

ACE in the Hole: Adaptive Contour Estimation Using Collaborating Mobile Sensors

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Application Area: Wireless mobile sensor networks

Platform: Fire Bird II

To design algorithms for efficient estimation of level sets in a scalar field using mobile sensors, Fire Bird 2 robots were used to conduct a feasibility test of the algorithm. Fire Bird 2 was programmed to move in a light field on a white line grid and sense light intensity in its neighborhood. It computes the gradient on line and uses the gradient to move towards a level set and further, uses the wall moving algorithm to trace the level set.

Two Fire Bird 2 robots were used in the experiment, one for navigation and the other as a base station to record values sent by the navigating robot while tracing the level set.

Autonomous Robot Navigation of Corners with Uncertain Sensor Information Using Fuzzy Control

Authors: Abhimanyu Bhargava, Rohit Narula and Prof. Satish Kumar; Dayalbag Educational Institute

Application area: Robotics

Platform: Fire Bird IV

It represents implementation of microcontroller programming blended with fuzzy logic for smooth and economic corner navigation by an autonomous robot. The application considered has a Fire Bird IV robot placed in the vicinity of corner. With no prior knowledge about the environment and its orientation, the robot is capable of aligning itself parallel to wall and then proceeding to negotiate a turn around the corner.

Evaluation has shown that the robot can perform the above task with sufficient accuracy, maintaining a safe distance from the wall. Use of a fuzzy control system for navigation helps to compensate for sensor errors, thus providing for a robust implementation.

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Efficient Real-Time Support for Automotive Applications: A Case Study

Authors: Gurulingesh Raravi, Neera Sharma, Krithi Ramamritham, Sachitanand Malewar
12th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), Sydney, Australia.

http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=1691332

Application Area: Automotive

Platform: Dexter 6

The number of computer-controlled functions in an automobile is increasing at a rapid rate and so is the number of microprocessors implementing and controlling these functionalities. Therefore, there is a need to minimize the computing power provided without affecting the performance and safety of the applications. The latter is especially important since intelligent automotive applications deal with critical data and involve deadline bound computations on data gathered from the automobiles' environment. These applications have stringent requirements on the freshness of data items and completion time of the tasks. Our work studies one such safety-critical application, namely Adaptive Cruise Control (ACC). We take a task+data centric approach for designing and implementing this application.

Two Dexter 6 series robots were used in this experiment. ACC was implemented on these robots. The robot was controlled by onboard PC running on RTLinux-3.1 platform. The PC performed all the computations and issued commands to the robot. The controller polled the data values from different sensors and performed computations to decide the action to be taken and drove the actuators to carry out the appropriate actions. The sensors were used to measure the host vehicle speed and leading vehicle distance.

Towards Intelligent Vehicles: Automatic Merge Control

Authors: Gurulingesh Raravi, Jatin Bharadia, Krithi Ramamritham

Workshop on Model and Analysis Methods for Automotive Systems held in conjunction with RTSS 2006, Brazil.

<http://www.it.iitb.ac.in/~erts/index.php?page=publications>

Application Area: Automotive

Platform: Fire Bird II

Merge Algorithms for Intelligent Vehicles

Authors: Gurulingesh Raravi, Vipul Shingde, Krithi Ramamritham, Jatin Bharadia

Proceedings of workshop on Next Generation Design and Verification Methodologies for Distributed Embedded Control Systems, Springer-Verlag, 2007, India.

<http://www.springerlink.com/content/h775164136ln2332/>

Application Area: Automotive

Platform: Fire Bird III

Merge-by-Wire: Algorithms and System Support

Authors: Vipul Shingde, Gurulingesh Raravi, Ashish Gudhe, Prakhar Goyal, Krithi Ramamritham

Accepted in Real Time Systems Symposium 2008, Spain and in Microsoft Research India Techvista 2008, India.

<http://www.it.iitb.ac.in/research/techreport/reports/52.pdf>

Application Area: Automotive

Platform: Fire Bird III, Dexter 6

Real-Time Data Services for Automotive Applications

Authors: Gurulingesh Raravi, Krithi Ramamritham and Neera Sharma

Application Area: Automotive

Platform: Dexter 6

In the recent years, the amount of data that needs to be sensed, stored and processed has increased significantly in an automobile with the rapid growth of electronics and control software applications. The number of microprocessors required to implement these applications have also gone up significantly. These applications deal with safety-enhancing vehicle functions and hence with critical data having stringent requirements on freshness and involving deadline bound computations. Therefore, there is a need for effective real-time data services to handle the data without affecting the performance and

safety of these applications and also minimizing the computational resource requirements. Using computational resources efficiently is very important which helps in reducing the additional cost of the car manufacturer incurred due to electronics and control software. These applications generally being distributed across several communicating Electronic Control Units(ECUs) increases the problem complexity. Our work studies one such critical application namely, Adaptive Cruise Control(ACC). We take data+task centric approach in providing real-time data services, designing and implementing this application.

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