

ANNEX 2

STANDARD TEMPLATE

QUARTERLY UPDATES

Name of the Asia-wide Programme :	Asia-IT&C Programme
Contract reference no.:	CN/ASIA-IT&C/002 (88667)
Project Title:	CyberC3: Cybernetic Technologies for Cars in the Chinese Cities
Name of Beneficiary:	Research Institute of Robotics, Shanghai Jiao Tong University
Period covered by this Quarterly Update:	2006.12 – 2007.02
Due date of this Quarterly Update:	14 March 2007
<i>Project Budget</i>	<i>669.287,00 EUR</i>
<i>Funds Disbursed by Commission to date</i>	<i>320.000,01 EUR</i>
<i>Expenditure Incurred by Project to date</i>	<i>566.037,43 EUR</i>

I. Introduction

The CyberC3 Project officially started from the 1st of December 2004. In the last three months, the following activities have been implemented:

- Development of the CyberC3 vehicles, great progress have been made in the vehicle production and system refinement, etc;
- Implementation of the pilot application in the Oriental Land, great progress have been made in the system integration and testing, etc;
- Maintenance of the Project website in both English and Chinese;
- Dissemination of the Project results to the public through website, leaflets, papers, news presses, and Video CD.

II. Implementation of Activities

According to the initial work plan and logical framework, the following activities have been implemented in the last three months, and some results have been achieved:

- **Development of the CyberC3 vehicles**

Progress has been made in the development of the CyberC3 vehicles by all partners, including:

- 1) Control Module:
 - a) Circuits for onboard LED has been installed;
 - b) START button and the ultrasonic sensors have installed on the C3-2 and C3-3 vehicles;
 - c) DSP software has been refined after the tests in the Oriental Land;
- 2) Power Module:
 - a) A new Power Module has been designed and tested;
 - b) EMI (Electromagnetic Interference) in cars has been studied, and some interference sources have been found;
 - c) Feasibility of application of super-capacitors on the vehicle has been studied;
- 3) Visual Guidance Module
 - a) Camera performance has been tested in different weather conditions;

- b) Ground-texture based global localization method has been refined, one patent application has been submitted, one technical report has been written, and one paper has been submitted to IEEE IV'07 symposium;
- c) Several algorithms about map building and SLAM have been studied and summarized, such as Bayes estimate, EKF, particle filter;
- 4) Laser Guidance Module
 - a) Laser radar Localization based on Landmark Pairs (L3P) method has been realized, and one paper for IEEE IV 07 was submitted. Experiments with both real range data and synthetic data has been made;
 - b) Laser radar Localization based on Iterative Closest Points (ICP) has been realized. Experiments with both real range data and synthetic data has been made;
 - c) An EKF based simultaneous localization and mapping (SLAM) algorithm has been implemented and tested;
- 5) GPS Module
 - a) A RTK-GPS System with two receivers has been tested;
 - b) A Gauss Projection Transform algorithm has been implemented and tested in Matlab;
 - c) Software for Data Acquisition and Processing has been designed and tested;
- 6) RFID Guidance Module
 - a) Feasibility of RFID guidance has been studied, and one technical report has been drafted;
 - b) RFID based methods for vehicle localization and navigation has been designed;
- 7) Collision Avoidance Module
 - a) Tracking and classification of obstacles using laser range finder and vision has been implemented by ISR;
 - b) Pedestrians and vehicles detection using vision has been implemented by ISR;
 - c) Fly algorithm for the detection of obstacles and for avoiding them on one cybercar has been implemented by INRIA;
 - d) Stereo vision based obstacle detection using wavelets approach has been implemented by INRIA;
 - e) Collision avoidance algorithm has been tested in the campus and the Oriental Land;
 - f) Moving object tracking using EKF, UKF and SOM has been tested using a synthetic video data;
 - g) Report on Vision based Moving Object Detection and tracking has been updated;
- 8) Path Planning Module
 - a) A Real-time Navigation Architecture for cybercars based on RTAI has been developed by ISR;
 - b) a problem involving interruptions in the execution software generated by SynDEX has been identified and corrected by INRIA;
 - c) new control approach for optimised control at intersections has been proposed and implemented by INRIA;
 - d) new version of the TAXI control software was under development at INRIA;
 - e) One algorithm for vehicle "U-turn" has been designed and tested;

- **Implementation of the Pilot Application**

Great progress has been made in the development of the CyberC3 system by SJTU, including:

- 1) System integration and testing
 - a) Three CyberC3 vehicles have been transferred to the Oriental Land;
 - b) Three CyberC3 vehicles have been tested in the Oriental Land;
 - c) Some special landmarks has been drawn on the road in Oriental Land for vision based guidance;
- 2) Central Control System
 - a) Communication between the Central Control System and stations has been tested in the Orient Land;
 - b) Communication between the Central Control System and vehicles has been tested in the Orient Land;
 - c) Distributed fleet dispatching algorithm has been studied, and one paper has been submitted;
- 3) HMI System
 - a) Feasibility of applying the touch-screen at station has been studied;
 - b) HMI Database for vehicle calling has been designed and developed;

- **Maintenance of the Project Website**

The Project website in both English and Chinese has been updated several times. For detail, see: <http://cyberc3.situ.edu.cn/>

Dissemination of the Project results

Project results have been disseminated to the target groups and the public through project website, leaflets, newspapers articles, TV videos, and Video CD, in order to enlarge the influence of cybercars in China and speed up the application of cybercars in Asia:

- 1) Four papers have been presented at Eurocast 2007, Las Palmas, February 12-15, 2007
 - a) Trajectory Planning in a Crossroads for a Fleet of Driverless Vehicles
 - b) Free space in front of an Autonomous Guided Vehicle in Inner-City Conditions
 - c) Robust Obstacle Detection based on Dense Disparity Maps
 - d) Towards a robust vision-based obstacle perception with classifier fusion in cybercars
- 2) Two papers have been submitted to IEEE IV'07:
 - a) Ground Texture Matching based Global Localization for Intelligent Vehicles in Urban Environment;
 - b) Landmark Pair based Localization for Intelligent Vehicles using Laser Radar;
- 3) The public media was informed and invited in all the activities by the Project, in order to raise awareness and to enlarge the influence of the Project. one articles on the pilot application in the Oriental Land has been published on XinMin Evening News on Jan. 4, 2007.



- 4) Other activities: European Officer Dr. Eric Ponthieu Visited SJTU on Dec. 28, 2006. For detail, see: http://cyberc3.situ.edu.cn/photo/2006-12-28_eric/index_en.htm



III. Partnership

During the last three months, the main role of each partner in implementing the activities is:

- All partners were involved in the development of the CyberC3 vehicles, where SJTU was involved in the development of all modules, INRIA was involved in the Visual Guidance Module, Collision Avoidance Module, ISR was involved in the Magnet Guidance Module and Obstacle Detection Module;
- SJTU was in charge of the production of vehicles for the pilot application;
- SJTU was in charge of the implementation of the pilot application in the Oriental Land (Shanghai);
- SJTU was in charge of the maintenance of the project website;
- SJTU was in charge of the dissemination of the project results.

IV. Methodology

The methodology applied in this Project is same as the one described in the Application Form (Annex I). Prof. Ruqing Yang from SJTU was appointed the Project Manager, and assembled the Steering Committee in the beginning of the Project, which comprised key staffs from all the partners.

Contact person:	Prof. Ruqing YANG
Signature:	