

Progress Report for 1992
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**Poročilo o rezultatih
opravljenega raziskovalnega dela
na znanstveno-raziskovalnem projektu
P2-1122-781 v letu 1992**

**Progress Report
on Research Project
P2-1122-781 in 1992**

Naslov projekta: *Rekonstrukcija oblik s pomočjo parametričnih modelov*
Project title: *Shape reconstruction with parametric models*

Izvajalec / Organization: *Fakulteta za elektrotehniko in računalništvo*

Odgovorni nosilec / Project head: *Franc Solina*

Številka pogodbe / Contract No.: *P2-1122-781*

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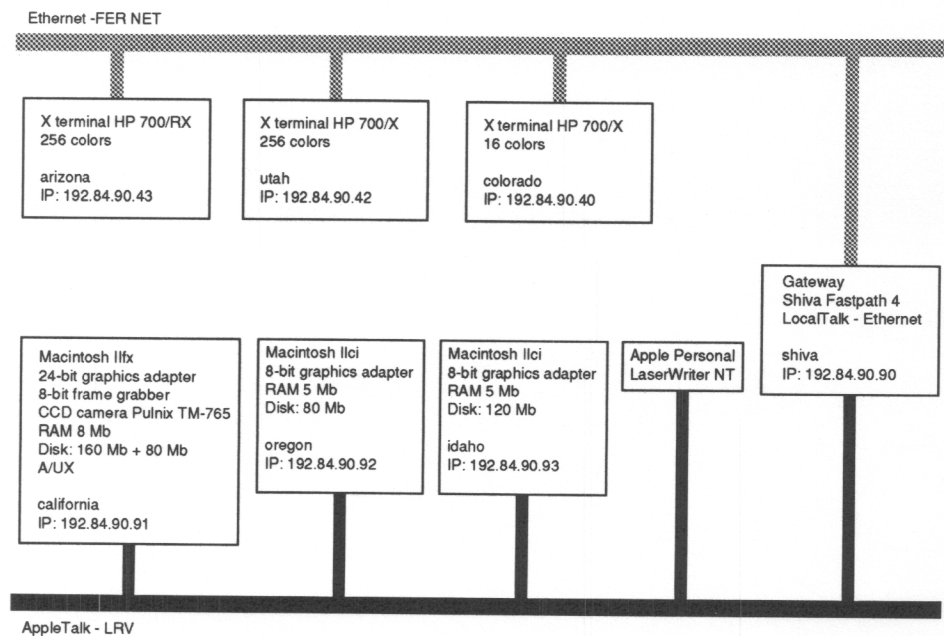
Aleš Leonardis,
Jasna Maver,
Aleš Jaklič,
graduate students

Research goals:

Basic research in *computer vision* with emphasis on computational models for shape, texture and color in combination with the segmentation process. The goal is to develop a robust vision system architecture that can combine different modules, adapt to the current purpose of the vision system and to the available computational resources.

The laboratory has some experience and consults also in *multimedia*, *visualization* and *desk-top publishing*.

Equipment:



Projects:

- *Shape reconstruction with parametric models* —Project P2-1122, Slovenian Ministry for Science and Technology,
- *Interpretation of Medical Moiré Images* —joint project with Medical Physics Department of The Veterinary University, Vienna, Austria.

Recent Publications:

- [BLL90a] R. Bajcsy, S.W. Lee, and A. Leonardis. Color image segmentation and color constancy. In *Proceedings of the SPIE/SPSE Symposium on Electronic Imaging Science and Technology*, Santa Clara, CA, February 1990.
- [BLL90b] R. Bajcsy, S.W. Lee, and A. Leonardis. Color image segmentation with detection of highlights and local illumination induced by inter-reflections. In *Proceedings of the 10th International Conference on Pattern Recognition*, pages 785–790, Atlantic City, NJ, June 1990.
- [BSG90] Ruzena Bajcsy, Franc Solina, and Alok Gupta. Segmentation versus object representation—are they separable? In Ramesh C. Jain and Anil K. Jain, editors, *Analysis and Interpretation of Range Images*. Springer, New York, 1990.
- [JS91] Aleš Jaklič and Franc Solina. Extracting reflectance properties of materials by active vision. In *Proceedings 15. ÖAGM Arbeitstreffen*, Klagenfurt, Austria, 1991. Österreichische Arbeitsgemeinschaft für Mustererkennung.
- [LB92] A. Leonardis and R. Bajcsy. Finding parametric curves in an image. In G. Sandini, editor, *Proceedings of The Second European Conference on Computer Vision—ECCV-92*. Springer-Verlag, 1992. LNCS-Series Vol. 588.
- [Leo92] Aleš Leonardis. Recovery of parametric models in an image. In *Proceedings of the 16. ÖAGM-Meeting*, pages 88–97, Vienna, Austria, May 1992. Österreichische Arbeitsgemeinschaft für Mustererkennung.
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- [LJBS91] S.W. Lee, Aleš Jaklič, Ruzena Bajcsy, and Franc Solina. Analysis of multiple reflection components. In Baldomir Zajc and Franc Solina, editors, *Proceedings 6th IEEE Mediterranean Electrotechnical Conference*, pages 1219–1222, Ljubljana, Slovenia, 1991. IEEE Region 8.
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- [MB91] J. Maver and R. Bajcsy. Multiple view planning. In Baldomir Zajc and Franc Solina, editors, *Proceedings 6th IEEE Mediterranean Electrotechnical Conference*, pages 1201–1204, Ljubljana, Slovenia, 1991. IEEE Region 8.
- [Mav92] Jasna Maver. Occlusions and the next view planning. In *Proceedings of the 16. ÖAGM-Meeting*, pages 171–183, Vienna, Austria, May 1992. Österreichische Arbeitsgemeinschaft für Mustererkennung.
- [MB92a] J. Maver and R. Bajcsy. Occlusions and the next view planning. In *IEEE International Conference on Robotics and Automation*, pages 1806–1811, Nice, May 1992.
- [MB92b] J. Maver and R. Bajcsy. Occlusions as a guide for planning the next view. *IEEE Transaction on Pattern Analysis and Machine Intelligence*, 1992. Accepted for publication.
- [PLK92] F. Pernuš, A. Leonardis, and S. Kovačič. Non-information-preserving shape features at multiple resolutions. In *Proceedings of the 11th International Conference on Pattern Recognition*, pages B:166–169, The Hague, The Netherlands, September 1992.
- [SB89] Franc Solina and Ruzena Bajcsy. Recovery of mail piece shape from range images using 3-D deformable models. *International Journal of Research & Engineering, Postal Applications*, Inaugural Issue:125–131, 1989.
- [SB90] Franc Solina and Ruzena Bajcsy. Recovery of parametric models from range images: The case for superquadrics with global deformations. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, PAMI-12(2):131–147, 1990.
- [SB91] Franc Solina and Zaviša Bjelogrič. Methodologies and techniques for interpretation of 3D range images. In *Proceedings First ESA Workshop on Computer Vision and Image Processing for Spaceborne Applications*, WPP-029, ESTEC, Noordwijk, The Netherlands, June 1991. European Space Agency.
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- [Sol92] Franc Solina. Current activities in computer vision and pattern recognition in Slovenia. In *Proceedings of the 16. ÖAGM-Meeting*, pages 283–286, Vienna, Austria, 1992. Österreichische Arbeitsgemeinschaft für Mustererkennung.

K A Z A L C I

raziskovalnih rezultatov opravljenega raziskovalnega dela,
na znanstveno-raziskovalnem projektu v letu 1992

Skladno s predlogom programa projekta so bili doseženi naslednji **c i l j i**:

NAMENSKI CILJI:

V letu 1992 smo uspešno nadaljevali z načrtovanim delom na projektu *Rekonstrukcija oblik s pomočjo parametričnih modelov*, ki sodi na področje računalniškega vida. V okviru tega projekta razvijamo nove metode interpretacije slik tridimenzionalnega sveta s pomočjo parametričnih modelov in nove strategije aktivnega zajemanja novih podatkov.

Opravljen delo in dosežene namenske cilje na projektu bi lahko razvrstili v naslednje sklope:

Rekonstrukcija in izbiranje modelov za segmentacijo. V okviru te problematike smo pokazali, da naša metoda deluje na različnih vrstah slik in z različnimi vrstami modelov. Problematika je podrobno predstavljena v naslednjih referencah: [Leo92], [LB92] in [Žni92], ki so našteje in priložene doseženim objektnim ciljem. Predlagali smo tudi nov kriterij za izbiranje med različnimi vrstami modelov ([SL92]), ki temelji na principu najkrajše dolžine opisa.

Aktivno zajemanje novih slikovnih informacij. V okviru paradigme aktivnega vida razvijamo novo strategijo načrtovanja naslednjega pogleda, tako da v čimkrajšem času zajamemo čimbolj popolno informacije o določeni sceni. Za podrobnosti glej referenci [Mav92] in [MB92a].

Analiza odbojnostnih lastnosti predmetov z aktivnim vidom. Raziskujemo tudi vlogo parametričnih modelov pri analizi odbojnosti ([Jak92a], [Jak92b]), da bi lahko ugotovili materialne lastnosti predmetov.

Lastnosti superelipsoidov, ki smo jih v našem delu že pogosto uporabili, smo podrobneje preučevali v [Ciu92].

Oblike pri različnih resolucijah smo preučevali v [PLK92], da bi lahko ugotovili najboljše lastnosti za identifikacijo predmetov.

Interpretacija moiré slik. Slike človeškega telesa, posnete s tehniko strukturirane svetlobe, ki neposredno odražajo tridimenzionalno površinsko strukturo, analiziramo s pomočjo prototipičnih modelov in nevronskih mrež ([SW92]).

Pregledni članki. Širši pregled našega dela smo objavili v dveh referencah. [Sol92] postavlja naše delo v širši slovenski kontekst. V [SLMJ92] pa opozarjamo na pomen računalniškega vida za tehnološki razvoj. V [FS92] pa smo pregledali stanje v razvoju mobilnih robotov in to predvsem z vidika računalniškega vida.

OBJEKTNI CILJI:

1 Članki v mednarodnih in domačih revijah

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[FS92] Valetina Filova and Franc Solina. Mobila robots — a short overview. *Electrotechnical Review*, ELVEA-59(3-4):177–181, 1992.