

2013 臺灣國際科學展覽會 優勝作品專輯(國外作品)

作品編號 110019
參展科別 電腦科學科
作品名稱 Self driving car
得獎獎項 四等獎

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ABSTRACT OF EXHIBIT

TAIWAN INTERNATIONAL SCIENCE FAIR

Autonomous car is a very new concept, being a car without any driver. Several concurrent software process data using Artificial Intelligence to recognize and propose a path which the car should follow.

The goal of the project is that a driverless car can reduce the distance between the cars, lowering the degree of road loadings, reducing the number of traffic jams, avoid human errors, and allowing people with disabilities (even blind people) to travel using an autonomous car. Theoretically a car without driver in the future should be much safer, because human reaction speed is higher than 200 ms, and the computing power of the newest computers allows traffic calculations even to 10 ms. The necessary power is provided by three multi-core laptops that process with Artificial Intelligence in order to recognize traffic signs, traffic lanes, traffic car fingerprints, processing the data from a 3D radar, using particle filters to localize car in a GPS map, the management of database with traffic signs, magnetic sensors, acceleration sensors, a distributed software, a supervisory system and the software which drives the stepper motor to turn the steering wheel (acceleration and braking).

Currently the software is able to recognize the traffic signs, register them in a database using Google Maps. The fields record the sign and direction of travel from that area. Each car participating in the traffic and using this software will register new signs detected and will modify the degree of confidence of recognition for other users.

Another software component is able to recognize the demarcation lines between lanes, with three cameras to calculate exactly or using probabilities where it is on the road, where the roadsides are and to propose a new direction even in the absence of traffic signs for the next seconds. Another part of the software is trying to use Artificial Intelligence to detect other car fingerprints from webcam images.

The calculation was performed on 3 computers, requiring distributed processing. I developed a management information system based on semaphores that allows data processing and supervision from 3 different computers.

This project presents a hardware version of a LIDAR – a 3D radar and a software for creating a 3D environment in which the car navigates and using it the car will take

decision to avoid obstacles. The LIRDAR contains a total of 16 avalanche photo-detector mounted on a stepper motor that spins at a frequency of 10 Hz. The information provided by my radar is about 576.000 pixels at resolution of 10 bits. The 3D radar helps the entire software system to increase the confidence of decision.

評語

1. A continuation work from past year's work. The experimental results are adequately good. Please compare your recognition accuracy with other algorithms in the literature.
2. This project has great application value. Please do conduct real environment experimentations to show that the system is robust to different real-world conditions.