بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـــســـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

SHAPE ENERGY MATCHING USING DEFORMABLE TEMPLATES

By

Eng. Youssef Salah Tawfik Ibrahim
Research Assistant
Electronics Research Institute

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
COMPUTER ENGINEERING

Under the Supervision of

Prof. Dr. Samir I. Shaheen
Computer Engineering Dept.,
Cairo University

Prof. Dr. Nadia H. Hegazi
The Electronics Research Institute

Prof. Dr. Ahmed M. Darwish
Computer Engineering Dept.,
Cairo University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
September 1999

SHAPE ENERGY MATCHING USING DEFORMABLE TEMPLATES

By

Eng. Youssef Salah Tawfik Ibrahim
Research Assistant
Electronics Research Institute

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
COMPUTER ENGINEERING

Approved by the
Examining Committee

Prof. Dr. Samir Ibrahim Shaheen, Thesis Main Advisor

Prof. Dr. Nadia Hamed Hegazi, Thesis Advisor

Prof. Dr. Ahmed Mahmoud Darwish, Thesis Advisor

Prof. Dr. Mohamed Abd El Hamid Ismail, Member

Prof. Dr. Magdy Fekry Ragaey, Member

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
September 1999

Acknowledgments

I would like to acknowledge all the people who have assisted me during the years of my graduate study at Cairo University. I am the most grateful to my advisors, Prof. Samir Shahin and Prof. Nadia Hegazi, for their professional and personal advice and guidance. They have provided me with numerous valuable ideas, insights, and comments. They have also been very understanding and supportive. I am very fortunate to have them as my advisors. I would also like to thank Dr. Ahmed Darwish for his many insightful discussions. He has also exposed me to a rich literature of deformable template-related work. He has always been available to me to discuss ideas and concepts in computer vision and learning.

My sincere thanks go to all the members of my family. I am very grateful to my parents for their never-fading love, care, understanding, and encouragement. I could have accomplished nothing without their love and support. I would like to dedicate this dissertation to them. I would also like to thank my sisters and brothers for their support.

My colleagues at the ERI have provided help and moral support. I would like to thank them for their interests and concerns.

Abstract

Snakes, or active contours, have been previously used in computer vision applications to locate and identify objects. However, problems associated with initialization, poor convergence to boundary concavities and high computational complexity, have limited their utility. In this thesis, we have proposed and implemented a general non-occluded object localization and classification scheme using deformable templates. Prior knowledge of an object shape is described by an

The shape variations in an object class are achieved by combining a stable, invariant and unique contour model with Markov random field. The deformed shape contour then interacts with the input image via a directional edge potential field calculated from the salient edge features. A Bayesian scheme, which is based on the prior knowledge and the edge information in the input image, is employed to find a match between the deformed template and objects in the image.

To avoid the high computational complexity, a coarse-to-fine algorithm was implemented in an efficient hierarchical fashion. We have successfully applied the suggested algorithm for the detection and classification of industrial parts. Results show that the scheme is very robust with respect to scale, position and orientation changes of the objects as well as noise and local deformations of the shape.

CONTENTS