Detect and Avoid Obstacles

Proposal

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Contents

Motivation

- Smart city
  - Real-time
  - Normal cars / self-driving cars
- Safety
  - Blind corner: immediate response
  - Double assurance: prevent blind spots and faults of self-driving system
  - Additional traffic information

Expected Results

- Obstacle detection
  - STM32 continually monitor specified area
  - Send BLE message to notify cars when obstacle appears
- Obstacle avoidance
  - Connect to STM32 via BLE
  - Slow down driving speed in advance
  - Self-driving car can bypass obstacles by itself

Preliminary Lab

Car Preparation

- Assemble
  - Follow the directions in [1]
- Raspberry Pi
  - Virtual environment
  - Donkey Car
  - OpenCV
  - OLED display
- Host PC
  - Virtual environment
  - Donkey Car
  - Tensorflow

Preliminary Lab

Car Preparation

- Calibration
  - Adjust length of the pull-bars
  - Steering: in `~/mycar`, `donkey calibrate --channel 0 --bus=1`
  - Throttle: exchange the port for left / right motor
  - Visual observation only
- Manual Control
  - In `~/mycar`, `python manage.py drive`
  - Add `--js` for joystick

Preliminary Lab

Survey

- Existing products
  - iRoadSafe [2]
  - MONICA [3]
- Obstacle detection
  - Active sensor / vision / multi-sensor fusion [4]
  - Kinect: depth + infrared [5]

References I

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[2] 經濟部技術處, "IRoadSafe 智慧道路安全警示系統," (2019), [Online]. Available: https://www.moea.gov.tw/MNS/doit/content/Content.aspx?menu_id=34693.

[3] L. Rothkrantz, "Smart road," in *2019 Smart City Symposium Prague*, Prague, Czech Republic, May 2019, pp. 1–6.

[4] A. Eskandarian, Ed., *Handbook of Intelligent Vehicles*. London, UK: Springer, 2012, pp. 1034–1041.

[5] Y. Zhu, B. Yi, and T. Guo, "A simple outdoor environment obstacle detection method based on information fusion of depth and infrared," *Journal of Robotics*, no. 2379685, pp. 6–9, Dec. 2016.