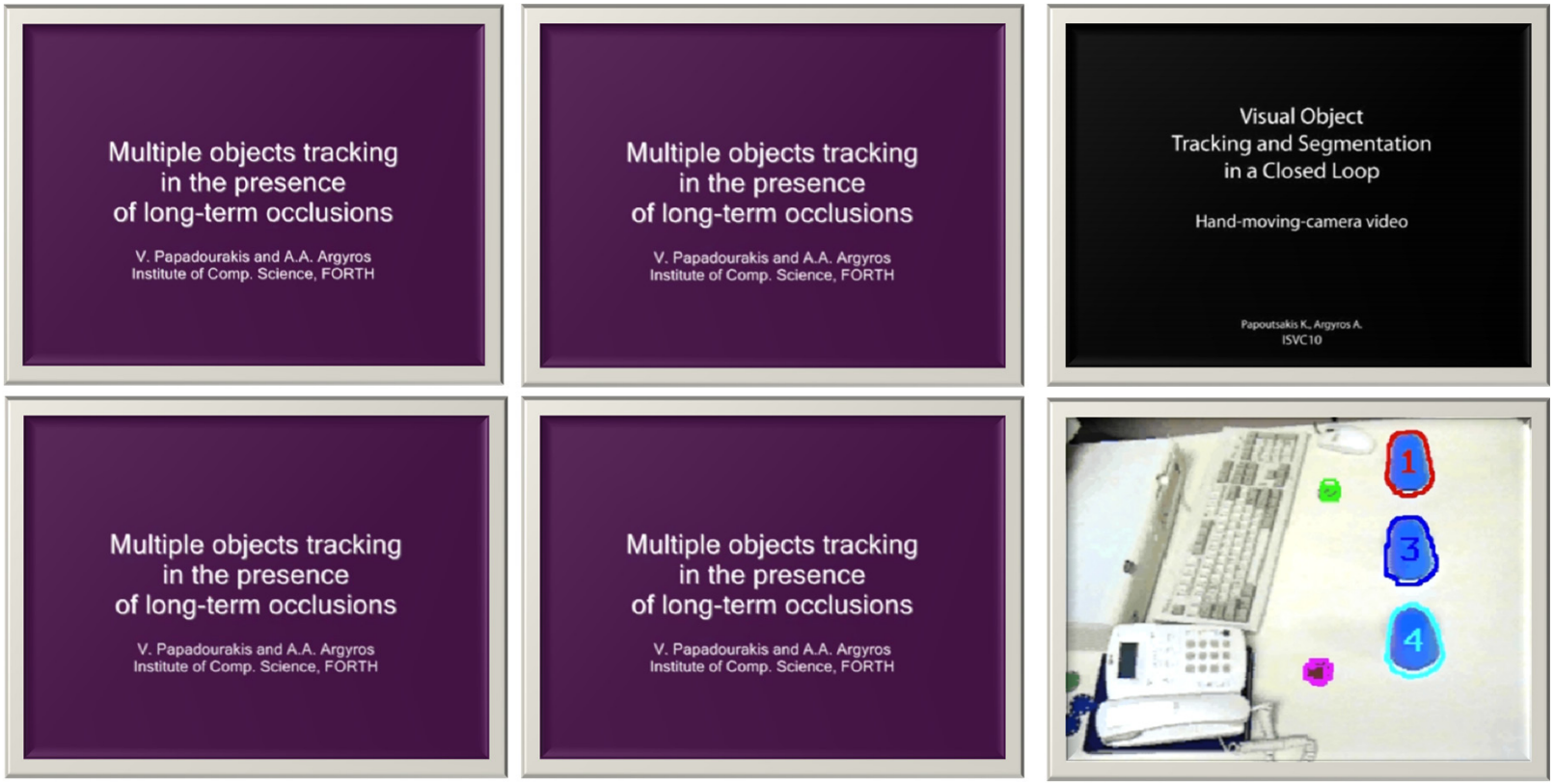


(video source: wikipedia)

V. Papadourakis, A.A. Argyros, "Multiple Objects Tracking in the Presence of Long-term Occlusions", in Computer Vision and Image Understanding (CVIU), Elsevier, vol. 114, issue 7, pp. 835-846, 2010.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Tracking in the presence of severe occlusions



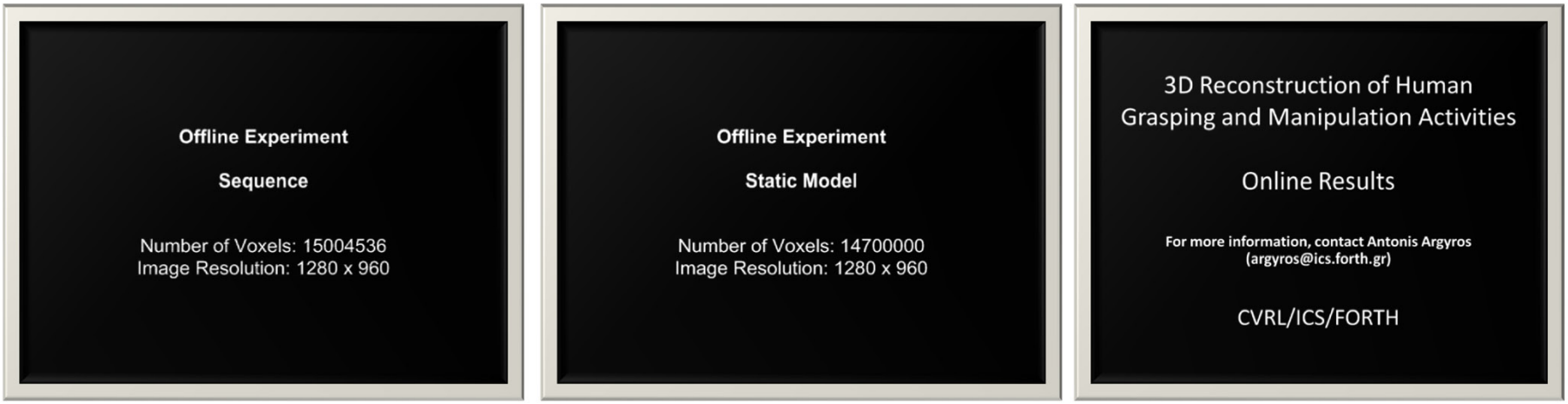
V. Papadourakis, A.A. Argyros, "Multiple Objects Tracking in the Presence of Long-term Occlusions", in Computer Vision and Image Understanding (CVIU), Elsevier, vol. 114, issue 7, pp. 835-846, 2010.
K. Papoutsakis, A.A. Argyros, "Object tracking and segmentation in a closed loop" to appear in Proceedings of the International Symposium on Visual Computing, ISVC'2010, Las Vegas, USA, Nov 29-Dec 1, 2010.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Detection and tracking of hands in 2D

Detection and tracking of hands in 3D

From multiple views to textured 3D meshes



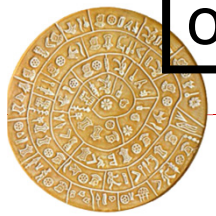
K. Tzevanidis, X. Zabulis, T. Sarmis, P. Koutlemanis, N. Kyriazis, A.A. Argyros, "From multiple views to textured 3D meshes: a GPU-powered approach", in Proceedings of the Computer Vision on GPUs Workshop, CVGPU'2010, In conjunction with ECCV'2010, Heraklion, Crete, Greece, 10 September 2010.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Tracking the articulation of hands

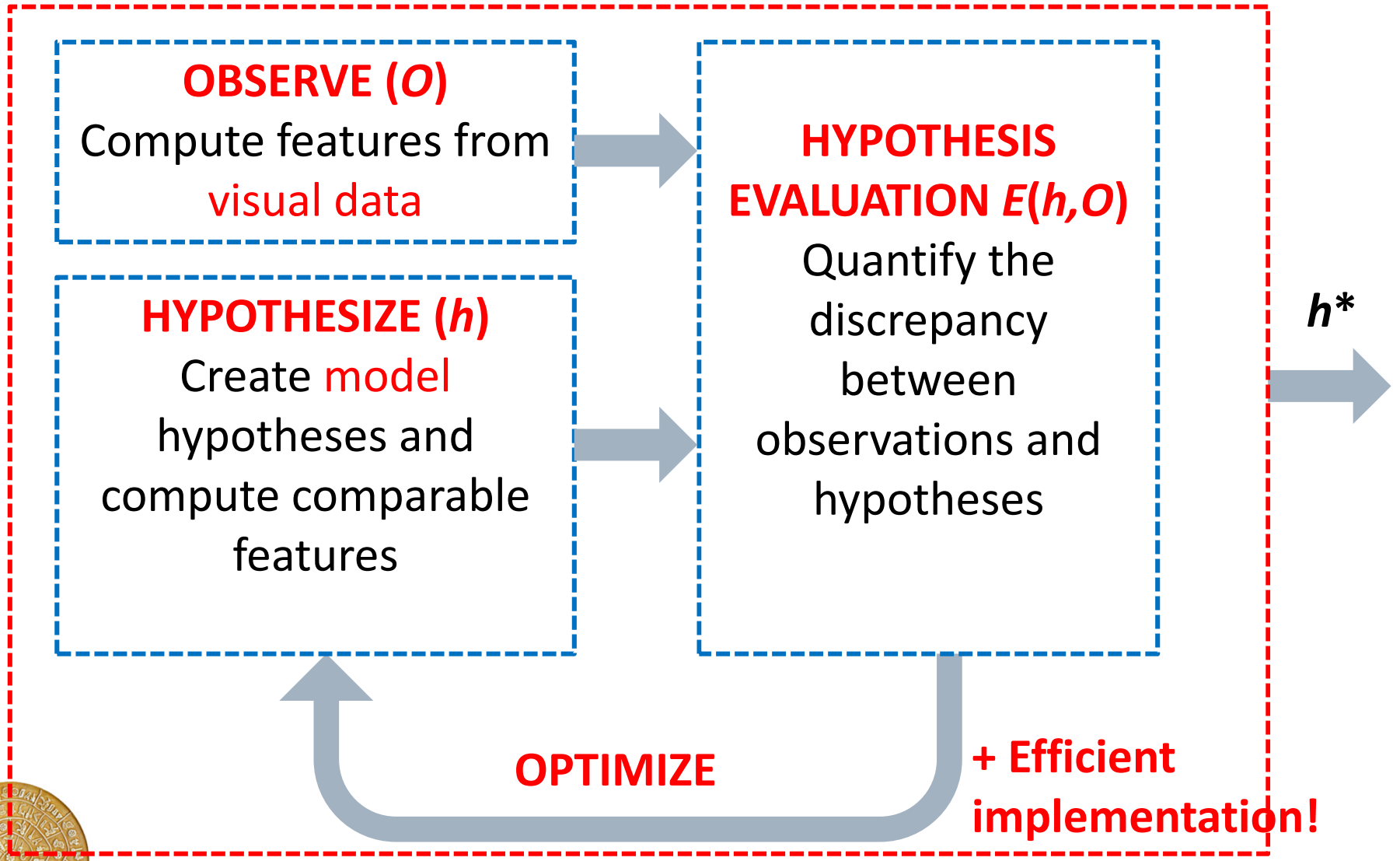
- Estimate the full 3D position, orientation and articulation (i.e., all joint angles of a performing hand)

	Multicamera setup	RGB-D data (Kinect)
A hand in isolation	ACCV'2010	BMVC'2011
A hand interacting with object(s)	ICCV'2011	CVPR'2012 CVPR'2013



Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Our hypothesize-and-test framework



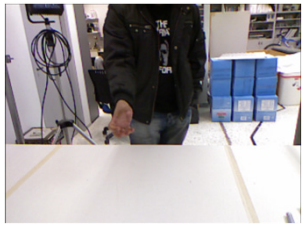
Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

3D hand tracking based on RGB-D images

- **Observations *O*:** 3D structure of the skin colored regions in each RGBD frame
- **Model:** One hand (37 geometric primitives, 20 intrinsic + 6 extrinsic = **26 DoFs = *h***)
- **Hypothesis testing (*E*):** Rank each hypothesis *h* based on its compatibility *E* with the observations *O*
- Formulate an **optimization problem** to minimize the discrepancies between the hypothesis *h* and the observations *O*

$$h^{*} \overset{PSO}{=} \arg\min_{h} \{E(h,O)\}$$

- **Hypothesis formulation and optimization:** Particle Swarm Optimization on a **27D** parameter space





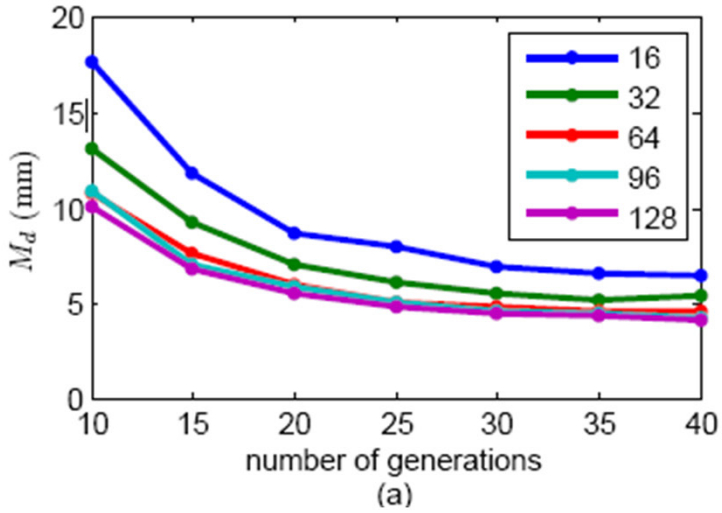
Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

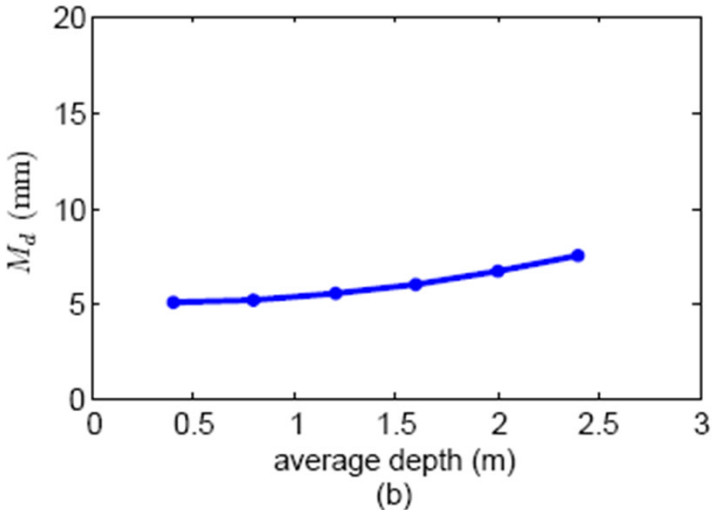
3D hand tracking based on RGB-D images

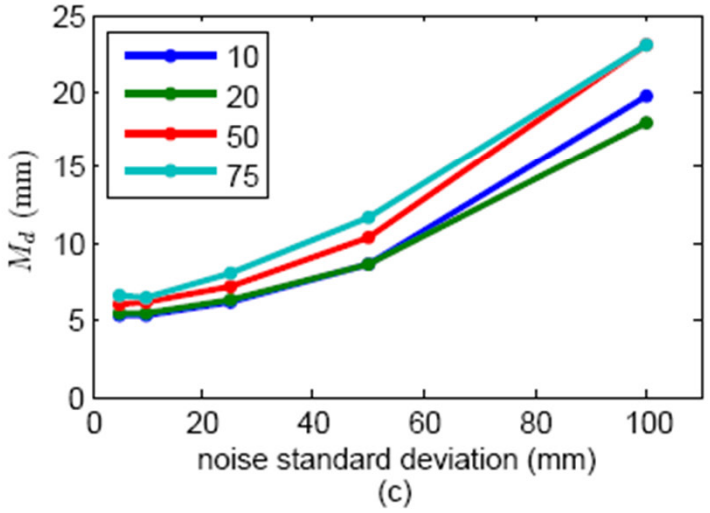
I. Oikonomidis, N. Kyriazis, A.A. Argyros, “Efficient model based 3D tracking of hand articulations using Kinect”, BMVC 2011, UK, September 2011.

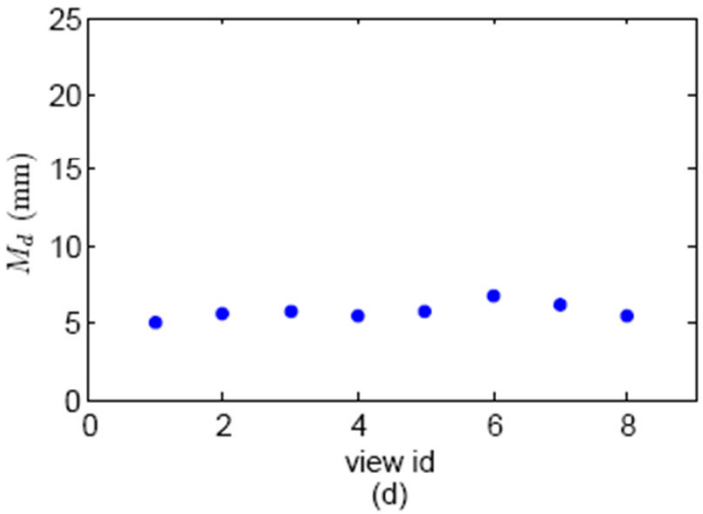
Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Quantitative evaluation









Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Software

- **FORTH 3D Hand Tracking Library:** A software library for the 3D tracking of the articulated motion of hands
  - Available with a free license for research purposes at http://www.openni.org/files/3d-hand-tracking-library/.
  - 1st place award, CHALEARN Gesture Recognition Demonstration Competition
  - In conjunction with ICPR 2012, Tsukuba, Japan, Nov. 2012
  - Sponsored by Microsoft Research, Redmond, USA

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

BUT…

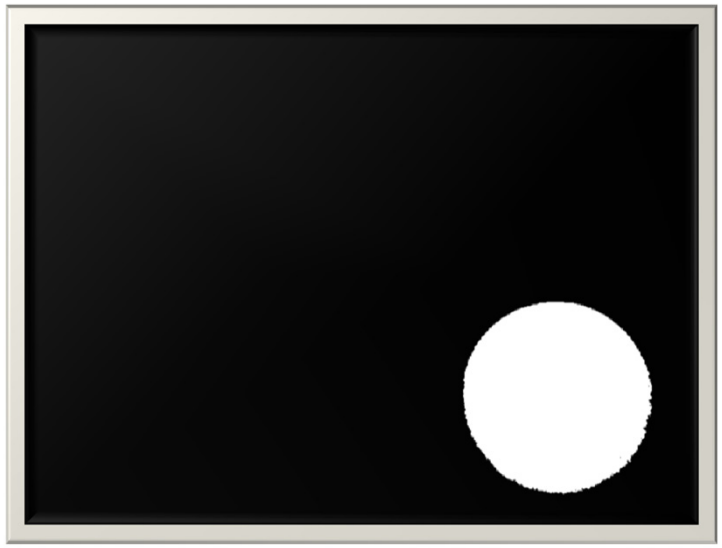
- …besides tracking hands in isolation we are also interested in tracking hands interacting with their environment…

  - What does a hand “tell” about the grasped/manipulated objects?
  - What do objects “tell” about the grasping/manipulating hand?

A hand in interaction with an object

A key observation and idea:

Seeing the hand, “only”



Seeing the object, “only”

- **Thus**
  - occlusions due to hand-object interaction is not a curse to be bypassed but a feature to be exploited…
  - Joint hand-object modeling

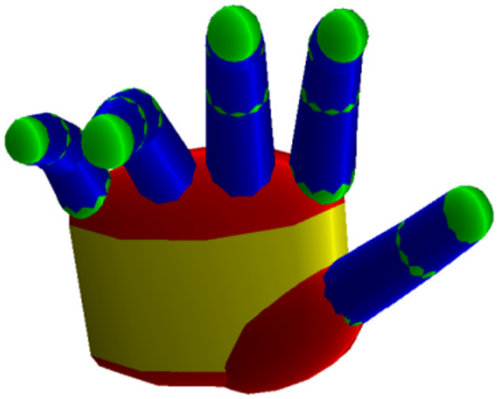
Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

A hand in interaction with an object

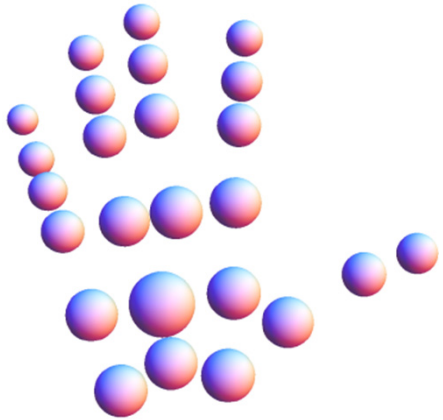
Another (obvious, yet important) observation:

- A hand and an object cannot share the same physical space!

- **Thus:**
  - Penalize physically implausible solutions (i.e., solutions that exhibit hand-object interpenetration)



+



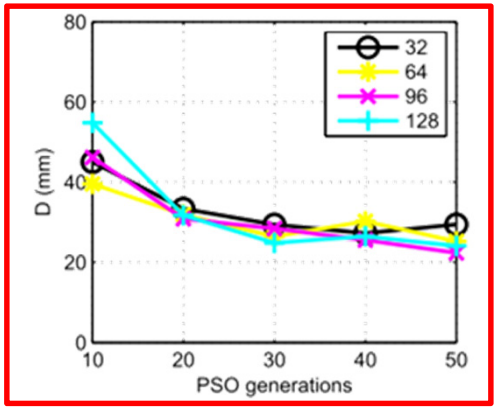
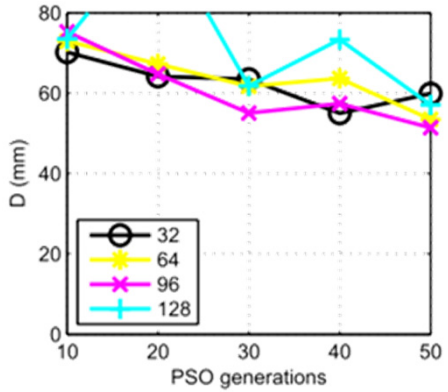
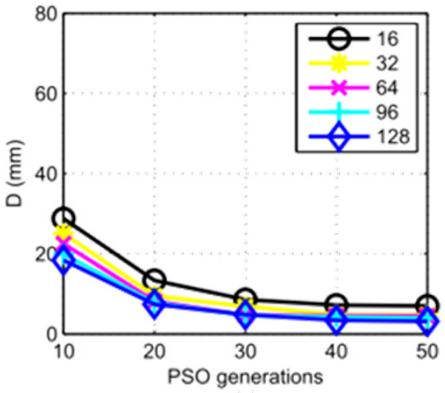
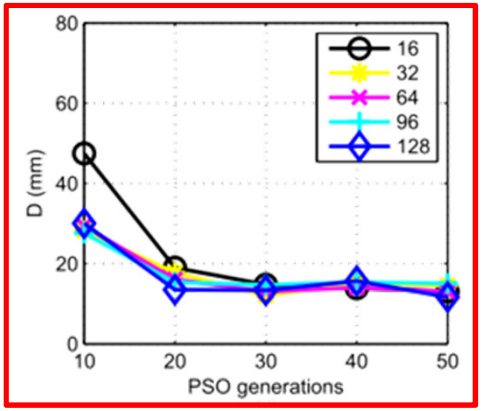
Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

A hand in interaction with an object

I. Oikonomidis, N. Kyriazis, A.A. Argyros, “Full DOF tracking of a hand interacting with an object by modeling occlusions and physical constraints”, ICCV 2011, Barcelona, Spain, November 2011.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Results - parameter investigation

	Object Modeling	No Object Modeling
Input from 2 cameras		
Input from 8 cameras		

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Results - parameter investigation

Object	Estimated/actual parameters (in mm)
Cylinder	Radius: 51/53, Height: 121/131
Ellipsoid	X: 128/116, Y: 128/116, Z: 122/116
Box	X: 66/67, Y 158/150, Z: 84/93

Accuracy in estimating the object parameters

A hand in interaction with multiple objects (RGBD)




Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Tracking two strongly interacting hands

I. Oikonomidis, N. Kyriazis, A.A. Argyros, “Tracking the articulated motion of two strongly interacting hands”, CVPR 2012, Rhode Island, USA, June 2012.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Extending the existing framework…

- **Why?**
  - **Computational complexity** increases fast with the number of the objects to be tracked
    - One hand interacting with *N* rigid objects → (27+*7N*)-Dimensional parameter space…
  - Physical constraints can be taken into account, but one needs to consider them one-by-one…
- **How?**
  - Capitalize on **physics** and on the **single actor hypothesis**: In a hand-object interaction scenario, state changes of **passive objects** are due to the motion of the **active hand(s)**

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Physically plausible 3D scene tracking: The single actor hypothesis

- **Proposed approach:** Track the scene by searching for the **hand motion**, that, in a **physics based simulation** environment, results in hand-object configurations that are as similar as possible to actual, RGBD-camera-based observations
- … thus, given physics-based simulation of hand motion ***x,*** physics-based simulator ***S,*** observations ***O*** and objective function ***E*** scene tracking amounts to solving:

$$x^{*} \overset{PSO}{=} \arg\min_{x} \left\{ E\left(O, S(x)\right) \right\}$$

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Tracking a scene by tracking the actor

N. Kyriazis, A. A. Argyros, “Physically plausible 3D scene tracking: The single actor hypothesis”, CVPR 2013, oral presentation, Portland, Oregon, USA, June 2013.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Up to now:
from images to 3D info

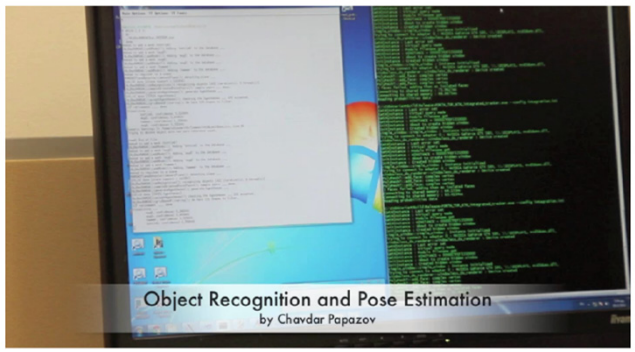
How about moving
from 3D info to "higher level concepts"…

Higher level concepts

- Recognize **action primitives** and **actions**
  - Example: Activity of pouring water from a mug

M. Patel, C.H. Ek, N. Kyriazis, A.A. Argyros, J.V. Miro, D. Kragic, "Language for Learning Complex Human-Object Interactions", in Proceedings of the IEEE Int'l Conference on Robotics and Automation (ICRA 2013), Karlsruhe, Germany, May 6-10, 2013.

- **Infer human intention** to facilitate robot learning by demonstration
  - Example: grasp for tool use, grasp for transfer

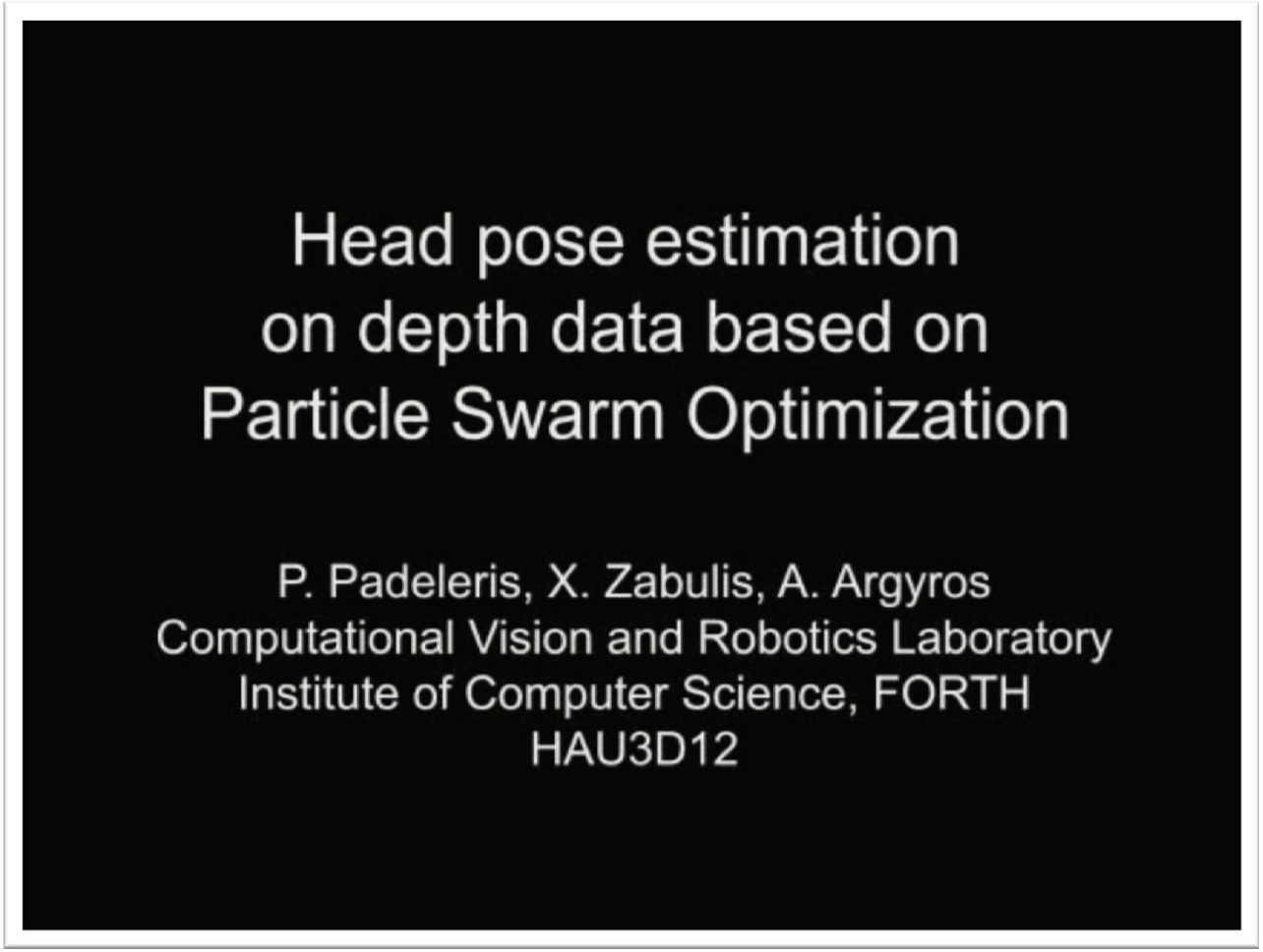


D. Song, N. Kyriazis, I. Oikonomidis, C. Papazov, A. Argyros, D. Burschka, D. Kragic, "Predicting Human Intention in Visual Observations of Hand/Object Interactions", in Proceedings of the IEEE ICRA 2013, Karlsruhe, Germany, May 6-10, 2013.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Different problems, similar hypothesize-and-test computational framework

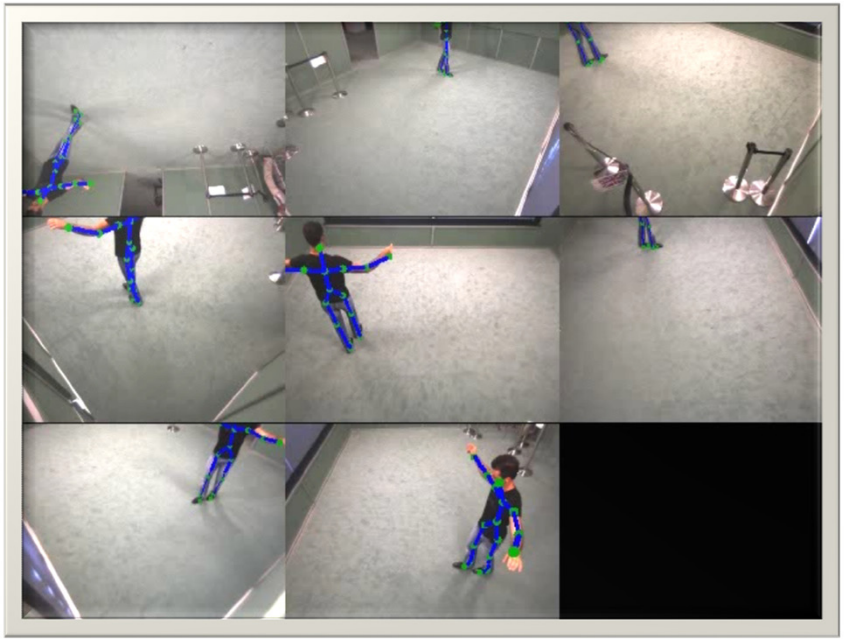
Head pose estimation



P. Padeleris, X. Zabulis and A.A. Argyros, “Head pose estimation on depth data based on Particle Swarm Optimization”, in HAU3D’2012 (CVPR 2012 workshop)

Human body articulation tracking and beat synchronous dance animation

3D body articulation tracking



… and animation of characters

C. Panagiotakis, A. Holzapfel, D. Michel, A.A. Argyros, “Beat Synchronous Dance Animation based on Visual Analysis of Human Motion and Audio Analysis of Music Tempo”, to appear, ISVC’2013

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Shape from Interaction

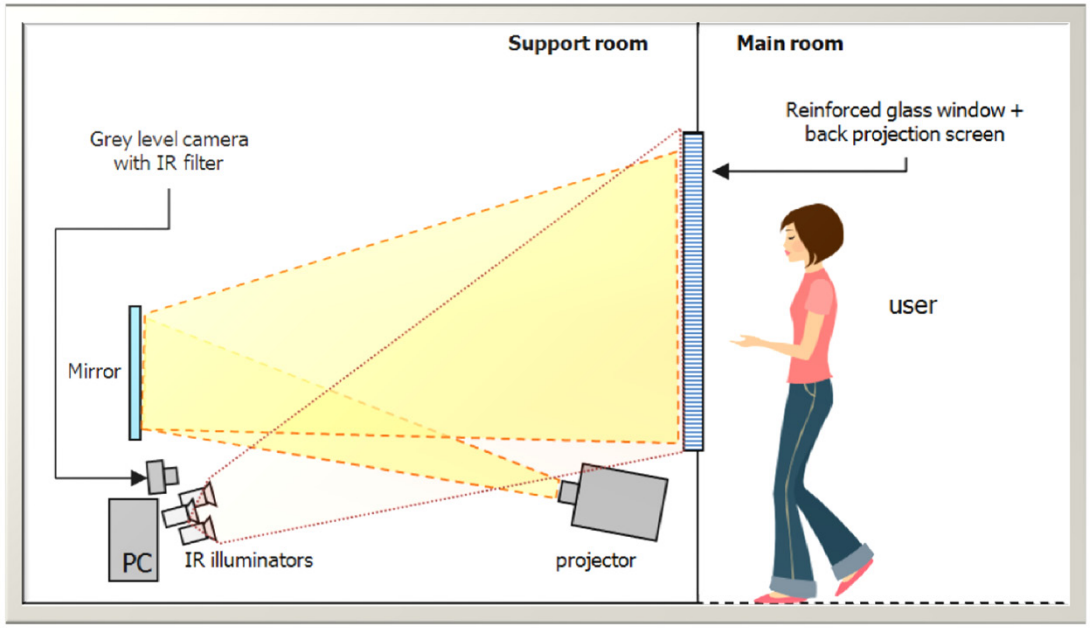
D. Michel, X. Zabulis, A. Argyros, “Shape from Interaction”, MVA journal, under review

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Interesting side effects: Tracking hands at the service of building Smart Environments

Interactive exhibits: Polyapton

- **POLYAPTON**

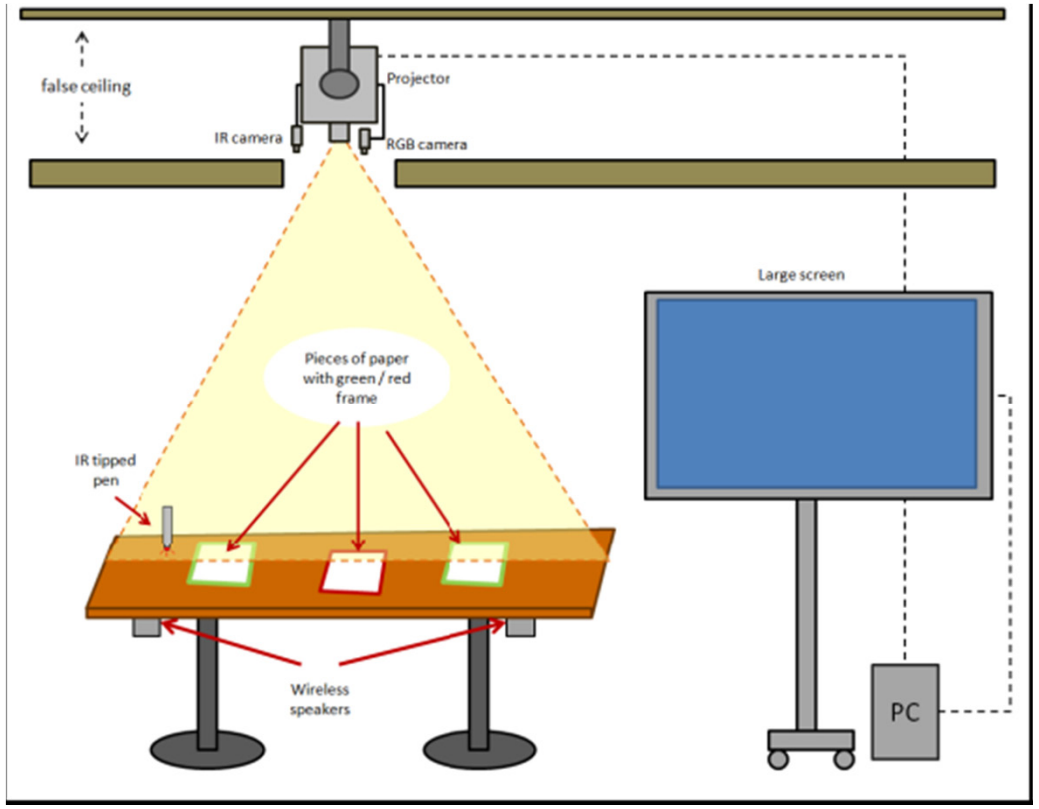


D. Michel, A.A. Argyros, D. Grammenos, X. Zabulis, T. Sarmis, "Building a multi-touch display based on Computer vision techniques", in proceedings of the IAPR Conference on Machine Vision and Applications (MVA'09), pp. 74-77, Hiyoshi Campus, Keio University, Japan, May 20-22, 2009.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Interactive exhibits: Macedonia Map

- **MACEDONIA MAP**



D. Grammenos, D. Michel, X. Zabulis, A.A. Argyros, "PaperView: Augmenting Physical Surfaces with Location-Aware Digital Information" in Proceedings of the ACM SIGCHI Conference on Tangible Embedded, Embodied Interaction, TEI'2011, Funchal, Portugal, Jan 23-26, 2011.

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Acknowledgments

- Dimitris Grammenos
- Cedric Groyer
- Panagiotis Koutlemanis
- Nikolaos Kyriazis
- Manolis Lourakis
- Damien Michel
- Iason Oikonomidis
- Pashalis Padeleris
- Vassilis Papadourakis
- Kostas Papoutsakis
- Thomas Sarmis
- Kostas Tzevanidis
- Xenophon Zabulis

Work supported by the EU projects:

- GRASP

- ActIPret

- Work supported by the ICS FORTH internal Research Programme on Ambient Intelligence Environments

Current work

- EU project **robohow.cog**:

http://robohow.eu/project

Cognitive Robots that Learn Complex Everyday Manipulation Tasks

- EU project **WEARHAP**:

Wearable Haptics for Humans and Robots

- EU project **DALi**:

"Devices for Assisted Living"

http://www.ict-dali.eu/dali

- EU project **HOBBIT**:

"The Mutual Care Robot"

http://www.hobbit-project.eu/

Antonis Argyros, Computer Science Department, Univ. of Crete – Institute of Computer Science, FORTH
argyros@ics.forth.gr, http://www/ics.forth.gr/~argyros

Final remark…

We are not only looking **at** people,

… we are also looking **for** people!!!

argyros@ics.forth.gr

http://users.ics.forth.gr/~argyros

Thanks for your attention!