



PROJECT OF SCIENCE AND TECHNOLOGY CO-OPERATION

BETWEEN

**MIDDLESEX UNIVERSITY
SCHOOL of COMPUTING SCIENCE
UNITED KINGDOM**

AND

**SOUTH FEDERAL UNIVERSITY (SFedU)
A.B.KOGAN RESEARCH INSTITUTE FOR NEUROCYBERNETICS (KRINC)
LABORATORY OF NEUROINFORMATICS OF SENSORY AND MOTOR SYSTEMS (LNISMS)**

RUSSIA

**REAL-WORLD IMAGES PROCESSING BY DETECTION OF THEIR STABLE
REGIONS**

2007-2009

LONDON – ROSTOV-ON-DON

1 - Title of the project:

REAL-WORLD IMAGES PROCESSING BY DETECTION OF THEIR STABLE REGIONS

2 - Partners:

Middlesex University:

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Project Director: Senior Lecturer, Dr. Xiaohong Gao, PhD

South Federal University:

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Project Director: Head of the LNISMS, Dr. Lubov Podladchikova, PhD

3 - Goal of the Project:

The main goal of the Project is an application of the approaches and methods developed earlier [Gao X. et al, 2002-2007; Shaposhnikov D.G et al, 2002-2007] for real-world image processing.. The specificity of our approach for image processing and recognition consists of: (i) colour segmentation by CIECAM97 model [Gao X. et al, 2002-2007], (ii) identification of the most stable image regions, (iii) space-variant or fovea-like image representation, (iv) content feature description.

4 - Expected results:

Software modules of the systems for processing of traffic signs and faces during PET procedures.. Algorithms and methods for detected of the stable informative images regions, verification of model and predictions in psychophysical test. Joint publications on the theoretical and experimental results.

5 - Objectives:

1. Design of the software modules based on the models (for traffic sign and face image during PET procedures developed earlier.
2. Verification of the model predictions in psychophysical experiments.
3. Development of an algorithms for face detection based on colour segmentation by CIECAM'97 model.
4. Development of an algorithms for detection of stable regions in the facial images during PET procedure.

6 - Preliminary joint work:

This Project is continued of the joint Projects: “Development of Biologically Plausible Models of Vision with Application to Real-world Image Analysis” (2001-2003) and “Invariant IMAGE Recognition by Identification of their Most Informative Regions” (2004-2006). The collaborative work started in 2000 during 4-th International Conference on Cognitive and Neural Systems (Boston, USA). In 2001, by the support of The Royal Society under international exchange scheme (gt/Ex-Agr/hostacct), a Russian team member, Dr. Shevtsova visited the Middlesex University for 6 weeks to apply the Behaviour Model of Vision (BMV) to the traffic sign recognition task. In 2005, Dr. Podladchikova visited the Middlesex University as external examiner during defense procedure of PhD student K.Hong. The obtained results were published in 16 papers and presented on 10 of international conferences.

The work was based on application of two models developed earlier for image segmentation and recognition. The first of them is the CIECAM97 model [Gao X. et al, 2002-2005] and the second one is the BMV model [Podladchikova L.N. et al, 1997; Rybak I.A et al, 1998]. The main goal of this work was a creation of a low-cost and high-performance traffic sign recognition system based on bio-vision simulations. Several new algorithms and procedures to improve the system recognition rate and computational efficiency were elaborated.

The results obtained during previous Project implementation indicate on possible ways for modification of the developed system to improve the recognition efficiency. In particular, an approach to achieve a stable recognition rate by the BMV model for partially occluded traffic signs should be found. Further more, an opportunity for application of face recognition methods and algorithms to improve the analyses the face images will be investigated during PET procedure.

7 - Steps of the Project and the role to be played by each research team:

The whole work will be carried out using mathematical modelling computer and simulation methods. The steps of work are coincident with Objectives of the Project. Basic model for traffic sign segmentation and recognition developed earlier [Gao X. et al, 2002-2003, Shaposhnikov D.G. et al, 2002-2003] will be used during the Project implementation.

KRINC, Rostov State University (RUSSIA):

Stage 1. Design of the software module based on the model for invariant traffic sign images recognition developed earlier. Development of assistant tools to carry out extensive computer simulation and to estimate the system performance.

Stage 2. Development experimental set up and conducting psychophysical experiments for verification of the model prediction about possible errors in the human perception of warning traffic signs.

Stage 3. Development of an algorithms for detection of stable regions in the facial and PET images.

School of Computing Science, Middlesex University (UNITED KINGDOM):

Stage 1. Creation of a database of real world traffic signs arranged according to their transformations based on own algorithms of colour segmentation.

Stage 2. Development of software for segmentation of traffic sign by CIECAM'97 model.

Stage 3. Development of an algorithms for face detection based on colour segmentation by CIECAM'97 model.

8 - Organization and Financial Statement:

In the framework of the present Project, each partner has its own financial support of research. Additional financial support may be search from different national and international foundations. The additional cause will be negotiated and signed respectively by both Institutions.

9 - Exchange of research teams:

The partners will exchange scientific reports, papers and demonstration data. They will prepare joint publications and exchange scientists for participation in scientific and educational seminars and carrying out joint research works.

10 - Research team list:

From the KRINC:

Project Director:	L.PODLADCHIKOVA	Head of the LNISMS
Principal Investigators:	A.GOLOVAN	Senior Researcher
	V.GUSAKOVA	Senior Researcher
	D.SHAPOSHNIKOV	Researcher
	S.ANISHENKO	Engineer

From the School of Computing Science:

Project Director:	X. GAO	Senior Lecturer
Principal Investigators:	K.HONG	PhD Student
	S.BATTY	PhD Student

11 - Duration of the Project:

This agreement comes into force upon signing and will remain continue in force for a three year period, 2007-2009 renewable by explicit agreement. This agreement can be cancelled by either of the two partners with a six months advance notice.

12 - Administrators of the project:

Signed, from the **Middlesex University**:

Vice-Chancellor/Dean of School,
Professor Norman Revell

Project Director, Dr. X. Gao

Date:

Signed, from the **Rostov State University**:

Director of the KRINC,
Professor Boris Vladimírsky

Project Director, Dr. L. Podladchikova

Date: