Abstract

1 Introduction

Monocular vision has been demonstrating a flourishing field in autonomous vehicles.
Several applications has presented excellent solutions to problems presented nowadays. Therefore, this research contributes with an innovation, using Particle Image Velocimetry(PIV)[2] and Pearson's Correlation Coefficient(PCC)[5]. The proposal is follow objects in scene and stipulate its relative velocity utilizing the both techniques cited above.These parameters are calculated in 2 and 3 dimensions and generate a coefficient relative to velocity of approaching and removal of objects.

Matlab is software used to simulations. PIV went the most important point of the beginning this project, considering the applications with it.
Generally, this technique is utilised to calculate the field of velocity in fluids. Thus, it's possible to calcule the field of velocity of any objects that moves in scene. So, PIV was adjusted for situation to autonomous vehicles, using PCC and bank of dates of KITTI[3].

2 Theoretical fundament

2.1 Pearson correlation

2.2 PIV

3 System description

Diagrama1

4 Algorithm description

DiagramaX

4.1 Multi-resolution match criteria

onde estava, onde esta agora que tamanho tinha que tamanho tem.

4.1.1 Multilayer 3D approximation

usa Multi-resolution match criteria e explica isso dos tamanhos

4.1.2 factor of approaching - Relative velocity

4.2 Renew ROI criteria

Diagrama2

5 Numerical results

6 Conclusion

PIV has presented satisfactory results. Different kinds of information that can be concluded, like: estimate collision, tracking of objects in 2 or 3 dimensions and factor of approaching and removal. The simulations in Matlab has given promissories results: (TABLES and GRAPHICS).

PIV is great tool to analizy tracking and velocity of objects and it shows an exepcional field to develop different ways to solve the problems of applicability in autonomous vehicles.

7 Acknowledgement

FAPEMIG
numero de bolsa
numero de projeto
numero de aluno

References

[1] AOUDE, Georges S. et al. *Sampling-Based Threat Assessment Algorithms for Intersection Collisions Involving Errant Drivers*. IFAC Symposium on Intelligent Autonomous Vehicles, 2010.

[2] BASTIANNS, Rob J .M. *Cross-correlation PIV; theory, implementation and accuracy*. Eindhoven: Technische Universiteit Eindhoven, 2000. - EUT Report 99-W-OOl. - ISBN: 90-386-2851-X.

[3] GEIGER, Andreas et al. *Vision meets Robotics: The KITTI Dataset*. International Journal of Robotics Research (IJRR), 2013.

[4] JONAS, Thomas.*Real-Time Probabilistic Collision Avoidance for Autonomous Vehicles, Using Order Reductive Conflict Metrics*. Submitted to the Department of Aeronautics and Astronautics in partial fulfillment of the requirements for the degree of Doctor of Philosophy. Massachusetts Institute of Technology. June, 2003.

[5] MIRANDA NETO, Arthur et al. *Image Processing Using Pearson's Correlation Coefficient: Applications on Autonomous Robotics*. Autonomous Robot Systems (Robotica), 2013 13th International Conference on, 2013.

[6] WOERNER, Kyle. *COLREGS-Compliant Autonomous Collision Avoidance Using Multi-Objective Optimization with Interval Programming*. Submitted to the Department of Mechanical Engineering in partial fulfillment of the requirements for the degrees of Naval Engineer and Master of Science in Mechanical Engineering. Massachusetts Institute of Technology. June, 2014.