APPLICATION FORM
7TH CALL FOR PROPOSALS
REGIONAL PROGRAM STIC-ASIE / ICT-ASIA

A. General presentation

A1	**Lead institution and project leader**
	e-Motion team-project INRIA Rhône-Alpes, 655 Avenue de l'Europe, 38334 Saint Ismier, Cedex, France Dr. Anne Spalanzani

A1 Bis	**Co-lead institution and co-project leader in France (administrative management of the project)**
	LASMEA – CNRS Laboratory Blaise Pascal University Professor Philippe Martinet Head of ROSACE Team

A2	**Project title and its acronym or initials**
	ICT-PAMM (Personal Assistance for Mobility and Manipulation)

A3	**Theme**
	Intelligent Service robotics Personal assistance for mobility and manipulation

A4	**Purpose of the project**
	This project aims at conducting common research activities in the areas of robotic mobile service and robotic assistance of human in different contexts of human life. Most countries are becoming to be aged societies, and the percentage of people with special needs is already significant and due to grow. In developed countries, 12% of people were older than 60 in 1950, 19% in 1998 and should be 28% in 2025[1]. The integral assistance systems are robotic modules and technological aids in general for personal assistance, such as robots, mobile bases, electric wheelchairs, soft robot manipulator arm. They can support disable and elderly people with special needs in their living environment Intelligent Service Robotics cover a broad spectrum of research axis, from intelligent robots acting as a servant, secretary, or companion to intelligent robotic functions such as autonomous wheelchair navigation, embedded robotics, ambient intelligence, or intelligent space. Some international industrials already think that smart houses or smart buildings (with sensors, actuators and computer capabilities) could be already considered as "static robots": in these cases, adding a mobile robot inside the house or the building could add "mobility capabilities" to the whole

[1] Velkoff and Lawson 1998: gender and aging : caregiving. International Brief. Http://www.census.gov/ipc/prod/ib-9803.pdf

	system. Many applications can be listed such as : Cleaning & Housekeeping, Edutainment, Humanoids, Inspection, Surveillance, Medical Applications, Construction, Guides & Office, Fire Fighters, Food Industry, Search & Rescue, Lawn Mowers … In 2008, the unit sales of professional service robot units increased by 33%. Between 2009 and 2012 almost 50,000 units of professional service robots will be sold, mainly military and surveillance robots, logistic systems, medical robots and milking robots. Millions of domestic/personal robots were already on the market world-wide. Between 2009 and 2012 millions of vacuum cleaners, lawn mowers and entertainment robots will conquer the world (http://www.worldrobotics.org/). And for the future ?... "***A robot in every home***" as said in 2007 Bill Gates the leader of the PC revolution predicting that the next hot field will be robotics (in an article in Scientific American magazine). Since 20 or 30 years, if we believe the forecasts of the IFR Statistical Department, robots and robotics technologies will be spread in all the environment, personal or professional, to assist many everyday life activities. This project will focus on the assistance of human in terms of its mobility, its social interaction, as well as its everyday chores that are especially pertinent to the elderly. As the elderly population grows rather rapidly, thank to the advancement in medical and health care capabilities, providing them with higher quality of, yet economically viable, personal care becomes of an utmost importance both socially and economically.

A5	**Summary of the project**
	Technologies involved in this domain are numerous but the main are : Sensing, Mobility, Manipulation, Design, Control, Planning, Components . In this project, we shall concentrate on sensing, mobility, manipulation and interaction that are required for robot to be able to assist human with mobility, errand, as well as social interaction related services. Using the skills and objectives of the teams involved, four issue guidelines for applications, ensuring their relevance and consistency: 1. Mobility of people 2. Manipulation of appliances and household objects 3. Social interaction 4. Distress detection *Mobility of people* responds to the problem of fully and/or partially displaced persons by proposing to develop some automated wheelchair and/or robotic walking assistance. *Manipulation of appliances and household objects* intends to provide the capability of errand and appliance control services to human or in particular elderly on demand. *Social interaction* focuses on 2 research issues: integrating social rules in the navigation of the wheelchair as well as in the manipulation of appliances and household objects, proposing social interaction between the robot and people. *Distress detection* aims at detecting risky situation (falls, uneasiness, weakness, etc.) in real-time.

A6	**Information on the project partners ***			
	Asian partner A:		**Asian partner B:**	
	Organization	Intelligent Systems Research Center, Sungkyunkwan University, Korea		Intelligent Robotics and Automation, National Taiwan University

	Name of the lead researcher	Prof. Sukhan Lee http://isrc.skku.edu		Dr. Ren C. Luo
	Address	Sungkyunkwan University Research complex 2, 300 Cheoncheon-dong Jangan-gu, Suwon, Gyeonggi-do 440-746 Korea		National Taiwan University 625 Min-Da Hall, No.1, Sec.4, Roosevelt Rd., Taipei 106, Taiwan
	Tel/Fax	+82-31-290-7150/+82-31-299-6479	Tel/Fax	+886-2-3366-9822/+886-2-3366-3605
	Email	Lsh@ece.skku.ac.kr	Email	renluo@cc.ee.ntu.edu.tw
	Asian partner C:		**Asian partner D:**	
	Organization	International research Center MICA CNRS/UMI 2954	Organization	Intelligent Transportation System Lab, Kumamoto University
	Name of the lead researcher	Dr. Eric Castelli	Name of the lead researcher	Dr. Zhencheng James Hu
	Address	Hanoi University of Science and Technology 1 Dai Co Viet street Hanoi, Vietnam	Address	Graduate School of Science and Technology, Kumamoto University 2-39-1 Kurokami, Kumamoto 860-8555 Japan
	Tel/Fax	+84 4 3868 30 87/ +84 4 3868 35 51	Tel/Fax	+81-96-3423894
	Email	Eric.Castelli@mica.edu.vn	Email	hu@cs.kumamoto-u.ac.jp
	French partner A:		**French partner B:**	
	Organization	INRIA Rhône-Alpes e-Motion team	Organization	LASMEA, CNRS Blaise Pascal University, France
	Name of the lead researcher	Dr. Anne Spalanzani	Name of the lead researcher	Prof. Philippe Martinet
	Address	INRIA Rhône-Alpes, 655 Avenue de l'Europe, 38334 Saint Ismier Cedex, France	Address	Campus des Cezeaux 63177 Aubiere cedex France
	Tel/Fax	+33 4 76 61 52 92/ +33 4 76 61 54 77	Tel/Fax	+33 473 407 653 (sec 7261)/ +33 473 407 262

	Email	Anne.Spalanzani@inrialpes.fr	Email	Philippe.MARTINET@lasmea.univ-bpclermont.fr

B. Detailed project presentation

B1. General orientation of the project (basic research – applied research with or without the participation of a company) - *200 words maximum.*

Each partner has been conducting research related to this area based on its own funding sources. The principal orientation of this proposal is to promote the exchange of ideas, researchers, and research results. This project would be used as seed money to attract more funding from governments toward the advancement to the next generation of mobile service robots by taking the leverage from the many research outcomes of the participating organizations, including the rich research results out of the past Cyber Transportation research. For instance, it is known that special research programs coming from the National Agency of Research allow connection with Taiwan in the field of technology for health, and with Japan in the large field of robotic (i.e 2010 Calls).

B2. Project description - *2 pages maximum.*

- Objectives, origin, implementation plan including the contribution of each organization involved
- Project reach
- Expected outcomes

B2.1. Objective

The main objective is to bring the expertise of researchers in autonomous navigation (INRIA-Rhône-Alpes, LASMEA CNRS), sensor-memory based (visual servoing) robot motion control (LASMEA CNRS), mobile robot modelling (LASMEA CNRS), visual recognition and manipulation (ISRC/SKKU, IRA Lab), sociable interaction (ISRC/SKKU, MICA, INRIA-Rhône-Alpes) and environment modeling and understanding (Kumamoto University, MICA) in order to integrate a complete mobile interactive robotic system able to evolve autonomously in open and dynamic environments, maintaining interaction with human being.
We wish to address human friendly environment (i.e indoor: home, hospital,…) as well as urban context (outdoor: inner cities, shopping area, historical center, zoo, green spaces…).
The requested funding would be used to set up the collaboration between France and the four Asian countries to:
- Organize annual joint workshops (mainly close to international conferences)
- Organize visit of partners in order to set up international collaboration
- Exchange researchers and research results (to push and promote mobility of people and ideas) and start co-supervised PhD thesis
- Apply the advanced ICT (Information and Communication Technology) in mobile service robotic in order to improve the efficiency, integrity, safety, and quality of human life towards the goals of the ICT-PAMM project. Using ICT-PAMM project, France and the four Asian countries would seek larger funding toward promoting mobile service robotic in the Asian region and in the world.

B2.2. Areas of application

The project will promote the use of proper and autonomous technologies in order to help and assist human in daily task, to make easier and comfortable human life. It will focus on needs mainly coming from elderly people, helping them in everyday life tasks.
These new technologies will transform human life in more convenient and comfortable ways respecting the environment.

B2.3. Expected results

Such a mobile service robotic system is designed to offer help and assistance to human in their daily task.
Expected results are as following:
- proposing a common definition of service robots, their use and interaction with humans
- developing reliable and safe algorithms and technologies for mobile and manipulation service robots
- demonstrating in real places for mobile manipulation service robot
- starting international collaboration between each partners in the field of mobile and manipulation service robotic

The recent developments and results obtained in the field of Intelligent Service Robotics, the growing needs coming from society both from environmental protection and elderly people (for instance), and the already available technologies will allow the great success of such new concepts and technological solutions. In addition, solutions developed in taking into account human interaction and fitting human needs will be accepted more easily.

The proposed project combines 6 research groups (2 French and 4 Asian research groups) having complementary skills and expertise to conduct research in the area of service and assisting robotics, particularly focused on models and algorithms for context understanding and safe autonomous navigation in dynamic environments (like those found in a home environment)

To promote the concept of mobile service robot in the all countries, the partners will propose to organize workshops and live demonstrations in 2 countries. ISRC shall organize a demonstration on a cognitive consumer robot developed for the elderly, called HomeMate, in 2012, where the capability of HomeMate to carry out such errand services as a scheduled medicine delivery, an on-demand delivery of remote controllers and eyeglasses, etc. IRA Lab shall experiment on his soft robot manipulator arm to verify safety and performance which can help to perform a wide variety of supporting system to assist disable and ederly people with special needs in their living environment. E-Motion shall propose a demonstration on its automated wheelchair.

The project will start by a Kickoff meeting (first step) aiming to:
• Task T1 : selecting mobile manipulation service tasks to be investigated (service robotic and cyber transportation)
• Task T2 : giving a description of possible technologies developed by the partners

The second step of the program concerns the collaboration actions for studying and developing the technologies for
the selected scenarios:
• Task T3 : Technology for personally assisted living, visual search and retrieval of objects, appliance manipulation as well as for brain tweezing with social interaction (Managed by ISRC/SKKU)
• Task T4 : Human interaction and knowledge based behaviors (Managed by MICA)
• Task T5 : Environment modeling and understanding (Managed by Kumamoto University)
• Task T6 : Navigation techniques using vision, risk assessment and social rules (Managed by LASMEA)

Possible partners' participation can be the following but can be updated during the kickoff meeting.

Partner	T1	T2	T3	T4	T5	T6
INRIA eMotion	X	X		X		X
LASMEA	X	X	X			X
ISRC	X	X	X	X		
Kumamoto	X	X			X	
MICA	X	X		X	X	
IRA	X	X	X			

B3. Timeline and main implementation phases

The project is supposed to start on 2011 and for two years (2011-2013).

Year 2011-2012: Starting the project, selecting scenarios and required technologies, initial studies.

The kickoff meeting will be organized at the conference ICRA 2011 in Shanghai.

May 2011 to October 2011: Tasks T1 & T2
Mutual visits, first workshop and technical meeting for scenario selection
• Spring 2011 (T1-T2): Visit of French Institutions by Asian partners and First workshop in Asia. E-motion will visit MICA Center.
• September 2011 (T1-T2): Visit of some Asian Institutions by French partners

November 2011 to April 2012 : Tasks T3 to T6 (first step)
Study of the involved technologies, first simulation results, first demonstration, writing the report year 1.
• Exchange of researchers/students (at minimum one trip both side)
• Definition of internship and postdoctoral subject proposals, using participating countries funding programs
(at minimum one position both side).

Year 2012-2013: Implementation and evaluation of real experimental platforms, The second workshop will be organized with final demonstrations.

May 2012 to October 2012: *Study of possible implementations and of the related technical issues (Tasks T3 to T6, secondstep).*
• Exchange of researchers/students/postdocs, based on the exchange program defined during year 1
• September 2012: visit of some French Institutions by some Asian partners

November 2012 to April 2013: *Implementation of the technologies (tasks T3 to T6), real evaluation on real personal assisting robots (T3-T6), writing the final report.*
• Demonstration on Mobile Service robot in Korea (ISRC)

June 2013
Final workshop during the IROS conference (Portugal) (seminar dedicated on the developed and evaluated technologies/techniques).

We have already planned some actions between partners:
- Workshop in ICRA 2011 Shanghai (May 9 th to 13th)
- Visit of MICA center by members of e-motion INRIA during the first semester 2011

B4. Contributions

After defining the scenarios and related technologies (Tasks T1 & T2) during the kickoff, each partners will takes in charge one particular task in the predefined list (T3 to T6). Each partner as a leader will organize collaboration between the engaged partners. All partners will be able to organize demonstrations on their own demonstrators.
Each demonstration will show capabilities in either autonomous navigation, learning and understanding the environment and social interactions, human interaction, localization, … Many sensors and different kinematic models will be considered.

The next generation of service robots is expected to demonstrate a new dimension of services for human with the capabilities of errand/delivery, appliance control, assembly, laundry, meal preparation, interaction and collaboration in physical and mental domains, etc. These capabilities as listed above are essential for service robots to move closer to personalized assistance and companionships in interaction with human in their daily lives.
To implement these capabilities scientific and technical bottlenecks need to be raised: full autonomy in manipulation, safe and comfortable navigation, very good interactions with potential users.
Obviously, these research axes are completely dependent on the representation of the environment which needs to be as complete and suitable as possible.

- Manipulation

As the autonomous navigation has been the key driving engine for the current generation of service robots, so is the autonomous manipulation for the next generation of service robots. To realize a full autonomy in manipulation for helping elderly people, especially under unstructured human daily environments, is however highly difficult, as it requires, as key enabling technologies, real-time visually guided search, grasping and retrieval of 3D objects, as well as real-time visually guided modeling and understanding of 3D workspace and environment, that work for large environmental variations. Besides, for autonomous manipulation, to show that it works in terms of its functionality is not enough, rather it must demonstrate the naturalness and dependability, like the way human does, that are expected by the users under interaction. In spite of its remarkable achievement during the past decades, however, the vision

technology available today are yet to provide the right solutions for the above requirements pertinent to the visually guided autonomy in manipulation for service robots.

- Human aware Navigation

Autonomous navigation in dynamic environment capability is one of the key issues for the next step of introducing robots in the daily life of human. To reach such objective, it is necessary not only to localize, model and control the vehicle itself, but to also to detect, estimate and predict the evolution of the close environment of the robot. In that case, we will address the hard problem of safe navigation in dynamic environment. Currently, vision and laser are the main sensory modalities used to perform navigation. Specific environment representation can be used introducing the uncertainty and the collision free space.

- Interaction

To design and realize robots able to propose user centered services, user-robot interaction, and more generally user-smart system interaction using robots, require specific attention. It is well known that human-human interaction uses multimodal entries (speech content, intonation, gestures, face, etc.). It is why human-machine interaction becomes more natural and closer to human-human interaction and for this, voice and vision are two natural candidates. With voice, user can control robot with vocal commands. Taking into account non linguistics information contained in speech, robots could also estimate psychological behavior of the users (emotions). Vision technology could also be used to recognize hand and body postures, as well as gestures. It is also possible to analyze user's face in order to estimate emotions and attitudes. One aim consists in proposing the formulation of a more humanized interaction between the user and the robot. Robots could be equipped with a speech communication interface and also a gesture recognition algorithms and a face analysis/emotion recognition module.

B5. Organization & Credentials.

Presentation of each organization of the lead researcher in each of them**.**

Project manager: Dr. Anne Spalanzani

Anne Spalanzani is associate professor at Pierre-Mendès-France University and member of the e-Motion project-team (http://emotion.inrialpes.fr) of LIG Laboratory (Laboratory of Informatics of Grenoble http://www.liglab.fr).
She received her PhD in Computer Science entitled "Evolutionary Algorithms for the study of the Robustness of Speech Recognition Systems" from the Joseph Fourier University in 1999. She spent 1 year at the CNR of Rome working on "Learning and Evolution".
Her research focuses now on perception based navigation. She has been involved in several national or international projects : European project BIBA [2001-2005], national Predit project PUVAME [2003-2005], European project BACS [january 2006-february 2011], ANR project LOVe [2006-2009], as well as the ICT-Asia CityHome [2008-2010].

Co-Project manager: Pr Philippe Martinet

Philippe Martinet (Clermont-Ferrand 1962) is a currently full professor of Automatics and Robotics at IFMA (French Engineering Institute in Advanced Mechanics), and research scientist in LASMEA (Blaise Pascal University in Clermont-Ferrand). He has led the research group GRAVIR (Vision and Robotics group) during 5 years until 2006. He has setup and he leads the research team ROSACE (Robotics and Autonomous Complex systems). His research interests include visual servoing, vision based control, robust control, automated guided vehicles, active vision and sensor integration, visual tracking, and parallel architecture for visual servoing applications. He has participated to more than 15 projects. He is currently Associated Editor of International Conferences (ICRA, IROS, ITSC), member of different Program Committees (ICRA, IROS, ICINCO, MFI, JNRR), reviewer for the main International Journals in Robotic (IJRR, TRO, AR, …). At the national level, he is member of the steering committee of the "GdR Robotique". From 1990 until today, he has supervised two "habilitations", 27 (10 still in progress) Phd, 11 Master students and 2 Post-doc. For the same period, he is author and co-authors of more than 200 references. In 2006-2007, he has spent one year abroad at ISRC in Sungkyoungkwan University as visiting professor.

B5.1 INRIA

INRIA (National Institute for Research in Computer Science and Control) is a French public-sector scientific and technological institute operating under the dual authority of the Ministry of Research and the Ministry of Industry.
INRIA's missions are "to undertake basic and applied research, to design experimental systems, to ensure technology and knowledge transfer, to organize international scientific exchanges, to carry out scientific assessments, and to contribute to standardization". INRIA gathers in its premises around 3,000 persons including 2,500 scientists and trainees, many of which belong to partner organizations (CNRS, industrial labs and universities) and are assigned to work on common "projects". The research carried out at INRIA brings together experts from the fields of computer science and applied mathematics covering the following areas: Networks and Systems; Software Engineering and Symbolic Computing; Man-Machine Interaction; Image Processing, Data Management, Knowledge Systems, Simulation and Optimization of Complex Systems. Contribution to standards is done through the Institute's co-ordination of the World Wide Web Consortium, and through participation of ETSI, IEEE, etc. INRIA has been involved over the last 12 years in the application of Information Technologies in the field of intelligent road transport and in particular in driving assistance and automation. INRIA has participated in numerous European research programmes in this field such as Carsense, DIATS, Stardust, CyberCars, CyberMove, and has co-coordinated of CityMobil, CyberCars-2, GeoNet. INRIA was the coordinator of the CyberCars and CyberMove Projects. INRIA has led two ICT-ASIA programs: FACT project (French-Asian Cyber Transportation 2006-2007) CITYHOME project (From Cyber Transportation to Mobile Service Robot 2008-2010) and also two French Korean STAR Program SAFEMOVE04-05.

EMOTION project at INRIA

The project-team e-Motion aims at developing models and algorithms allowing us to build artificial systems including advanced sensori-motors loops, and exhibiting sufficiently efficient and robust behaviors for being able to operate in open and dynamic environments (i.e. in partially known environments, where time and dynamics play a major role), while leading to various types of interaction with humans. Recent technological progress on embedded computational power, on sensor technologies, and on miniaturised mechatronic systems, make the required technological breakthroughs potentially possible (including from the scalability point of view). In order to try to reach the previous objective, we combine the respective advantages of computational geometry and of the theory of probabilities. We are also working in cooperation with neurophysiologists on sensory-motor systems, for trying to apply and experiment some biological models. This approach leads us to study, under these different points of view, four strongly correlated fundamental research themes: Perception and multimodal**,** Perception based navigation and SLAM, Motion planning and autonomous navigation in the physical world**,** and Learning, decision and probabilistic inference**.**

Key people involved at INRIA-Rhône-Alpes

Anne Spalanzani is associate professor at Pierre-Mendès-France University leader of the project. (For more see above).

Christian Laugier is Research Director at INRIA (French National Institute for Research on Computer Science and Control), and scientific leader of the Robotics project-team *e-Motion* at INRIA Rhône-Alpes. He received the Ph.D. and “State Doctor” degrees in Computer Science from Grenoble University (France) in 1976, and 1987 respectively. He has been involved in research in the fields of Computer Graphics and Robotics for more than 20 years; his current research interests mainly lies in the areas of *Motion Autonomy, Intelligent Vehicles, and Decisional Processes*. In 1997, he was awarded the *Nakamura Prize* for his contribution to the advancement of the technology on Intelligent Robots and Systems. Christian Laugier is involved in various national and international scientific committees (French Robea programme, French inter-ministerial Predit programme, CNRS Robotics RTP17, French- Korea committee of the Foreign Affairs Ministry, Adcom fo the EURON European network ...), and he supervised several projects supported by the French government or by Europe (Eurêka, Esprit, HCM, coordination of the *Heros* HCM network ...). He is regularly involved in the program committees or in the organization committees of the major international conferences in robotics, e.g. IEEE International Conference on Robotics and Automation (ICRA), or IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) ; he was the *General Chair* of IROS'97 in Grenoble, the *Program co-chair* of

IROS'00 in Takamatsu, and the *Program Chair* of IROS'02 in Lausanne; he is the *Program Chair* of IROS'08 in Nice. He is also a member of the *Advisory/Steering Committee of IROS* since 1996. In addition to his research and teaching activities, he participated in the start-up of four industrial companies in the fields of Robotics, Computer Vision, and Computer Graphics. He was a member of the administration boards of ITMI (from 1984 to 1987), ALEPH Technologies (from 1989 to 1990), and Getris Images (from 1998 to 2000); he also served as a Scientific Consultant for ITMI and ALEPH Technologies.

B5.2. LASMEA

The Laboratory for Electronic Material and Electromagnetism, and for Automatics of Clermont-Ferrand (LASMEA UMR6602 CNRS / UBP) is a research center jointly depending from the French National Council for Scientific Research (CNRS) and the Blaise Pascal University of Clermont-Ferrand. The laboratory has been created on January 1st, 1994 in order to federate research activities in Information Technologies. The Vision and Robotics Research Group (GRAVIR) of the LASMEA has a staff of 30 persons (23 faculty members and 2 CNRS researchers), 40 PhD students and 6 post-docs. Its research activities are splitted in 3 main teams (PERSYST,COMSEE and ROSACE) and cover 5 areas including calibration of camera and robots, sensor integration and characterization, fine measurement; Pattern recognition and tracking, Multi-sensorial perception; Robotic System Control: visual servoing for manipulators and mobile robots, robust control, control of complex mechanism Architecture and Algorithm Adequation in vision applications (SOC, fast prototyping, active sensor) and one major scientific project based on Intelligent Vehicle. These five areas are complementary and interact through several application fields, and in particular Intelligent Vehicle: perception and control by vision, telemeter, radar, and GPS. GRAVIR is involved in ROADSENSE, PAROTO, ARCOS2003, ROBEA-BODEGA, PREDIT-MOBIVIP, ANR-CITYVIP, ANR-FAST, ANR-ODIAAC, ANR-PROTEUS, ANR-ARMEN, ANR-SAFEPLATOON, FUI CRISTAL, FUI VIPA and has many contracts with PSA, Renault, Thomson, Sagem, and Daimler Benz. With most of the current partners (INRIA, NTU, ISRC, SJTU), we have done one ICT-ASIA FACT (French-Asian Cyber Transportation) project from 2006 until 2007. Before that, LASMEA, ISRC and INRIA were involved in two French Korean STAR Program called SAFEMOVE04 and SAFEMOVE05. By the end of this year, we will end another ICT-ASIA program called CITYHOME where INRIA, NTU, ISRC, SJTU, Heudiasyc and Kumamoto are involved.
These works are carried out in close relationship with the TIMS Research Federation (FR2856) of CNRS (Technologies for information, Mobility and Safety) which associates four laboratories of the Blaise-Pascal University of Clermont-Ferrand, and two Cemagref's laboratories. This Research Federation brings together multidisciplinary areas. LASMEA is involved in V2I: Intelligent Infrastructures and Vehicles. V2I is mainly concerned by vehicles in poorly structured environments, urban environment, road environment, and all indoor environments. PAVIN, a CNRS national dedicated VIP platform, has been inaugurated in june 2008. This platform has been offered to the partners of CITYHOME as an international platform to evaluate different algorithm for VIP (cyberCar).

ROSACE Team at Lasmea

ROSACE is a Robotics and Autonomous Complex Systems research team in LASMEA's GRAVIR group. ROSACE has 4permanents members and 14 PhD students. ROSACE is concerned by three main research axes (http://www.lasmea.univ-bpclermont.fr/rosace): VISIR Visual Servoing of Robots, AGV (Automatic Guided Vehicle), and MICMAC (Modelling, Identification and Control of Complex Machines). ROSACE is currently involved in some european projects (FP6-NOE EURON,), in several ANR - National Research Agency - projects (VIRAGO (High speed parallel robots), CITYVIP (urban environment), FAST (outdoor environment)), R-DISCOVER (Autonomous exploration), COGIRO (control of giant robots), PROTEUS (Software robotic platform), ARMEN (Assistive Robotics to Maintain Elderly people in Natural environment), ARMS (Manipulation in meet industry), and Regional projects (CRISTAL (urban environment), SRDviand (dedicated to meat industry), Innov@pole (urban and poorly structured environments)), BRI (Intelligent Transportation system with ISRC in Korea)

Key people involved at LASMEA

Philippe Martinet is full professor at IFMA in Clermont-Ferrand. He leads the ROSACE team, and during 5 years was the leader of GRAVIR (30 permanent staff and 42 PhD). (for more see above).

B5.3. ISRC, Korea

Intelligent Systems Research Center ISRC (Intelligent Systems Research Center) at Sungkyunkwan University was founded in 2004 and has chosen to focus her R&D on intelligent robotics and systems, including, but not limited to, fast and robust 3D perception, realtime 3D modeling of dynamic environments, fusion of diverse and uncertain information, visual navigation and manipulation, contextual understanding of scenes, natural interaction of robots with human counterparts, cognitive robotic engine as a fundamental paradigm for robotic information processing, hardware-software co-design of robotic functions, automatic content generation for robotic companionship, etc. ISRC is currently leading the Korean national program to develop the next generation of service robots for elderly as well as to develop the environmentally friendly personal transport service robots. Especially, ISRC has developed novel technologies on cognitive vision with such mechanism as the focus of attention, the multi-hypothesis based spatial-temporal evidence fusion, and the proactive evidence collection that are key for guaranteeing the dependability in visual perception and recognition for the next generation of service robots and of cyber transportation systems. ISRC is now participating as part of the FACT (French-Asian Cyber Transportation) program since 2004 (Safe Move project and ICT-ASIA program).

Key people involved at ISRC

Dr. Sukhan Lee is currently a Distinguished Professor of Information and Communication Engineering and the Director of the Intelligent Systems Research Center at the SungKyunKwan University (SKKU) in Korea. He is also holding an Adjunct Professorship with the Georgia Institute of Technology as well as with the University of Southern California. Prior to his tenure with SKKU since 2003, Dr. Lee has served as an Executive Vice President and Chief Research Officer (CRO) for Samsung (SAIT), managing Intelligent Systems as well as Micro/Nano Systems Sectors. Dr. Lee was also with the Jet Propulsion Laboratory (JPL), California Institute of Technology, as a Senior Research Staff (1990-1997) and with the University of Southern California as a Faculty of Electrical Engineering and Computer Science (1983-1997). Dr. Lee received his Ph.D from Purdue University, West Lafayette, and MS and BS from Seoul National University. He is a Fellow of IEEE and a Fellow of Korea National Academy of Science and Technology. He is currently directing the Industrial Activities Board as a Vice President of IEEE Robotics and Automation Society. He is the Founding Editor-in-Chief for the Springer-Verlag Journal of Intelligent Service Robotics

B5.4. MICA Center

MICA Center (Multimedia, Information, Communications and Applications) is an international unit of the CNRS (UMI 2954) established in Hanoi, Vietnam. It has been founded at the beginning of 2002 to participate to the development of the information technologies in Vietnam and to satisfy preoccupations concerning their evolution. The studies realized in MICA Centre aim to research and develop theoretical results and applications in the following topics: processing complex signals (speech and images), multimedia applications, human-machine and human-systems interfaces, perceptive spaces and ubiquitous computing, advanced (virtual, embedded and distributed) instrumentation.

Numerous research projects were developed by MICA researchers in close cooperation with French laboratories and laboratories from neighbor countries. As an UMI of CNRS, MICA Center takes an active part in the international visibility of CNRS, and more generally of French research, in a world area where are imagined, designed and diffused a great number of scientific and technological innovations in telephony, multimedia and information technologies fields.

Mica Center is constituted in four research groups:

- **"Speech and communication acts"** group works mainly on natural language processing, speech processing and vocal technologies in Vietnamese, Khmer, Lao et some Asian minority languages;
- Researchers from **"Images/videos processing and semantic extraction"** group study image and video processing for multimedia applications and for human-systems interaction; these activities concern form recognition, multimedia database indexing and retrieval based on content, object detection and tracking for visual scene interpretation ; for instance, the team works on face and gesture recognition for human-robot interaction;

- Main aims of **"Multimodalities and meaning"** group consist in improving communication between humans and machines (or systems) in order to obtain a more intuitive control or a more intelligent access to huge database;
- **"Advanced instrumentation and perceptive environments"** group works on the study and the development of pervasive (perceptive) environments, from very small one (smart terminal) to bigger ones (smart campus, smart industrial area, etc.); researchers of this group decline studies on advanced instrumentation (distributed and mobile instrumentation, sensors networks, etc), on human-machine interface (fusion/fission of dynamics interfaces), and user localization.

MICA researchers already participated to several (national or international) research projects related to pervasive environments and ubiquitous computing (international: ISERE project, MOSAIC project, SWEET-HOME project – national: SIAM project, "Smart Campus" project, "Smart ECG" project, Smart Robot project, PERSPOS project).

Key people involved at MICA Center

Eric Castelli is an Associate Professor at the "Institute National Polytechnique de Grenoble (INPG)" and Honorary Professor of Hanoi University of Science and Technology. He defended his PhD thesis in electronic system field in 1989 and his HDR thesis in 1999. He worked at "Institut de la Communication Parlee (ICP)" laboratory from 1984 to 1997, and then he joined the CLIPS laboratory in January 1998. Now he works in Hanoi – Vietnam in the framework of an international co-operation project in order to setup a new Franco-Vietnamese research laboratory: International Research Center MICA (Multimedia Information, Communication and Applications). He is now vice-director of the MICA Center in charge of the scientific program management. He published about 120 papers on various aspects of speech analysis, speech production, speech recognition & general instrumentation.
He has also been involved in several national and international projects : among others, one can quote European project "SPEECH-MAPS", MAE "CORUS", AUF PCSIU "TALK", European ASIA-Link "CONE", European ASIA-ITC "ISLAND", French STIC-ASIE "ISERE", AUF PCSIU "IRIS", French STIC-ASIE "MOSAIC", French STIC-ASIE "SCOUT", French BQR "PERSPOS", ANR Blanc "PI Languages", ANR TecSan "SWEET-HOME", ANR Blanc "APPSyl".
Scientifics topics: Speech processing, signal processing, instrumentation & multimedia.

Eric Castelli's publications related to the project,
[1] Dan Istrate, M. Vacher, J. F. Serignat, L. Besacier, **E. Castelli**. "Système de télésurveillance sonore pour la détection des situations de détresse". ITBM-RBM (Elsevier) Revue Européenne de Technologie Biomédicale. 2006.

[2] D. Istrate, D.; **Castelli, E**.; Vacher, M.; Besacier, L.; Serignat, J.-F. "Information Extraction From Sound for Medical Telemonitoring", IEEE Transactions on Information Technology in Biomedicine. Volume: 10 Issue: 2 Date: April 2006. pp 264-274.

Nguyen Viet Tung is a young permanent researcher which obtains his diploma recently in December 2008 in the framework of a sandwich PhD between MICA and LIG Grenoble. His research domain concerns Human-Machine Interface and ambient computing. He is involved in SIAM (Salle Intelligente pour Applications Multimédia) project and in "Smart Campus" projects, both projects currently studied in MICA Center in ubiquitous computing field. He will work at part time in SWEET HOME project.

Nguyen Cong Phuong is a permanent teacher/researcher of MICA Center (research) and Instrumentation and Industrial Informatics Department of HUT (teaching). He obtains his PhD diploma in December 2006. His research domain concerns real time audio analysis with application to medical telesurvey. He is already involved in SIAM (Salle Intelligente pour Applications Multimédia) project in MICA Center. He works at part time in SWEETHOME project. Nguyen Cong Phuong will bring his knowledge in real-time audio analysis and participate to the design of the audio acquisition modules.

M^{me} LE Thi Lan is a PhD permanent researcher from CNRS/MICA Center She obtained her PhD in the beginning of 2009 in the framework of an international project between MICA Center and French INRIA/PULSAR team from Sophia Antipolis (Southern France). Dr LE Thi Lan's scientific topics concern semantic extraction and reasoning from visual scenes and multimedia retrieval.

B5.5. Intelligent Robotics and Automation (IRA) Lab at National Taiwan University

Intelligent Robotics and Automation Lab, IRA Lab is in the Electrical Engineering Department of National Taiwan University. The lab leader Prof. Ren C. Luo is a distinguished professor of NTU and the President of Robotics Society of Taiwan. Prof. Luo was President of IEEE Industrial Electronics Society (2000-2001) and was Editor -in- Chief of IEEE/ASME Transactions on Mechatronics (2003-2008) and he is currently served as CO-EIC of IEEE Transactions on Industrial Electronics. Among all the related university departments, NTU's EE is prestigious to attract the best students of Asia. The objective of IRA Lab is to cultivate academic remarkable and talented person of the technological innovation. The research focus is centering around the following areas:

- Intelligent Robotics
  - ○Biped Robot
  - ○Security Robot
  - ○Robot Vision
  - ○Medical Robotics
- Automation
  - Intelligent Embedded System
  - Intelligent Building
  - Medical Automation

Key people involved at Intelligent Robotics and Automation (IRA) Lab

Prof. Ren C. Luo has served as General Chair of IEEE sponsored international conferences/workshops as listed below:

- 2010 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2010), Taipei, Taiwan
- 2008 IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO 2008), Taipei, Taiwan, August 21-23, 2008
- 2007 IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO 2007), Hsinchu, Taiwan, December 9-10, 2007
- 2007 IEEE International Conference on Industrial Electronics (IECON 2007), Taipei, Taiwan, November 5 - 8, 2007

Journal / Transactions Editor

- (Editor-in-Chief), IEEE/ASME Transactions on Mechatronics 2003-2008
- CO-EIC of IEEE Transactions on Industrial Electronics 2008

Research Funding Support

Through National Taiwan University, the IRA Lab has average funding for more than 1 million USD from National Science Council of Taiwan, Industrial Development Bureau, and Technological Development Division from Ministry of Economic Affairs of Taiwan

B5.6 Kumamoto University, Japan

Kumamoto University was founded in 1887 in Kumamoto City, which is in the central area of Kyusyu Island in the southern part of Japan. Kumamoto University is one of the most historical and famous universities in Japan and has grown into a prestigious institution with seven faculties, eight graduate schools and eleven research centers, which support a wide spectrum of educational and research activities. Currently, the university has 8,000 undergraduate students and 2,000 graduate students, including 300 international students from 35 countries. For over 100 years, Kumamoto University has been at the forefront of culture, advancing science and technology and contributing to the development of the educational system.

Intelligent Transportation System Lab

Intelligent Transportation System Lab in Kumamoto University was founded in 1996. The research group is at the leading edge of research in the advanced information processing technologies for Intelligent Transportation Systems (ITS) and Industrial Computer Vision. The ITS Lab aims to address

problems in transportation systems and networks using computer vision and other advanced information processing technologies. The ITS Lab holds a broad collaborations between industry and domestic/international partners. Applications can be found in the area of next generation of navigation system, advanced in-vehicle environment sensing and perception system, traffic flow analysis, travel time prediction, automatic parking system, etc.

Key people involved at Intelligent Transportation System Lab

Dr. Zhencheng James Hu, Associate Professor and co-director of ITS Lab. in Kumamoto University. Professor Hu received his PhD in Computer Science from Kumamoto University in 2001 and had held different positions in the image processing frontier industry before he joined back to the faculty team in ITS Lab in Kumamoto University. Professor Hu has been involved over the last 12 years in the field of intelligent vehicles, sensor fusion and augmented reality, and have published more than 80 technical papers in relative journals and conferences since 1996. He has been working as deputy project manager in the governmental projects like NEDO, MEXT as well as the collaboration projects with automobile industry partners like NISSAN, HONDA, SUZUKI, etc.

B6. Any other useful details

B6.1. Experience of the lead researchers in the implementation of similar programs

ISRC, INRIA and LASMEA-GRAVIR have participated to an ICT-ASIA programme (FACT 2006-2007).
ISRC, Kumamoto, INRIA and LASMEA-GRAVIR have participated to an ICT-ASIA programme (CITYHOME 2008-2010).

Recently , INRIA and LASMEA-GRAVIR have participated in :
• Mobivip [2003-2007] National project Predit Mobivip "Véhicules Individuels Publics pour la Mobilité en centre ville".
• LOVe [2006-2009] National project, Predit Programme LOVe "Logiciel d'Observation des Vulnérables".
• PROTEUS [2009-2013] National project, ARPEGE program PROTEUS: "Robotic Platform to facilitate transfer between Industries and academics"

The partners are: Renault, Valéo, INRETS/LCPC/LIVIC, INRIA (emotion, icare, imara), CEA List, Université Paris Sud, CNRS/heudiasyc, LASMEA, Armines (CNN, CAOR).

INRIA Projects
Cybercars 2 [2006- 2008] European project IST Cybercars 2, "Close Communications for Cooperation between Cybercars".
Profusion [2004-2008] European project, PreVENT Programme (Preventive and Active Safety Applications) Profusion, "Project for Robust and Optimized Perception by Sensor Data Fusion". The partners are: BMW, CRF, DaimlerChrysler, Delphi, Forwiss, ICCS, INRIA, Sagem, TUC, Volvo
Puvame [2003- 2006] National project, Predit Programme Puvame "Protection des Usagers Vulnérables par alarme et Manoeuvre d'Evitement". The partners are: e-Motion project (Inria Rhône-Alpes) and Imara project (Inria Rocquencourt), Ecole des Mines de Paris (EMP), INRETS, Intempora, Probayes, Robosoft, Connex.
BACS [january 2006-february 2011] European project "Bayesian Approach to Cognitive Systems" (BACS).
The partners are: Laboratoire de Système Autonomes - Ecole Polytechnique Fédérale de Zurich (coordinator), Laboratoire Gravir - INRIA - CNRS, Laboratoire de Physiologie de la Perception et de l'Action (LPPA) – Collège de France, Département d'étude Cognitive - Ecole Normale Supérieure, Institute for Biological Cybernetics - Max-Planck society, Institut Dalle Molle d'Intelligence Artificielle, Les Hopitaux Universitaires de Genève, Faculdade de Ciencas et Technologia - Universidade de Coimbra, ProBAYES S.A.S, Bluebotics SA, Electricité de France (EDF).
Lead researcher of INRIA in the FACT project, funded by French ICT Programme;
Lead researcher of INRIA in the SAFEMOVE project, funded by French Korean-French Star program;

LASMEA Projects
ANR/PREDIT
Mobivip [2003-2007] National project Predit Mobivip "Véhicules Individuels Publics pour la Mobilité en centre ville".
LOVe [2006-2009] National project, Predit Programme LOVe "Logiciel d'Observation des Vulnérables". The partners are: Renault, Valéo, INRETS/LCPC/LIVIC, INRIA (emotion, icare, imara), CEA List, Université Paris Sud, CNRS/heudiasyc, LASMEA, Armines (CNN, CAOR).

PROTEUS [2009-2013] National project, ARPEGE program PRROTEUS : "Robotic Platform to facilitate transfer between Industries and academics"

ARMEN [2010-2013] National project, TECSAN program ARMEN : "Assistive Robotics to Maintain Elderly people in Natural environment"

CITYVIP[2008-2011] National project, Predit Programme CITYVIP "Safe motion for cybercar in urban environment"
FAST [2008-2011] National project, PSIROB "Fast Autonomous Rover SysTem"
COGIRO [2009-2012], national project, ARPEGE program COGIRO "Control of Giant robot"
VIRAGO [2007-2011], national project, Young research program, VIRAGO "Nouvelles perspectives en robotique grâce à la vision rapide à acquisition séquentielle"
ACTISURTT [2010-2013], national project, VTT program, ActisurTT "Dispositifs actifs pour la sécurité des véhicules en environnement tout terrain"
Safeplatoon [2010-2013], national project, VTT program, Safeplatoon "Sûreté des convois de véhicules autonomes"
ARMS [2010-2014], national project, Arpege program ARMS "ARMS : a multi arms robotic system for muscle separation"

FUI projects
CRISTAL, VIPA Regional program funded by the FUI system
French/Asian projects
Lead researcher of LASMEA in the FACT project, funded by French ICT Program;
Lead researcher of LASMEA in the CITYHOME project funded by French ICT program
Lead researcher of LASMEA in the SAFEMOVE project, funded by French Korean-French Star program;
BRI project, Personal Intelligent Transportation System funded by Geonggy do Province in Korea

ISRC Projects
Lead researcher of SKKU in the FACT project, funded by French ICT Programme;
Lead researcher of SKKU in the SAFEMOVE project, funded by French Korean-French Star program;

B6.2. Presentation of existing activities correlated with the main objective of the project

LASMEA-CNRS
Modelling and Control (single mode, platoon mode) Localisation, Autonomous Navigation and SLAM
Vision based technique to localize mobile robot in different environment (indoor, outdoor (structured or unstructured) Vision based approaches for autonomous navigation.
Multi robot Localisation, robustness of localization by using data fusion technique.
Visual servoing of manipulator, Vision based Manipulation

INRIA-Emotion
Grid-based localization and online mapping with moving object detection and tracking
Save navigation based on the evaluation of risk of collision
Cycabtk Simulator

ISRC
Recursive Particle Filter with Geometric Constraints for SLAM
Recursive Unscented Kalman Filtering based SLAM using a Large Number of Noisy Observations
Particle Filter Based Robust Recognition and Pose Estimation of 3D Objects in a Sequence of Images

Model Based 3D Object Recognition Using Line Features
Cognitive Recognition for Home Service Robots
Real-Time 3D Workspace Modeling for Robotic Applications
High Performance Structured Light Based 3D Camera
Vision-Force Coupled Visual Servo
Cognitive Robotic Engine for Natural Human-Robot Interaction

MICA Center
User localization using heterogeneous data (PERPOS project, SMART CAMPUS project)
Humanized human-robot interaction (SMART ROBOT project, ROBOT²CONTROL project)
Elderly people behaviors analysis in a smart house (SWEET-HOME project)

Kumamoto University
Localization and navigation for mobile robot
V2V cooperation among mobile robot
Active safety and driver assistance

IRA Lab

Soft robot manipulator arm
Design of anthropomorphic shoulder, elbow and wrist joints will
Control strategy based on Adaptive Impedance Control algorithm

B6.3 Prospect for the sustainability of the collaboration after the end of the ICT-Asia project financing

In the scope of this project, we aim to reinforce collaboration between partners by co-advise ph-D, exchanging researchers and submitting more ambitious projects.

Partners will be involved to answer to proposal coming from ANR mainly in the NSC call (Taiwan) and JST (Japan) or, for instance, in the European Information and Communication Technologies Calls (FP7-ICT-2011-C).
Partners will be asked to answer to proposal coming from Korea in the Global Joint R&D program and Global infrastructure program.

C. Budget proposal

<table>
<tr><th></th><th>Income</th><th>Expenditure</th></tr>
<tr><td rowspan="2">1st year</td><td>Asian partners:

The “Personal Transport Service Robot” Project as a partnering project: 350K Euro per year for 3 years.
The “Cognitive Consumer Robot” Project as a partnering project: 1M Euro per year for 3 years.
Equipments of ISRC:
- Mobile Robot Platform for Service Robot Research: 100K Euro
- Vision Research Platform with Camera, Stereo Cameras, 3D Cameras: 50K Euro</td><td rowspan="2">Mobility
- Researchers: 17000 euros
- Doctoral students: 5000 euros
- Post-doctoral students: 5000 euros

Equipments:
- Mobile Robot Platform for Service Robot Research: 100K Euro
- Vision Research Platform with Camera, Stereo Cameras, 3D Cameras: 50K Euro

International seminars
- Logistics: 3000 euros
- Mobility: 10000 euros

Other (expand):</td></tr>
<tr><td>French partners:

MAEE*: 20000 euros
CNRS : 10000 euros
INRIA : 10000 euros</td></tr>
<tr><td rowspan="2">2nd year</td><td>Asian partners:

The “Personal Transport Service Robot” Project as a partnering project: 350K Euro per year for 3 years.
The “Cognitive Consumer Robot” Project as a partnering project: 1M Euro per year for 3 years.
Equipments of ISRC:
- Mobile Robot Platform for Service Robot Research: 100K Euro
- Vision Research Platform with Camera, Stereo Cameras, 3D Cameras: 50K Euro</td><td rowspan="2">Mobility
- Researchers: 17000 euros
- Doctoral students: 5000 euros
- Post-doctoral students: 5000 euros

Equipments:
- Mobile Robot Platform for Service Robot Research: 100K Euro
- Vision Research Platform with Camera, Stereo Cameras, 3D Cameras: 50K Euro

International seminars
- Logistics: 3000 euros
- Mobility: 10000 euros

Other (expand):</td></tr>
<tr><td>French partners:

MAEE*: 20000 euros
CNRS : 10000 euros
INRIA : 10000 euros</td></tr>
<tr><td></td><td>380 000 Euros</td><td>380 000 Euros</td></tr>
</table>

*MAEE: French Ministry of Foreign and European Affairs

The contribution requested from the MAEE under the ICT-Asia regional program can only be used to **partially cover the additional costs of the internationalization of the project**, i.e. researcher, post-doctoral or doctoral student mobility (travel and mission expenses) or the organization of international workshops and seminars (mobility and logistics)**.**

Financial support request to the French Ministry of Foreign and European Affairs and the French research organization partner of the program ICT-Asia:

1st year	Mobility - Researchers: 17000 euros - Doctoral students: 5000 euros - Post-doctoral students: 5000 euros Equipment: Operational cost: Scholarships: International seminars - Logistics: 3000 euros - Mobility: 10000 euros Other (expand):
2nd year	Mobility - Researchers: 17000 euros - Doctoral students: 5000 euros - Post-doctoral students: 5000 euros International seminars - Logistics: 3000 euros - Mobility: 10000 euros Other (expand):
Total*	80 000 Euros

* The total amount awarded by the MAEE **and** the French research organization partner of the program ICT-Asia, will not exceed a total of € 40,000 for the two years of the project, that is € 20,000 per year.