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International Inventory of Robotics Projects in the Healthcare Field

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ERA-379

Division of
Electrical Engineering

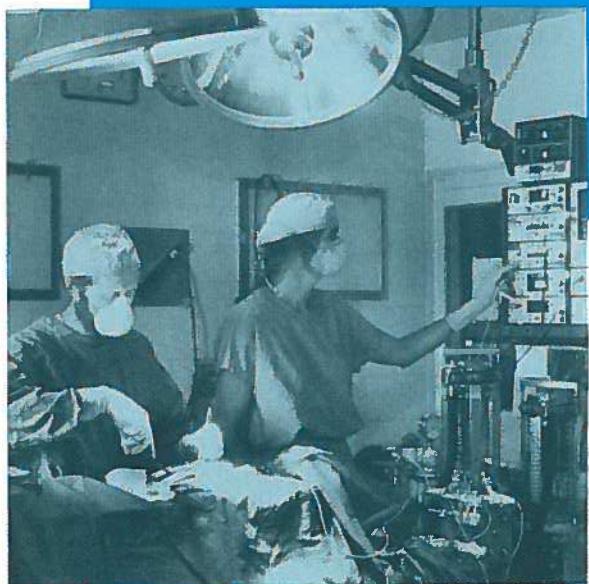
Division de
génie électrique

***International
Inventory of
Robotics
Projects in the
Healthcare
Field***

***Répertoire
international de
projets de
robotique dans
le domaine des
soins de santé***

Edited by
L.W. Korba
March 1989

Édité par
L.W. Korba
Mars 1989



Canada

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*International Inventory
of Robotics Projects
in the Healthcare
Field*

L.W. Korba
March 1989

*Répertoire international
de projets de robotique
dans le domaine des
soins de santé*

L.W. Korba
mars 1989

Laboratory for Biomedical
Engineering
Division of Electrical Engineering
National Research Council of
Canada
Ottawa, Ontario
K1A 0R6

Laboratoire de génie biomédical
Division de génie électrique
Conseil national de recherches du
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Ottawa, Ontario
K1A 0R6

Preface

This is the first *International Inventory of Robotics Projects in Healthcare* prepared by the National Research Council of Canada. The inventory is intended to facilitate the exchange of information among researchers and those interested in this field. All projects are organized into six categories: laboratory, prosthetics, patient care, rehabilitation, surgical, and others. A researcher index and a keyword cross reference listing are provided in two separate sections at the end of the inventory.

We are planning to produce a second edition of the survey in 1991. Submissions for inclusion in our mailing list would be appreciated.

Thank you for your participation.

L.W. Korba

Senior Research Officer
Division of Electrical Engineering

Préface

Le présent est le premier *Répertoire international de projets de robotique dans le domaine des soins de santé* préparé par le Conseil national de recherches du Canada. Ce répertoire vise à faciliter l'échange d'information entre les chercheurs et les autres personnes qui s'intéressent à ce domaine. Tous les projets sont organisés en fonction de six catégories : laboratoire, prothèse, soin des patients, réadaptation, chirurgie et autres. Un index des chercheurs et une liste de mots clés servant de références croisées sont donnés dans deux sections distinctes à la fin du répertoire.

Nous projetons de produire une seconde version du sondage en 1991. Tout envoi de noms à ajouter à notre liste de diffusion sera bien reçu.

Nous vous remercions de votre participation.

L.W. Korba

Agent de recherches principal
Division de génie électrique

Titles of Projects

A Feasibility Study for a Prostate Surgeon Robot	SR-01	Investigating Autonomous Vehicle for Applications in Health Care and Other Service Industries	OT-03
A Robotic Workstation for the Disabled	RH-07	Investigation of the Use of Small Robotic Arms in the Workplace to Enhance Employment Opportunities of Persons with Severe Physical Disabilities	RH-01
A Surgeon Robot for Prostate Gland Removal	SR-02	Laboratory Robotics Project	LB-03
Advanced Medical Robot	PC-06	Maneuverability and Safety of the Handicapped Transfer System	PC-02
Application of a Robotic Aid for the Severely Disabled	RH-11	Milly Aphorp Project	RH-08, RH-09
Automatic Analysis of Potentially Cancerous Cells	LB-02	Mobile Autonomous Robot Base for Rehabilitation Applications	RH-12
Autonomous Vehicles for the Institutionalized Elderly	PC-08	Patient Manipulator Design	PC-03
Communication Systems for the Handicapped	RH-16	Pre-robotic Positioners for Surgery	PC-05
Development and Evaluation of an Advanced Manipulation Aid for the Severely Disabled	RH-10	Robotic Aid for Severely Handicapped ..	RH-06
Development of a Robotics Programming Environment	RH-05	Robotic Platform for use in Health Care	PC-04
Development of Prototype Fetch and Carry Robot for the Disabled	RH-03	Robotic Retraction System for Surgery ..	PC-07
Development of Prototype Patient Handling Robot	PC-01	Robotics in Brain Surgery	SR-04
Development of Prototype Surgery Assistant Robot	SR-03	Studies in Positioning of Robotic Devices for Physically Disabled Persons	RH-14
HelpMate, a Mobile, Materials Transport Robot	OT-02	The Development of Multi Degree of Freedom and Electrical Upper Limb Prosthetic Components	PR-01
Human Factors in Analog Robot Control	RH-04	The Smart Wheelchair	RH-13
Hybrid Force/Position Control Studies (Compliant Control)	RH-02	The Use of Robots as Cognitive Enhancement Aids with Severely Orthopedically Disabled Students	OT-04
Image Processing as an Aid to the Diagnosis of Diseases of the Larynx	LB-01	TODUS — Task-oriented Discourse Understanding System	OT-01
		Wheelchair Mounted Telemanipulator Arm for use by the Disabled	RH-15

Laboratory

Laboratoire

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

Image Processing as an Aid to the Diagnosis of Diseases of the Larynx

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: A.E. Adams

ADDRESS/ADRESSE: Department of Electrical and Electronic Engineering, The University,
Newcastle upon Tyne, United Kingdom.

POSTAL CODE/CODE POSTAL NE1 7RU

Telephone/Téléphone (Area Code /Code régional): (091) 222 7273

Telex/Télex 53654 UNINEW G

Telefax/Télifax (091) 261 1182

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Images of the human larynx are captured using an endoscope and recorded on video tape. Selected frames are later transferred to an image processing system for analysis. The image is processed in order to identify particular conditions such as the presence of growths or partial paralysis of the vocal folds. The glottal area is also defined and measurements made. It is intended that these measurements will form part of the patient's records and also act as a database for an expert system which will be used to support the diagnosis of conditions in future patients.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index
Larynx, endoscopy, image processing, expert systems

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Laboratory/Patient Care

FUNDING AGENCY/AGENCY D'OCTROI: University of Newcastle upon Tyne

STARTING DATE/DATE DE DÉBUT: 1987

COMPLETION DATE/DATE DE FIN: Not defined

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date:

Current year/Année courante:

Estimated total/Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 1

Technical/Technique: ¹ / ₃

SIGNATURE:

DATE:

13th October 1988

LB-02

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Automatic Analysis of Potentially Cancerous Cells

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: A.E. Adams

ADDRESS/ADRESSE: Department of Electrical and Electronic Engineering, The University,
Newcastle upon Tyne, United Kingdom

POSTAL CODE/CODE POSTAL NE1 7RU

Telephone/Téléphone (Area Code /Code régional): (091) 2227273

Telex/Télex 53654 UNINEW G

Telefax/Télifax (091) 261 1182

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

This project is intended to support work, carried out, in the University's Cancer Research Unit, into the early diagnosis of cancerous cells in biopsy specimens. An image processing system captures images of prepared slides presented to a microscope system. Techniques are being developed which are intended to enhance aspects of the cell images with a view to measuring cell parameters and hence classifying cells as cancerous or non-cancerous. Parameters of particular interest include cell texture and cell boundary profile.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index
Cancer cell-analysis, image processing, texture analysis

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Laboratory

FUNDING AGENCY/AGENCY D'OCTROI: University of Newcastle upon Tyne

STARTING DATE/DATE DE DÉBUT: 1987

COMPLETION DATE/DATE DE FIN: Not defined

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date:

Current year/Année courante:

Estimated total /Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 1

Technical/Technique: 0

SIGNATURE:

A.E. Adams

DATE:

13 October 1988

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

LABORATORY ROBOTICS PROJECT

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: William Godolphin

ADDRESS/ADRESSE: c/o Andronic Technologies Inc.
Box 58221
Vancouver, B.C.

POSTAL CODE/CODE POSTAL V6P 6E4 **Telephone/Téléphone (Area Code /Code régional):** (604) 875-4827

Telex/Télex **Telefax/Télécopieur** (604)875-4856

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Our overall project goal is a system for fully automated blood processing from patient's vein to delivery of sample aliquots at in-trays of clinical analyzers. The robotic system should permit staff avoidance of exposure to infectious agents; it should minimize mislabelling and processing time; and reduce the need for performance of dull, tedious jobs by highly skilled lab technologists.

In Phase I of this project we developed a proprietary serial centrifuge and blood collection tube suitable for incorporation into such an automated system. These are proceeding to final design and manufacture.

In this phase (Phase II) we wish to develop the sample tracking and aliquotting technology. Phase III (future) will attempt to automate blood collection.

The fully automated system will include provision for (1) specimen collection, (2) extraction of serum or plasma, (3) aliquotting for analyses, (4) tending of analyzers, and (5) sample tracking and information processing. In the first year of Phase II (described in detail here) we will develop a prototype workcell and peripherals for functions (3) and (5).

Please suggest key words to be used in indexing /S.V.P. suggérer des mots clés qui pourraient être mis en index

Laboratory, Robotics, Blood, Centrifugation, Serial, Axial, Safety

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Laboratory

FUNDING AGENCY/AGENCY D'OCTROI: Private Company

STARTING DATE/DATE DE DÉBUT: 1984

COMPLETION DATE/DATE DE FIN: -----

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: 1 mil Current year/Année courante: 500K Estimated total/Total estimé: 2 mil

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 5 Technical/Technique: 0

SIGNATURE: 

DATE: Dec 1 / 88

Patient Care

Soin des patients

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

Development of Prototype Patient Handling Robot

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: Patrick A. Finlay (Project Manager)

ADDRESS/ADRESSE: Fulmer Systems Limited
Stoke Poges
Slough

POSTAL CODE/CODE POSTAL SL2 4QD UK **Telephone/Téléphone (Area Code/Code régional):** +44 (753) 662181

Telex/Télex 849374 G **Telefax/Télifax** +44 (753) 663178

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (*less than 200 words /moins de 200 mots*)

A 3-year project to specify, design and build a demonstrator patient handling robot, able to transfer a bedridden patient between surfaces and transport them around a semi-structured environment such as a hospital. The demonstrator is intended to serve as a test bed for future enhancements of the technology, leading to an autonomous advanced robot capable of high-level natural language input, with real time adaptation to patient dimensions and disposition. This is a collaborative project and forms of the United Kingdom Advanced Medical Robot programme assisted by the Department of Trade & Industry.

Please suggest key words to be used in indexing /*S.V.P. suggérer des mots clés qui pourraient être mis en index*

PATIENT LIFTING AUTONOMOUS NAVIGATING HOSPITAL ADVANCED-ROBOTICS

State category in which project belongs (see over)/*Spécifiez dans quelle catégorie le projet appartient (voir au verso):*

Patient Care

FUNDING AGENCY/AGENCE D'OCTROI: Department of Trade and Industry and Collaborators

STARTING DATE/DATE DE DÉBUT: 1989

COMPLETION DATE/DATE DE FIN: 1992

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX
Not Available

To date/À date:

Current year/Année courante:

Estimated total /Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Not Available

Professional/Professionnel:

Technical/Technique:

SIGNATURE:

DATE: October 1988

PC-02

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Maneuverability and safety of the Handicapped Transfer System

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Satoshi Hashino

ADDRESS/ADRESSE: 1-2, Namiki, Tsukuba, Ibaraki-pref. JAPAN 305

POSTAL CODE/CODE POSTAL 305

Telephone/Téléphone (Area Code /Code régional): 0298-54-2647

Telex/Télex

0298-54-2549

Telefax/Téléfax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Presently, transfer of the disabled and patients from beds heavily rely on human assistance(family,nurse). It is well known that this causes pain and injury to many helpers such as nurses due to strain in an unstable position. In these circumstance, development of high performance transfer support equipment which the bedridden patients can operate themselves, or with the aid of one helper, may alleviate the burden on the helpers as well as help the disabled and patients to move easily at will, which may become a great relief for the elderly in the long run.

Patient care robot "MELKONG" has been developed in our laboratory. This is composed of two main parts. One is dual arms driven by hydraulic. These arms can lift up 100kg weighed person. The another is omni directional transportation system driven by electric. By using this transportation system, MELKONG can approach to bed in high accurate positioning. This system is controlled by dual 8086 processors. Easy operation is aimed by using the voice control.

Please suggest key words to be used in indexing /S.V.P. suggérer des mots clés qui pourraient être mis en index
patient care robot, omni directional vehicle, voice control

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Laboratory

FUNDING AGENCY/AGENCY D'OCTROI:

Ministry of International Trade and Industry

STARTING DATE/DATE DE DÉBUT:

April, 1983

COMPLETION DATE/DATE DE FIN: March, 1989

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

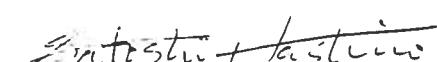
To date/À date: \$ 720,000 Current year/Année courante:\$ 80,000 Estimated total/Total estimé: \$ 800,000

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 1

Technical/Technique: 2

SIGNATURE:



DATE: Nov. 11, 1988

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

PATIENT MANIPULATOR DESIGN

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: Dr. D.R. Kerr
 ADDRESS/ADRESSE: Department of Aeronautical and Mechanical Engineering
 University of Salford
 Salford, United Kingdom
 POSTAL CODE/CODE POSTAL M5 4WT Telephone /Téléphone (Area Code /Code régional): 061-736-5843
 Telex/Télex 668680 (SULIB) Telefax/Télifax 061-745-7808

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (*less than 200 words /moins de 200 mots*)

This project concerns the design at a conceptual level of a robotic manipulator to address a patient in a variety of situations, effect lifting, and to enable the patient to be transported to another location, with due regard to the condition of the patient. The design will also take account of sub-system design, and of overall kinematic and loading requirements.

Performance of a prototype made at a later stage will be evaluated.

Please suggest key words to be used in indexing /*S.V.P. suggérer des mots clés qui pourraient être mis en index*

Robotics, Healthcare; Patients, Lifting

State category in which project belongs (see over)/*Spécifiez dans quelle catégorie le projet appartient (voir au verso):*

Patient Care

FUNDING AGENCY/AGENCY D'OCTROI: U.K. Department of Trade and Industry (DTI)

STARTING DATE/DATE DE DÉBUT: 1989 COMPLETION DATE/DATE DE FIN: 1989/90

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX
 not available for publication

To date/À date: Current year/Année courante: Estimated total/Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 1 in 1989 Technical/Technique:

SIGNATURE:

DATE: 16 November 1989

PC-04

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Robotic Platform for use in Health Care

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Larry Korba, David Green

ADDRESS/ADRESSE: Rm. 171, Bldg. M-50, Montreal Road, Ottawa, Ontario

POSTAL CODE/CODE POSTAL K1S 2N4

Telephone/Téléphone (Area Code /Code régional): (613) 993 2482

Telex/Télex 053-4134

Telefax/Télifax (613) 952 7998

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

This project investigates the application of advanced robotics technology to the health care field. The intention is to develop technology that will assist the elderly or infirmed in living more productive lives while reducing a variety of stresses on the health care system. Our work is divided into two distinct areas. The first area is the development of specifications for a patient handling autonomous vehicle. This effort involves an assessment of the environment and individuals in a chronic care facility to determine the needs. Following this there will be a detailed assessment of the design of a patient handling vehicle to enhance acceptance, safety requirements, and function of the device. The second area is the development of the generic technology for an autonomous vehicle operating in a health care environment. A Cybernation mobile platform equipped with 24 sonar sensors and 3 68020 VME computer boards is our initial arrangement for developing the software system. Special sensors for range imaging, hazard detection and people detection are under development.

Further to this work, we are investigating the application of current robotic sensing technologies to electric wheelchairs to improve the wheelchairs' performance. The goal here is to improve the safety of electric wheelchairs and to make them suitable to those individuals who cannot use current ones by the application of robotic sensor technology.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Robotics, Autonomous Vehicle, Health Care, Sensors, Laser Ranger, Human Factors,

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Patient Care, Rehabilitation

FUNDING AGENCY/AGENCY D'OCTROI: National Research Council of Canada

STARTING DATE/DATE DE DÉBUT: 8/1987 COMPLETION DATE/DATE DE FIN:

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: Current year/Année courante: Estimated total /Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 7 Technical /Technique: 4

SIGNATURE: *Larry Korba*

DATE: Dec 9, 1988

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

Pre-Robotic Positioners for Surgery

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: J.A. McEwen

ADDRESS/ADRESSE: c/o Andronic Devices Ltd.
Box 58426
Vancouver, B.C.

POSTAL CODE/CODE POSTAL V6P 6E4

Telephone/Téléphone (Area Code /Code régional): (604)875-4288

Telex/Télex

Telefax/Télifax (604)875-4856

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (*less than 200 words /moins de 200 mots*)

Surgery of the future will increasingly involve robotic positioning of tissues, organs and limbs, as well as robotic positioning of surgical effectors relative to the patient, with the motion of such effectors being controlled in part by information derived from advanced patient monitoring techniques.

As an initial step toward the development of advanced robotic positioning systems for surgery, a manually positioned device for positioning a patient's arm or leg during surgery has been developed and evaluated. A number of accessories have been developed for these systems, and both the systems and accessories are now being manufactured and marketed. The next phase of the project involves adding sensors and automated end effectors to the existing base structure, and linking the control of the effectors with the sensed information, initially to arrive at new accessories for the existing products. In addition, a semi-automated device which supports some of the weight of the patient's limb is being developed.

Please suggest key words to be used in indexing/*S.V.P. suggérer des mots clés qui pourraient être mis en index*

Surgical robot, Advanced robot, Limb Positioner

State category in which project belongs (see over)/*Spécifiez dans quelle catégorie le projet appartient (voir au verso):*

Patient Care

FUNDING AGENCY/AGENCE D'OCTROI: Private company

STARTING DATE/DATE DE DÉBUT: September 1986 COMPLETION DATE/DATE DE FIN: December 1991

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/A date: \$500K Current year/Année courante: \$300K Estimated total/Total estimé: \$2M

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Proessionnel: 5

Technical/Technique:

SIGNATURE:



FOR J.A. McEwen

DATE: DEC 13, 1983

PC-06

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Advanced Medical Robot

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: J.A. McEwen

ADDRESS/ADRESSE: c/o Andronic Devices
Box 58462
Vancouver, B.C.

POSTAL CODE/CODE POSTAL V6P 6E4

Telephone /Téléphone (Area Code /Code régional): (604)875-4288

Telex/Télex

Teletax /Télifax (604)875-4856

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Surgery of the future will increasingly involve robotic positioning of tissues, organs and limbs, as well as robotic positioning of surgical effectors relative to the patient, with the motion of such effectors being controlled in part by information derived from advanced patient monitoring techniques. An advanced medical robot is defined as a general-purpose machine system, which, like a human, can perform a variety of different diagnostic and therapeutic tasks under conditions that may not be known in advance.

This project has already resulted in a prototype advanced medical robot for positioning a patient's leg during surgery of the knee, which was first used in surgery on March 12, 1985. This constitutes the first use of a robot in surgery anywhere in the world.

The next phase of the project will involve further development of the sensors, patient interfaces, and operator controls for this system, with the objective of developing an advanced medical robot system suitable for manufacture.

Please suggest key words to be used in indexing /S.V.P. suggérer des mots clés qui pourraient être mis en index
Surgical robot, Advanced robot

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):
Patient care

FUNDING AGENCY/AGENCY D'OCTROI:

Private Company

STARTING DATE/DATE DE DÉBUT: 1984

COMPLETION DATE/DATE DE FIN: 1994

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: \$1M

Current year/Année courante: 0

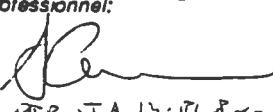
Estimated total /Total estimé: \$3M

MANPOWER UTILIZATION CURRENT YEAR /MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 1

Technical /Technique:

SIGNATURE:


J.A. McEwen

DATE: DEC 13, 1988

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

Robotic Retraction system for Surgery

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: J.A. McEwen

ADDRESS/ADRESSE: c/o Andronic Devices Ltd.
Box 58462
Vancouver, B.C.

POSTAL CODE/CODE POSTAL V6P 6E4

Telephone/Téléphone (Area Code/Code régional): (604)875-4288

Telex/Téléc

Telefax/Télifax (604)875-4856

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Surgery of the future will increasingly involve robotic positioning of tissues, organs, and limbs, as well as robotic positioning of surgical effectors relative to the patient, with the motion of such effectors being controlled in part by information derived from advanced patient monitoring techniques.

As an initial step toward the development of advanced robotic retraction systems for surgery, a manually positioned retraction system has been developed and evaluated. The next phase of the project involves adding sensors and automated end effectors to the existing base structure, and linking the control of the effectors with the sensed information.

Please suggest key words to be used in indexing /S.V.P. suggérer des mots clés qui pourraient être mis en index

Surgical robot, Advanced robot, Surgical Retraction

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Patient Care

FUNDING AGENCY/AGENCE D'OCTROI: Science Council of British Columbia and Private Company

STARTING DATE/DATE DE DÉBUT: September 1988 COMPLETION DATE/DATE DE FIN: December 1991

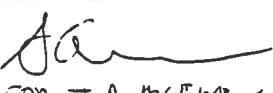
COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: \$100K Current year/Année courante: \$100K Estimated total/Total estimé: \$400K

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 1

Technical/Technique:

SIGNATURE: 
FOR J.A. MC EWEN

DATE: DEC 13, 1988

PC-08

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Autonomous Vehicles for the Institutionalized Elderly

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Betty Ann M. Turpin

ADDRESS/ADRESSE: Research Department
Elisabeth Bruyere Health Centre
43 Bruyere St., Ottawa, Ont. Canada

POSTAL CODE/CODE POSTAL K1N 5C8

Telephone/Téléphone (Area Code /Code régional): 613-560-0050

Telex/Télex

Telefax/Téléfax

Ex. 245

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Unique opportunities for the development of new technology are encountered by virtue of the growth of the elderly population. Ideally technological advance should be developed to enhance the independence of the elderly and to assist them to live more productive and comfortable lives, while reducing stresses placed on the health-care system. Research is needed to elucidate the needs of the elderly in relation to the potential use of robotic technology.

The overall goal of this project is to identify and assess the safety and ergonomic requirements and the potential application of robotics for the institutionized elderly. To identify the robotic needs an interdisciplinary approach will be adopted. The target population under scrutiny are the residents and professional and service staff of a long-term care institute, specifically Elisabeth Bruyere Health Centre.

A number of data collection techniques are proposed: (1) measurement of the physical environment; (2) observation of daily regimes; (3) recording of selected hospital procedures; (4) recording of feedback from staff on an educational video; and (5) recording of resident and staff comments and discussions via working group participation.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Autonomous Vehicles, Elderly, Robotics, Safety, Ergonomics

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Patient Care, Rehabilitation

FUNDING AGENCY/AGENCY D'OCTROI: National Research Council of Canada, Biomedical Engineering

STARTING DATE/DATE DE DÉBUT: Sept. 1, 1988 COMPLETION DATE/DATE DE FIN: 1 March 1988

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: Current year/Année courante: \$7,595.70 Estimated total/Total estimé: \$24,000.

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE -- ANNÉE COURANTE:

Professional/Professionnel: 1 (1.0)

Technical/Technique: 1 (0.3)

SIGNATURE:



DATE: January 9, 1989

Prosthetics

Prothèse

Prosthetics

Prothèse

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

THE DEVELOPMENT OF MULTI DEGREE OF FREEDOM AND ELECTRICAL UPPER LIMB PROSTHETIC
COMPONENTS

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: David Gow

ADDRESS/ADRESSE: BIOENGINEERING CENTRE, PRINCESS MARGARET ROSE ORTHOPAEDIC HOSPITAL
FAIRMILEHEAD, EDINBURGH

POSTAL CODE/CODE POSTAL EH10 7ED

Telephone/Téléphone (Area Code /Code régional): 031.445.4123

Telex/Télex

Telefax/Télifax 031.445.3440

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (*less than 200 words /moins de 200 mots*)

The project aims to develop a range of modular upper limb prosthetic components. Initially these electrical actuators will be designed to replicate the locii of movement and functions of the pneumatic motors used in the Edinburgh series of gas powered limbs. These limbs had five degrees of freedom and were successfully fitted to 27 Thalidomide affected children in the 1970's. These arms had controllable shoulder elevation and rotation, elbow flexion, wrist rotation and prehension. To date prototype electrical hand and elbow actuators have been built.

Please suggest key words to be used in indexing /*S.V.P. suggérer des mots clés qui pourraient être mis en index*
PROSTHETICS, UPPER LIMB AMPUTATIONS, ULTI-DEGREE OF FREEDOM, ARTIFICIAL LIMBS

State category in which project belongs (*see over*)/*Spécifiez dans quelle catégorie le projet appartient (voir au verso):*

(UPPER LIMB) PROSTHETICS

FUNDING AGENCY/AGENCY D'OCTROI: LOTHIAN HEALTH BOARD

STARTING DATE/DATE DE DÉBUT: CONTINUOUS

COMPLETION DATE/DATE DE FIN: NONE

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: £60,000+ Current year/Année courante: £30,000 Estimated total/Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: ONE MAN

Technical/Technique: TWO MEN

SIGNATURE:

*Thomas Deck
pp. David Gow*

DATE: 5/12/88

Rehabilitation

Réadaptation

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

INVESTIGATION OF THE USE OF SMALL ROBOTIC ARMS IN THE WORKPLACE TO ENHANCE EMPLOYMENT OPPORTUNITIES OF PERSONS WITH SEVERE PHYSICAL DISABILITIES

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: Leonard Anderson, MS

ADDRESS/ADRESSE: Cerebral Palsy Research Foundation of Kansas, Inc.
2021 N. Old Manor

POSTAL CODE/CODE POSTAL Wichita, Kansas **Telephone/Téléphone (Area Code/Code régional):**
67208 (316) 688-1888

Telex/Télex **Telex/Téléfax**

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (*less than 200 words /moins de 200 mots*)

Persons with severe physical disabilities have been employed in the electronics component preparation field (tinning of the leads of small electronic components), and in other workstations which involve the handling ("picking and placing") of small electronic circuit board edge connectors. The research has been conducted at Center Industries Corporation in Wichita, Kansas.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index
Robotics, Robotic Arms, Picking and Placing

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation (Vocational)

FUNDING AGENCY/AGENCY D'OCTROI:

NIDRR (USA Dept. of Education)

STARTING DATE/DATE DE DÉBUT: Feb., 1983 **COMPLETION DATE/DATE DE FIN:** Jan., 1988

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX
Approx.

To date/À date: \$280,000 U.S. Current year/Année courante: Estimated total/Total estimé: \$280,000 (U.S.)

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel:

1½ total full time

Technical/Technique:

½ full time

SIGNATURE:

DATE:

10-17-88

RH-02

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Hybrid Force/Position Control Studies (Compliant Control)

Name and address of principal investigator/Nom et adresse du requérant:

ADDRESS/ADRESSE: Alfred I. duPont Institute--Research/AS&E
P.O. Box 269
Wilmington, DE 19899

POSTAL CODE/CODE POSTAL

Telephone/Téléphone (Area Code/Code régional): (302) 651-6830

Telex/Télex

Telefax / Telefax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

The use of a robot manipulator as an assistive device for a person with disabilities introduces issues of safety and compliant control which are the focus of this project. In such an environment, the manipulator will be needed to perform tasks which require intimate contact with the person and motion control which complies with the environment (i.e. shaving, feeding, etc.). This project proposes to research and develop strategies for robot compliance using a hybrid of force-sensing and position-control. Force sensors will be placed on the robot arm to detect force-of-contact with objects and strategies developed to utilize the force information interactively so as to achieve compliant control.

Please suggest key words to be used in indexing /S.V.P. suggérer des mots clés qui pourraient être mis en index

Compliant Control, Force/Position Control, Force Feedback

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation

FUNDING AGENCY/AGENCE D'OCTROI:

Nemours Foundation

STARTING DATE/DATE DE DÉBUT: January, 1989 **COMPLETION DATE/DATE DE FIN:** August, 1990

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

1989- 1990-

To date/A date: Current year/Année courante: \$ 119,000 Estimated total /Total estimé: \$ 75,000

MANPOWER UTILIZATION CURRENT YEAR / MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: William Crochetiere, Ph.D.**Technical/Technique:** 1 Graduate students

SIGNATURE: _____ **DATE:** November 1, 1988

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

Development of Prototype Fetch and Carry Robot for the Disabled

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: Patrick A. Finlay (Project Manager)

ADDRESS/ADRESSE: Fulmer Systems Limited
Stoke Poges
Slough,

POSTAL CODE/CODE POSTAL SL2 4QD, UK

Telephone/Téléphone (Area Code /Code régional): +44 (753) 662181

Telex/Télex 849374 G

Telefax/Télifax +44 (753) 663178

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

A 3-year project to specify, design and build a demonstrator mobile Fetch and Carry Robot for use by the disabled and elderly at home. The demonstrator is intended to serve as a test bed for future enhancements of the technology, leading to an autonomous advanced robot capable of operating in an unstructured environment, including direct interaction with the users for tasks such as feeding. This is a collaborative project and forms part of the United Kingdom Advanced Medical Robot programme assisted by the Department of Trade and Industry.

Please suggest key words to be used in indexing /*S.V.P. suggérer des mots clés qui pourraient être mis en index*

MOBILE AUTONOMOUS HOME-BASED FETCH & CARRY DISABLED ADVANCED-ROBOTICS

State category in which project belongs (see over)/*Spécifiez dans quelle catégorie le projet appartient (voir au verso):*

Rehabilitation

FUNDING AGENCY/AGENCY D'OCTROI: Department of Trade and Industry and Collaborators

STARTING DATE/DATE DE DÉBUT: 1989

COMPLETION DATE/DATE DE FIN: 1992

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

Not Available

To date/À date:

Current year/Année courante:

Estimated total /Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel:

Not Available

Technical /Technique:

SIGNATURE:

DATE: October 1988

RH-04

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Human Factors in Analog Robot Control

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Richard Foulds, Ph.D. (temp)

ADDRESS/ADRESSE: Alfred I. duPont Institute--Research/AS&E
P.O. Box 269
Wilmington, DE 19899

POSTAL CODE/CODE POSTAL

Telephone/Téléphone (Area Code /Code régional): (302)651-6830

Telex/Télex

Telefax/Téléfax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

A robot being used by a person with disabilities is traditionally understood to be controlled in one of three ways: 1) Pre-programmed, point-to-point control in which the user simply signals yes/no to a specific, proposed action; 2) Direct Control in which the user directly controls the physical motion of the robot; 3) A hybrid of Pre-programmed and Direct Control. Although direct control of a manipulator is relatively well developed in industry, it presupposes an operator who is not physically disabled. This project proposes to research the human factors issues involved in the direct, analog control of a robotic manipulator by a person with physical disabilities. This will include the development of the basic control strategies and systems as well as models for assessing an individual's ability to generate an analog system and developing optimized control interfaces. The research will use the DataGlove as its primary analog input device. The project will use the results of this research to develop models for analog control and will implement these models on Manus (the first wheelchair-borne manipulator, developed at the IRV in Delft, The Netherlands.) as well as on the RTX.

Please suggest key words to be used in indexing /S.V.P. suggérer des mots clés qui pourraient être mis en index

Analog Control, Telethesis, Continual Control, Direct Control

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation

FUNDING AGENCY/AGENCY D'OCTROI:

Nemours Foundation

STARTING DATE/DATE DE DÉBUT: January, 1989 COMPLETION DATE/DATE DE FIN: December, 1990

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: Current year/Année courante: 1989- \$89,000 Estimated total /Total estimé: \$150,000

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: Currently conducting search for Principal Investigator

Technical/Technique: 1 Graduate students

SIGNATURE:

DATE: November 1, 1988

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Development of a Robotics Programming Environment

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Michel L. Gilbert

ADDRESS/ADRESSE: Alfred I. duPont Institute--Research/AS&E
P.O. Box 269
Wilmington, DE 19899

POSTAL CODE/CODE POSTAL

Telephone/Téléphone (Area Code/Code régional): (302)651-6830

Telex/Telex

Telefax/Télifax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

The Programming Environment Project seeks to address the need for a standardized rehabilitation robotics programming environment. Designed for the professional robotics programmer in either a clinical or research area, this environment would include all of the basic software and hardware tools necessary for minimizing the engineering effort involved in developing a specific clinical or research application. This development falls into three broad development areas. First, a standardized software interface must be designed for communication between the computer and the robotic manipulator. Second, a standardized software interface must be designed for communication between a user and the computer via a variety of input devices. Finally, normal programming utilities must be investigated and, where necessary, designed and developed. This project will also serve as the technical support project for the Alfred I. duPont Institute's Robotics Research Program.

Please suggest key words to be used in indexing / S.V.P. suggérer des mots clés qui pourraient être mis en index

Programming, Utilities, Environment, Robot Language

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation

FUNDING AGENCY/AGENCE D'OCTROI:

Nemours Foundation

STARTING DATE/DATE DE DÉBUT: September, 1988 **COMPLETION DATE/DATE DE FIN:** Ongoing

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: 1988- \$81,000 Current year/Année courante: 1989- \$75,000 Estimated total /Total estimé: Ongoing

MANPOWER UTILIZATION CURRENT YEAR / MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: Michel L. Gilbert, James Technical/Technique: 2 Graduate students
W. Fee, Carol A. Sargent

SIGNATURE: **DATE:** November 1, 1988

RH-06

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE
TITLE OF PROJECT/TITRE DE PROJET:

ROBOTIC AID FOR SEVERELY HANDICAPPED

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Prof. A. Goldenberg and Prof. M. Milner
ADDRESS/ADRESSE: Dept. of Mechanical Engineering and
Dept. of Rehabilitation Medicine
University of Toronto, Toronto, Ont. Canada
POSTAL CODE/CODE POSTAL M5S 1A4 Telephone/Téléphone (Area Code /Code régional): 416-978-5745
Telex/Télex Telex/Téléfax 416-978-7753

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

A robotic aid to severely handicapped is developed using an industrial robot, voice control, sensing and software. The robot can be controlled using voice in a remote mode, or it can operate automatically using sensors and software suitable for grasping tasks. The sensors are mounted on the gripper. The user commands the robot using voice to the vicinity of the object to be picked up. After reaching a suitable location the robot is commanded to operate in an automatic mode using the special gripper fitted with proximity sensors. This combination of remote and automatic control facilitates the use of severely handicapped people.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index
robotic aid, quadriplegics, automatic grasping, voice control

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation

FUNDING AGENCY/AGENCE D'OCTROI: Canadian Paraplegic Association

STARTING DATE/DATE DE DÉBUT: Sept. 1987 COMPLETION DATE/DATE DE FIN: March 1989

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: Current year/Année courante: Estimated total /Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: Technical/Technique:

SIGNATURE:



DATE:

Oct. 31, 1988

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

A robotic workstation for the disabled

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: Mr. Michael Hillman

ADDRESS/ADRESSE: Bath Institute of Medical Engineering,
The Wolfson Centre, Royal United Hospital,
Combe Park, Bath.

POSTAL CODE/CODE POSTAL BA1 3NG

Telephone/Téléphone (Area Code /Code régional): (0225) 823106

Telex/Télex

Telefax/Télifax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (*less than 200 words /moins de 200 mots*)

The aim of the project is to develop a relatively low cost robotic manipulator aid for the severely physically disabled. The system is based around a commercially available Atlas manipulator built into a workstation trolley. The system will enable the user to perform simple tasks such as loading a cassette tape or computer disc. User control is by a two switch input (eg microswitch, sip-puff) through a BBC Microcomputer. It is intended to eventually develop a purpose built manipulator and microprocessor control system. Clinical trials on the system are being carried out at the Duke of Cornwall Spinal Injuries Unit at Odstock Hospital, Salisbury, UK.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Aids for disabled, Robotic workstation, User control

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation

FUNDING AGENCY/AGENCE D'OCTROI:

Wolfson Foundation

STARTING DATE/DATE DE DÉBUT: August 1988 **COMPLETION DATE/DATE DE FIN:** February 1991

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: £4,500 Current year/Année courante: £30,000 Estimated total/Total estimé: £86,000

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 2.5 man years

Technical/Technique: 0.25 man years

SIGNATURE:

M R Hillman

DATE: 18 - 10 - 88

RH-08

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Milly Aptorp Project

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: R.D. Jackson

ADDRESS/ADRESSE: Engineering Department, Cambridge University, Trumpington Street,
Cambridge. CB2 1PZ England.

POSTAL CODE/CODE POSTAL CB2 1PZ

Telephone/Téléphone (Area Code /Code régional): 44-223-332600

Telex/Télex 81239

Telefax/Téléfax 332662

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Research at Cambridge University is looking into aspects of rehabilitation robotics, applications in special needs education and a purpose written control language for a variety of rehabilitation situations.

Robot Control Language

The language is called CURL, short for Cambridge University Rehabilitation robot Language. In describing the language we have tried to account for sensor and vision information that may be available when making decisions about moving and grasping objects. Curl is able to do limited collision avoidance and most importantly is intended for input devices ranging from two switch controls to voice.

Curl normally expects English type commands but will recourse to direct drive when necessary and appropriate for the user. The English syntax of the control language can be used interactively by voice or multiple key keyboards and/or can be programmed by the teacher or advanced students.

contd.

Please suggest key words to be used in indexing /S.V.P. suggérer des mots clés qui pourraient être mis en index

Special education robots, rehabilitation robots, robot Languages in rehabilitation
State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation

FUNDING AGENCY/AGENCY D'OCTROI: Milly Aptorp Trust

STARTING DATE/DATE DE DÉBUT: Nov. 1983 COMPLETION DATE/DATE DE FIN: Oct. 1989

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

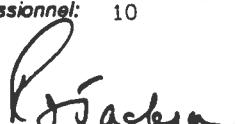
To date/À date: Current year/Année courante: Estimated total /Total estimé: £86,000

MANPOWER UTILIZATION CURRENT YEAR /MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 10

Technical/Technique: 0

SIGNATURE:



DATE: 17.11.88

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

Milly Apthorp Project

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: R.D. Jackson

ADDRESS/ADRESSE: Engineering Department, Cambridge University, Trumpington Street,
Cambridge, England.

POSTAL CODE/CODE POSTAL CB2 1PZ

Telephone/Téléphone (Area Code /Code régional): 44-223-332600

Telex/Télécx 81239

Telefax/Téléfax 332662

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Research at Cambridge University is looking into aspects of rehabilitation robotics, applications in special needs education and a purpose written control language for a variety of rehabilitation situations.

Robots in special needs education (learn and play robots)

We believe that the great potential for robots may not be in "aids for daily living" but in less obvious areas such as special needs education. We have been exploring a robot as a means of giving disabled children access to three dimensional space in a way which allows them to explore with the visual, tactile and auditory clues that most people learn within the first 18 months. The robot not only allows children to learn about relationships and language but may also be valuable in finding out what is happening in the child's mind.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Special education robots, rehabilitation robots, robot Languages in rehabilitation

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation

FUNDING AGENCY/AGENCY D'OCTROI: Milly Apthorp Trust

STARTING DATE/DATE DE DÉBUT: Nov. 1983

COMPLETION DATE/DATE DE FIN: Oct. 1989

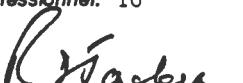
COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: Current year/Année courante: Estimated total/Total estimé: £86,000

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 10

Technical/Technique: 0

SIGNATURE: 

DATE: 17.11.89

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET: DEVELOPMENT AND EVALUATION OF AN ADVANCED MANIPULATION
AID FOR THE SEVERELY DISABLED

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: Larry J. Leifer

ADDRESS/ADRESSE: Rehabilitation R&D Center,
V.A. Medical Centre, Mail Stop 153
3801 Miranda Ave. Palo Alto, CA

POSTAL CODE/CODE POSTAL 94304 **Telephone/Téléphone (Area Code /Code régional):** 415-858-3991

Telex/Télex **Telefax/Téléfax**

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (*less than 200 words /moins de 200 mots*)

The VA - Stanford Assistant Robot Project has developed a mobile manipulation assistant for persons with severe physical limitations. The system includes a three-wheeled omni-directional vehicle, a PUMA-260 arm mounted on the vehicle and a command-control work station. At this time it is being used in clinical tests by tetraplegics. It is used to fetch and retrieve objects, operate appliances, handle desktop materials and perform sentry duty in home or office-like environments. The vehicle is supervised by a tetraplegic sitting at a console and giving commands through a voice input system. The user interface consists of an adjustable desk with an IBM-PC-AT, a Kurzweil speech system, three displays for performance monitoring, and a head-motion detector for functions that normally require a joystick. The robot can operate autonomously for several hours. It is designed for indoor travel on flat surfaces and uses sensor systems (touch sensitive bumpers and a laser range finder) to enable path finding and collision avoidance. A camera mounted on the arm allows the user to supervise the robot when it is otherwise out of sight. There is a 4800-baud radio link with the command-console.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Robot, Voice Control, Quadriplegics, Rehabilitation, Vocational Applications,
Omnidirectional

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation

FUNDING AGENCY/AGENCY D'OCTROI: V.A.

STARTING DATE/DATE DE DÉBUT: 1985 **COMPLETION DATE/DATE DE FIN:** 1988

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: 1.2 M Current year/Année courante: 300K Estimated total/Total estimé: 1.2 M

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 4 Technical/Technique: 2

SIGNATURE: *LJM VandeLom* DATE: 11/28/88
(For L.J. Leifer)

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

APPLICATION OF A ROBOTIC AID FOR THE SEVERELY DISABLED

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Larry J. Leifer

ADDRESS/ADRESSE: Rehabilitation R&D Center, VA Medical Center
Mail Stop 153
3801 Miranda Ave. Palo Alto, CA.

POSTAL CODE/CODE POSTAL 94304 Telephone/Téléphone (Area Code /Code régional): 415-858-3991

Telex/Téléc. Telefax/Téléfax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

The VA-Stanford Assistant Robot Project is performing clinical evaluation and field-testing of a desktop vocational assistant robot for tetraplegics. The system uses a PUMA-260 manipulator and an Otto-Bock gripper for desktop material handling and appliance operation. The user communicates with the robot through a VOTAN speech recognition and synthesis system and IBM-PC/AT software written in Turbo-Pascal by the project staff. The control software manages communication with the robot, handles screen displays, and performs functions relating to error recovery, vocabulary training, and event history-list gathering. Tasks performed by the system include those associated with the vocational and daily-living needs of an office worker. One system is being used at a school that teaches disabled individuals to work with computers. A tetraplegic student is now using the robot to do about ten tasks, with new application programs being developed on-site. Tasks include floppy disk handling, setting up manuals, getting a drink of water, heating up and serving lunch, and operating a phone. The VA plans to build 10 systems for field assessment in other clinical and vocational settings during the next two years.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Voice control, Desktop, Vocational Applications

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation

FUNDING AGENCY/AGENCY D'OCTROI: V.A.

STARTING DATE/DATE DE DÉBUT: 1987 COMPLETION DATE/DATE DE FIN: 1990

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: 600K Current year/Année courante: 200K Estimated total /Total estimé: 800K

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 3 Technical/Technique: 1

SIGNATURE: *L.J. Leifer* DATE: 11/28/88

(FOR L.J. Leifer)

RH-12

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

"Mobile Autonomous Robot Base for Rehabilitation Applications"

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Simon P. Levine, Ph.D.

ADDRESS/ADRESSE: Rehabilitation Engineering Program
1C335 University of Michigan Hospital
Ann Arbor, Michigan 48109-0032

POSTAL CODE/CODE POSTAL 48109-0032

Telephone/Téléphone (Area Code /Code régional): (313)936-7170

Telex/Télex

Telefax/Téléfax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

The University of Michigan Mobile Rehabilitation Robotics project is a joint effort between the Rehabilitation Engineering Program and the Robotics Systems Division in the College of Engineering. The focus of this research is the development of an intelligent, autonomous mobile robot base which can be used 1) to assist handicapped people and 2) for patient care.

The robot base is designed to serve as a mobile platform for carrying a variety of environmental manipulators such as robotic arms, environmental control units, computer assistive systems, or other technologies. The ultimate goal of this development effort is a robot that can not only pass from one point in its environment to another while avoiding obstacles, but also (autonomously) follow a user *companion* as they freely move about or guide an individual to a desired location. The design of the robot includes a variety of sub-systems dealing with obstacle avoidance, local path planning/travel, absolute positioning, global path planning/travel, and companion tracking.

One particular clinical application planned for the mobile robot base is its integration with a computerized task guidance system for cognitively impaired people developed at the University of Michigan. In addition, testing within daily living and vocational activities using a manipulator is also planned.

Rehabilitation Robotics; Mobile Robotics; Autonomous Navigation; Autonomous Robots

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Rehabilitation, Patient Care

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

FUNDING AGENCY/AGENCY D'OCTROI: Internally funded presently.
External funding is pending.

STARTING DATE/DATE DE DÉBUT: 9/1/88

COMPLETION DATE/DATE DE FIN: Open

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: \$75,000 Current year/Année courante: Pending Estimated total/Total estimé: Pending

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel:

3

Technical /Technique: 3

SIGNATURE:



DATE: 11/16/88

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

THE SMART WHEELCHAIR

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: PAUL NISBET

ADDRESS/ADRESSE: CALL CENTRE, DEPT. OF EDUCATION, EDINBURGH UNIVERSITY,
4 BUCCLEUCH PLACE,
EDINBURGH

POSTAL CODE/CODE POSTAL EH8 9LW

Telephone/Téléphone (Area Code /Code régional): 031-667-1438

Telex/Télécx

Teletax/Télétax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

The Smart Wheelchair is a Microprocessor-controlled system mounted on a commercially available powered wheelchair. The system may be controlled by single, double or switch arrays, joystick, a scanning selector or by external computer or communication aids via an RS 232 link. Safety and environmental sensors provided are bump detectors, ultrasonic range finders, and inductive line following system, and a watchdog timer. The Wheelchair is not intended to be an autonomous vehicle, but is intended to provide a learning and exploratory environment for young disabled children, by integrating mobility with communication and learning.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Intelligent Wheelchair. Communication. Education.

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation.

FUNDING AGENCY/AGENCE D'OCTROI:

Scottish Education Department.

STARTING DATE/DATE DE DÉBUT: April, 1986 **COMPLETION DATE/DATE DE FIN:** October, 1989.

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: £15,000 Current year/Année courante: £10,000 Estimated total/Total estimé: £40,000

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 2/3

Technical/Technique:

SIGNATURE:

DATE: 14th October, 1988.

RH-14

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE
TITLE OF PROJECT/TITRE DE PROJET:

STUDIES IN POSITIONING OF ROBOTIC DEVICES FOR PHYSICALLY DISABLED PERSONS

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: MICHEAL D. O'RIAIN, Ph.D., P.Eng.

ADDRESS/ADRESSE: THE REHABILITATION CENTRE
505 Smyth Road
Ottawa, Ontario

POSTAL CODE/CODE POSTAL K1H 8M2

Telephone/Téléphone (Area Code/Code régional): (613) 737-7350

Telex/Téléc

Telefax/Téléfax (613) 737-7056

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Safe control of robotic devices in a sine qua non especially if they are to be used by physically disabled persons. This research project will investigate the use and usefulness of "Extended Physiological Proprioception" in Robotics for disabled persons. Extended physiological proprioception (E.P.P.) was first introduced as a control methodology for powered upper-extremity prostheses. E.P.P. ensures reliable position control by - firstly - linking the position in space of the control device with the position in space of an intact joint, and - secondly - mechanically preventing the input from ever exceeding the output capabilities of the controlled device. It is hoped that this work will lead to the safe control of Robotic systems when performing functions such as eating, etc. Input/output relationships and system dynamics will be under the control of a microprocessor system.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Microprocessor control, Extended physiological proprioception, Prostheses, Feeders.

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

REHABILITATION

FUNDING AGENCY/AGENCE D'OCTROI: Natural Sciences and Engineering Research Council, Canada;
The Henry White Kinnear Foundation.

STARTING DATE/DATE DE DÉBUT: April 1989

COMPLETION DATE/DATE DE FIN:

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date:

Current year/Année courante:

Estimated total/Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel:

Technical /Technique:

SIGNATURE: *Michael D'Orain*

DATE: 22 November, 1988.

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

WHEELCHAIR MOUNTED TELEMANIPULATOR ARM FOR USE BY THE DISABLED.

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: STEPHEN D. PRIOR

ADDRESS/ADRESSE: MIDDLESEX POLYTECHNIC, BOUNDS GREEN ROAD, LONDON, ENGLAND.

POSTAL CODE/CODE POSTAL	N11 2NQ	Telephone /Téléphone (Area Code /Code régional):	01-368-1299
Telex/Télex	8954762	Telefax /Télécopie	3611726

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

The aims of this project are to investigate and evaluate the needs and abilities of wheelchair bound disabled people of various levels of physical disability, and use the results from this study to develop a mechanical device that will enable them to rehabilitate and reintegrate into society.

Please suggest key words to be used in indexing /S.V.P. suggérer des mots clés qui pourraient être mis en index

Rehabilitation, Patient Care, Aids For The Disabled, Wheelchair Manipulator

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation.

FUNDING AGENCY/AGENCE D'OCTROI: NAB RESEARCH INITIATIVE, A.S.P.I.R.E

STARTING DATE/DATE DE DÉBUT: 21st JUNE 1988 COMPLETION DATE/DATE DE FIN: 21st JUNE 1991

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: U/A Current year/Année courante: U/A Estimated total/Total estimé: U/A

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: ONE Technical /Technique: ONE

SIGNATURE: *Stephen Prior* DATE: 29th OCTOBER 1988

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

Communication Systems for the handicapped

Name and address of principal investigator/*Nom et adresse du requérant:*

NAME/NOM: Klaus Fellbaum, Prof. Dr.

ADDRESS/ADRESSE: Institute for Telecommunication, Technical University of Berlin

POSTAL CODE/CODE POSTAL D- 1000 Berlin 10 **Telephone/Téléphone (Area Code /Code régional):** xx49 (30) 314 25209
Telex/Télex 184 262 tubln d **Teletax/Télétax** xx49 (30) 314 - 232 22

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (*less than 200 words /moins de 200 mots*)

We are developing communication systems for blind, deaf and motoric disabled persons.
They are based on speech recognition and speech synthesis.

Most of our research activities are devoted to "human factor aspects", i. e. ergonomical design aspects and handling procedures which are adapted to the individual case of disability.
Finally we have developed a voice-controlled operation microscope for surgical application.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

voice-controlled systems, speech recognition, speech synthesis

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Rehabilitation, Surgical

FUNDING AGENCY/AGENCE D'OCTROI:

German Ministry of Labour (Bonn, Federal Republic of Germany)

STARTING DATE/DATE DE DÉBUT: 1983

COMPLETION DATE/DATE DE FIN: 1989

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: 500 000,- DM Current year/Année courante: 150 000,- Estimated total/Total estimé: 750 000,- DM

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 4 (+ 3 students)

Technical/Technique:

SIGNATURE:



DATE: 28 - 11- 1988

Surgical

Chirurgie

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

A FEASIBILITY STUDY FOR A PROSTATE SURGEON ROBOT

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Mr. B.L. Davies

ADDRESS/ADRESSE: Department Mechanical Engineering
Imperial College London
London, U.K.

POSTAL CODE/CODE POSTAL SW7 2BX **Telephone/Téléphone (Area Code /Code régional):** 01-589-5111
Telex/Télex 929484 **Telefax/Télifax** 01-584-7596 **Ex. 6157**

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

To use a robot (Puma 560), adapted with a special framework to carry a high speed cutter, to produce the necessary shape and sequence of cuts to perform a prostatectomy. The robot is under the continual control of the surgeon, who can observe the prostate through an endoscope and camera, and can modify the procedure at any stage.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clefs qui pourraient être mis en index
surgeon, robot, prostate

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Surgical

FUNDING AGENCY/AGENCE D'OCTROI: Private funds

STARTING DATE/DATE DE DÉBUT: 1.2.88 **COMPLETION DATE/DATE DE FIN:** 31.12.88

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: **Current year/Année courante:** **Estimated total /Total estimé:**

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 2 part time engineers **Technical/Technique:** 2 part time technicians

SIGNATURE: **DATE:** 7.11.88

SR-02

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

A SURGEON ROBOT FOR PROSTATE GLAND REMOVAL

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: B.L. Davies

ADDRESS/ADRESSE: Centre for Robotics
Imperial College London
London, England

POSTAL CODE/CODE POSTAL SW7 2BX Telephone/Téléphone (Area Code/Code régional): 01-589-5111
Telex/Télex 929484 Telefax/Télifax 01-584-7596 EX. 6157

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

A feasibility study for using a Puma 560 robot to carry a special framework which in turn carries a cutter which is designed to remove tissue from the prostate gland. The robot orients the cutter at the correct angle using the 1st 5 axis. The 6th axis then rotates the cutter through the required area. Additional motors provide reciprocating motion of the cutter between end stops and also drives the cutter at 40,000 RPM. The pattern of cuts for tissue removed can be readily selected by the surgeon who has control of the operation and can interrupt or redirect the process at any stage.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clefs qui pourraient être mis en index

Medical, Robotics, Surgeon, Computer Control

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Surgical

FUNDING AGENCY/AGENCY D'OCTROI:

STARTING DATE/DATE DE DÉBUT: Jan. 1988 COMPLETION DATE/DATE DE FIN: Jan. 1989

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: £4,000 Current year/Année courante: £5,000 Estimated total/Total estimé: £5,000

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: occasional Technical/Technique: 3 months

SIGNATURE:



DATE: 10 October 1988

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET:

Development of prototype Surgery Assistant Robot

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Patrick A. Finlay (Project Manager)

ADDRESS/ADRESSE: Fulmer Systems Limited
Stoke Poges
Slough

POSTAL CODE/CODE POSTAL SL2 4QD UK **Telephone/Téléphone (Area Code/Code régional):** +44 (753) 662181

Telex/Télex 849374 G **Telefax/Télifax** +44 (753) 663178

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

A 3-year project to specify, design and build a demonstrator manipulator capable of carrying out the hazardous aspects of a post mortem examination on a highly infectious patient. The demonstrator is intended to serve as a test bed for future enhancements of the technology, with the goal of a range of semi-autonomous advanced robots for use in surgery on living patients, where the procedure requires high precision or manipulative ability. This is a collaborative project and forms part of the United Kingdom Advanced Medical Robot programme assisted by the Department of Trade and Industry.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

PRECISION HAZARDOUS SURGERY ADVANCED-ROBOTICS AUTONOMOUS

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Surgical

FUNDING AGENCY/AGENCE D'OCTROI: Department of Trade and Industry and Collaborators

STARTING DATE/DATE DE DÉBUT: 1989 **COMPLETION DATE/DATE DE FIN:** 1992

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

Not Available

To date/À date: Current year/Année courante:

Estimated total/Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Not Available
Professional/Professionnel:

Technical/Technique:

SIGNATURE:

DATE: October 1988

SR-04

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN
DE LA ROBOTIQUE EN MÉDECINE
TITLE OF PROJECT/TITRE DE PROJET:

ROBOTICS IN BRAIN SURGERY

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Prof. A. Goldenberg

ADDRESS/ADRESSE: Dept. of Mechanical Engineering
University of Toronto
Toronto, Ont. Canada

POSTAL CODE/CODE POSTAL M5S 1A4

Telephone/Téléphone (Area Code /Code régional): 416-978-5745

Telex/Télex

Telefax/Télifax 416-978-7753

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

A robot interfaced with a computerized tomographic device is developed as a work station to perform brain surgery. The robot receives commands from a display computer on which the surgeon indicates the location, the incision and depth of penetration. The robot is attached to a platform on which the head ring used in the tomography is connected. Software was developed to allow for robot commands to be expressed in suitable reference frames. Calibration of the robot is also performed using the platform and special fixtures connected to it. The system is now ready for integration and testing.

Please suggest key words to be used in indexing /S.V.P. suggérer des mots clés qui pourraient être mis en index

robotic devices, surgery, computerized tomography

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Surgical

FUNDING AGENCY/AGENCE D'OCTROI: Sick Children's Hospital (Dr. J. Drake)

STARTING DATE/DATE DE DÉBUT: Sept. 1988 COMPLETION DATE/DATE DE FIN: December 1988

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: Current year/Année courante: Estimated total /Total estimé:

MANPOWER UTILIZATION CURRENT YEAR /MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: Technical/Technique:

SIGNATURE:



DATE:

Oct. 31, 1988

Other

Autres

**ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAIN
DE LA ROBOTIQUE EN MÉDECINE**

TITLE OF PROJECT/TITRE DE PROJET: TODUS - TASK-ORIENTED DISCOURSE UNDERSTANDING SYSTEM ...
A NATURAL LANGUAGE FRONTEND FOR MCAP - MULTIPLE COOPERATING AGENTS PROJECT

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Professor Richard D. Amori

ADDRESS/ADRESSE: Computer Science Department
East Stroudsburg University
East Stroudsburg, Pennsylvania, U.S.A.

POSTAL CODE/CODE POSTAL 18301

Telephone/Téléphone (Area Code /Code régional): 717-424-3447

Telex/Télex

Telefax/Téléfax

or **-424-3779**

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

TODUS is a compact, efficient natural language interface designed for operator control of equipment. Presently it is the front-end to a four robot work cell, the MCAP Project. While MCAP models a typical industrial application with tools and inventory items, it is also representative of many rehabilitation applications where the human must be able to control equipment such as a robotic aid. TODUS is available for demonstration in our lab.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index

Robotics, Artificial Intelligence, Natural Language Interface, Rehabilitation

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Laboratory, Rehabilitation, Surgery

FUNDING AGENCY/AGENCY D'OCTROI: Internal funding and Ben Franklin Partnership

STARTING DATE/DATE DE DÉBUT: Completed and Demonstratable
COMPLETION DATE/DATE DE FIN:

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: About 1 person year for TODUS
Current year/Année courante: Estimated total/Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: N/A

Technical/Technique:

SIGNATURE:

DATE: 12 December 1988

OT-02

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

HELPMATE, A MOBILE, MATERIALS TRANSPORT ROBOT

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Gay Bogardus

ADDRESS/ADRESSE: TRC
15 Great Pasture Road
Daabury, CT. USA

POSTAL CODE/CODE POSTAL 06810 Telephone/Téléphone (Area Code /Code régional): 203.798.8988

Telex/Télex n/a Telefax/Télifax 203.791.1082

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

In the United States today, there is a nationwide shortage of entry-level, unskilled workers and a critical shortage of highly skilled nurses. Because of these two trends, the quality of patient care in hospitals, nursing homes and other health care facilities is at risk.

Without sufficient support staff to carry out materials transport duties in health care facilities, the already overworked patient care nurses are forced to leave the patient's bedside to do it themselves. This inefficient use of highly skilled labor deserves immediate attention.

HelpMate, TRC's first product aimed at the health care industry, is a mobile completely autonomous, materials transport robot developed to help address this labor shortage crisis. HelpMate will perform "fetch and carry" functions between nursing units and hospital support units such as Dietary and Central Supply. HelpMate uses ultrasound and infrared proximity sensors, vision and dead-reckoning to travel along the hospital corridors and on the elevators. It detects and avoids all obstacles, both stationary and moving.

HelpMate relieves pressure caused by chronic understaffing and frees professional staff for higher priority, direct patient care duties.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clefs qui pourraient être mis en index

Mobile, Autonomous, Materials Transport, Labor shortage

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Hospital Operations

FUNDING AGENCY/AGENCY D'OCTROI: Connecticut Product Development Corporation

STARTING DATE/DATE DE DÉBUT: Dec. 1986 COMPLETION DATE/DATE DE FIN: Mid. 1989

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/A date: Current year/Année courante: Estimated total/Total estimé: \$ 1 million

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE -- ANNÉE COURANTE:

Professional/Professionnel: Technical/Technique: 6 full time

SIGNATURE: *Gay Bogardus* DATE: 28 Dec. 1988

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE

TITLE OF PROJECT/TITRE DE PROJET:

Name and address of principal investigator/Nom et adresse du requérant:

NAME/NOM: Michael Gelsie
ADDRESS/ADRESSE: E.I. DuPont, Engineering Laboratory
101 Beech St., P.O. Box 80840
Wilmington, D.C. U.S.A.
POSTAL CODE/CODE POSTAL 19880-0840 Telephone /Téléphone (Area Code /Code régional): 302-695-0176
Telex/Télex Telefax /Télifax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Investigating autonomous vehicle for applications in health care and other service industries.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clés qui pourraient être mis en index
Autonomous, Vehicle, Robot

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Industrial, Laboratory, Rehabilitation

FUNDING AGENCY/AGENCY D'OCTROI: E.I. DuPont

STARTING DATE/DATE DE DÉBUT: 6/88 COMPLETION DATE/DATE DE FIN: 1/89

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/À date: Current year/Année courante: Estimated total/Total estimé:

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: Technical /Technique:

SIGNATURE: Michael Gelsie DATE: 12.9.88

OT-04

ROBOTICS IN HEALTH CARE RESEARCH AND DEVELOPMENT/RECHERCHE ET DÉVELOPPEMENT DANS LE DOMAINE
DE LA ROBOTIQUE EN MÉDECINE
TITLE OF PROJECT/TITRE DE PROJET:

The Use of Robots as Cognitive Enhancement Aids with Severely Orthopedically

Name and address of principal investigator/Nom et adresse du requérant: Disabled Students

NAME/NOM: Richard D. Howell, Ph.D.

ADDRESS/ADRESSE: The Ohio State University
29 W. Woodruff Avenue, Room 225
Columbus, OH 43210

POSTAL CODE/CODE POSTAL 43210

Telephone/Téléphone (Area Code /Code régional): 614/292-4872

Telex/Téléc

Telefax/Télifax

BRIEF DESCRIPTION OF PROJECT/DESCRIPTION BRÈVE DU PROJET: (less than 200 words /moins de 200 mots)

Robotic manipulators are being used in an investigation of their effectiveness as cognitive enhancement aids when used by severely orthopedically disabled children to manipulate educational materials. A science education environment has been developed in which to test the learning potential of the robotic manipulation aid. During the course of the design and development of a prototype robotic system for educational use, several issues have surfaced that constitute serious considerations in the process. Of particular importance are issues involving accessibility, software design, curriculum integration and specific research questions involving spatial visualization demands in the robotic environment.

Please suggest key words to be used in indexing/S.V.P. suggérer des mots clefs qui pourraient être mis en index

Learning/Cognition, Children

State category in which project belongs (see over)/Spécifiez dans quelle catégorie le projet appartient (voir au verso):

Education (Larry: This is the only appropriate category for our project!)

FUNDING AGENCY/AGENCY D'OCTROI: U.S. Dept. of Education: Office of Special Education Programs

STARTING DATE/DATE DE DÉBUT: 10/1/88 COMPLETION DATE/DATE DE FIN: 3/30/89

COSTS INCLUDING SALARIES BUT NOT OVERHEADS/COÛTS, INCLUANT SALAIRES MAIS NON LES FRAIS GÉNÉRAUX

To date/A date: \$100,000.00 Current year/Année courante: \$75,000.00 Estimated total/Total estimé: \$250,000.00

MANPOWER UTILIZATION CURRENT YEAR/MAIN-D'OEUVRE UTILISÉE — ANNÉE COURANTE:

Professional/Professionnel: 4

Technical/Technique: 3

SIGNATURE:



DATE: 10/27/88

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