



KOÇ UNIVERSITY

Optical Microsystems Laboratory (OML)

OML UPDATE, ISSUE NO:4

JULY 2011

OML NEW LAB SPACE

OML Director Hakan Ürey joined Koc University in 2001 and currently a Professor of Electrical Engineering. He has 22 US and European patents, >40 SCI journal papers, >500 Citations, >100 conference papers with many invited talks, 8 edited books, 2 book chapters, 4 awards and chaired several international conferences.

OML lab space kept growing over the years and ended up with labs in three different floors in the Engineering building. Thanks to the University management, we converted a large classroom next to our main lab and combined all the offices and labs in one expanded area located in Engineering Z16, which is more than 300 m². New OML space includes offices, a meeting room, 20m² clean room for MEMS testing, a large main lab area, and 3 smaller rooms for special projects



Pico-Projector developed by Microvision Inc. incorporates many inventions of Dr. Ürey. Now his group is working on next generation MEMS scanners and novel ways to make 3D displays using pico-projectors.



OML Research has been showcased during a number of events and visits held in recent months.

OML STUDENT PATENTS

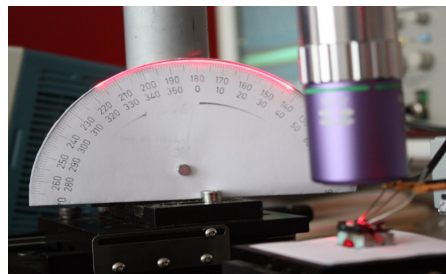
Many Inventions with Koç undergraduate and graduate students as co-inventors are licensed to industry:

- H. Urey, O. Ergeneman, United States Patent 7,489,433, "Method and apparatus for making and using 1D and 2D magnetic actuators," Issued Feb 10, 2009 (Licensed to Microvision Inc., USA)
- H. Urey, H. Torun, US Patent Pending, European Patent EP1757914 (Licensed to ASELSAN, Turkey).
- H. Urey, C. Ataman, US Patent, 7,733,493, "Fourier transform spectrometer" Issued June 8, 2010 (Licensed to Fraunhofer Institute for Photonics Microsystems, Germany).
- H. Urey, R. Sprague, S. O. Isikman, "Scanning light collection," US Patent Pending, 20080237349 (Licensed to Microvision Inc., USA)
- R. Sprague, H. Urey, S. O. Isikman, "Variable laser beam focus," US Patent Pending, 20080230611 (Licensed to Microvision Inc., USA)
- H. Urey, M. Sayinta, "Method and apparatus for 3D Display," WIPO Application 2008 (Licensed to industry)
- H. Urey, E. Alaca, E. Timurdogan, "Biosensor for multi-analyte detection," Patent pending (Licensed to Inventram Inc.)
- H. Urey, U. Baran et al, "Rotary MEMS Scanner," Patent pending (Licensed to industry)
- H. Urey, K. Aksit, M. K. Hedili, "Method and apparatus for 3D display screen," Patent pending (Licensed to Microvision Inc.)

See our web site for full list of patents and papers.

OML RESEARCH PROJECTS

MEMS Scanners: Our main goal in MEMS scanner projects is to investigate different scanner technologies (mirror based and microlens based, monolithic and hybrid, Silicon and FR4) and scanning architectures to meet the compact form-factor, low power consumption, low dynamic deformation, large scan angle and mirror size, and high scanning speed requirements. Both electrostatic comb-drive and electromagnetic actuated scanners are designed and developed at OML. Main sponsor : Microvision Inc., USA.



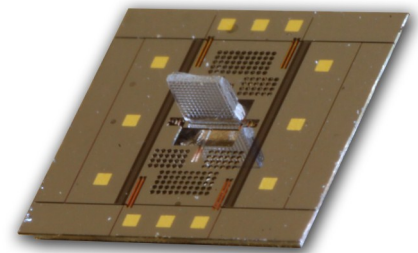
MEMS scanner with record performance. 76deg scan angle at 20KHz with 1.5mm mirror.

MEMS Spectrometers: Both FR4 and MEMS based spectrometers are developed for Fourier Transform Spectrometer applications. Using a lamellar grating interferometer based MEMS device, we recently achieved >500um deflection, 10mm² clear aperture area, and >300Hz operation. Latest results will be presented at OMN2011 conference. (Sponsor: FTS system is developed within the MEMFIS Consortium and sponsored by European Commission under FP7 program.

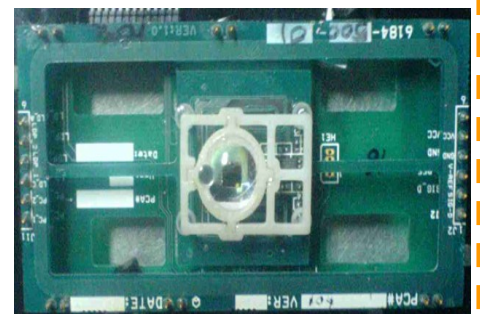
MOEMS Thermal Camera:

We focus on a new thermo-mechanical IR detection technology with micro-optical readout method. Thermo-mechanical infrared detectors convert the infrared radiation (IR) to mechanical displacement using bi-material bending of thin-film structures in response to heat energy. The deflections can be measured with sub-nanometer accuracy using optical techniques.

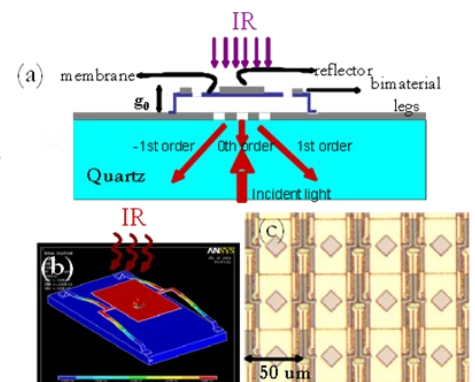
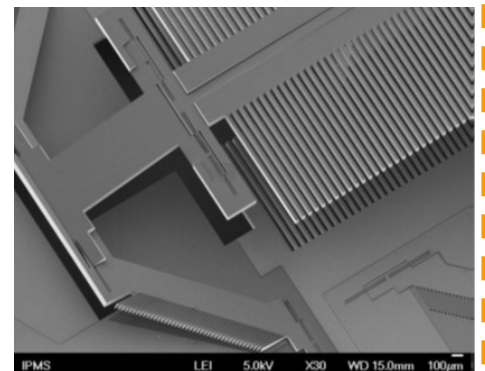
Nano-Biosensor for Point-of-Care Diagnostics: This is a multi-disciplinary project supported by TUBITAK and aims to develop easy to use, robust, portable, real-time, remote, low-cost and multi-analyte biosensor platform. Actuation is achieved using thin-film ferromagnetic material as the cantilever material. Resonance frequencies of the cantilevers are observed by utilizing the grating interferometric optical readout.



1mm Microlens array on MEMS Stage



Advanced Barcode Reader: 2 DOF FR4 Scanner integrated with VCSEL, detector, and magnetic actuator and angle sensors.



OML JAM SESSION II— Dec 29, 2010

DIRECTOR

Prof. Dr. Hakan Ürey

RESEARCHERS

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Aslıhan Arslan
Gökhan Hatipoğlu
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Erdem Erden
Kutal Gökçe
Dr. V. C. Kishore
Dr. Jaibir Sharma
Dr. Onur Ferhanoğlu

FULL LIST

<http://home.ku.edu.tr/~mems/members.htm>

Past and present OML members took the holiday period as an opportunity to get together for an end-of-the year gathering on Dec. 29th. An afternoon session with presentations by some of the past and present members of the OML ended with the traditional dinner & entertainment in Barınak restaurant.

- ◆ Dr. Hakan Ürey, Koç University “Welcome & OML Update”
- ◆ Dr. Çağlar Ataman, Research Associate at EPFL “MEMS Thrusters for Satellite Propulsion”
- ◆ Dr. Hamdi Torun, Asst. Prof. at Boğaziçi University “Microsystem Development for Single-Molecule Mechanics Measurements”
- ◆ Dr. Arda D. Yalçinkaya, Asst. Prof. at Boğaziçi University “Development of medical micro-devices for interventional operations”
- ◆ Serhan Işıkman, UCLA PhD Student “Lensfree Optical Tomography”
- ◆ M. Fatih Toy, EPFL PhD Student “DHM for Space Biology: Tale of a Parabolic Flight Campaign”
- ◆ Erman Timurdoğan, MIT PhD Student “Large scale automated optical interconnect tuning for communications”
- ◆ Onur Ferhanoğlu, PhD Student at Koc Univ., “Top 10 Multimedia Files of OML Members”

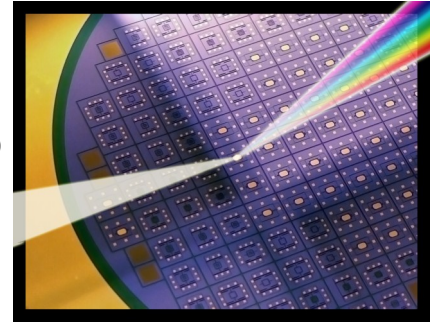
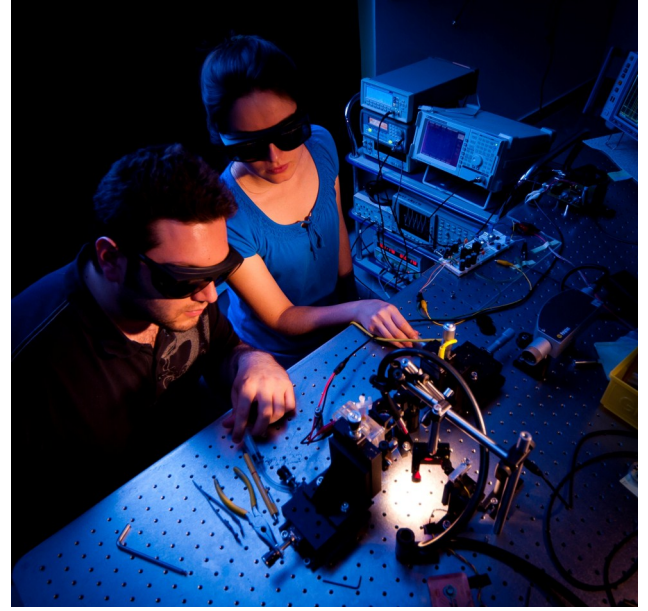


Photo taken at Barınak after OML Jam Session with current and former OML Members

OML RESEARCH INTERESTS AND SPONSORS

RESEARCH INTERESTS:

MEMS/NEMS, micro-optics, photonic microsystems, 2D/3D displays biophotonic Microsystem Applications

CURRENT PROJECTS



MICROVISION

Microvision Inc., USA
MEMS & FR4 Scanners
2010-2012



TÜBİTAK

Scientific and Technical
Research Council, Turkey
(1) Biosensor 2010-12

aselsan

Aselsan, Turkey.
MOEMS Thermal Camera
2010-2013



Prof. Ürey received TUBITAK-Encouragement Award from the President of Turkey, Abdullah Gül

memfis

MEMFIS: EC-FP7 Grant
MEMS Spectrometer
2008-2012



HELIUM3D: EC-FP7 Grant
3D Laser Display
2008-2011



MICROVISION

USA: 6 projects
completed 2001-2007



Fraunhofer- IPMS,
Germany
2007-2008



EC FP6; Network of
Excellence in Micro-Optics
2004-2008



NSF: US-Turkey
Collaboration
Duration: 2004-2006



TÜBİTAK

TÜBİTAK
(1) Magnetic Scanner:
2004-06
(2) Nanomagnetic
Mat. 2005-07



National Academy of
Sciences, Turkey
Outstanding Young
Scientist Award
2006-2009



EC FP6: 3DTV
Network
2004-2008



EC FP6: MINOS-
Euronet
Duration: 2005-
2008

MC2

MC2ACCESS,
Chalmers,
Sweden 2008



KUMPEM, Barcode
Scanner
2004-2006



ARCELİK,
Turbidity
Sensor 2006

AYGAZ aselsan

AYGAZ LPG 3D
Inspection:
2006-2007

Aselsan, Turkey.
MOEMS Thermal Camera
2006-2009

COMPLETED PROJECTS

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