M1 Informatique – Recherche bibliographique
UE Projet
Carnet de bord : les coulisses de la recherche documentaire

Les éléments que vous indiquez dans ce carnet donneront lieu à une notation
(Notation sur 40 points comptant pour 10% de l'UE)
Ce carnet doit être communiqué au moment de la soutenance

Noms, prénoms et spécialité

Viti Mario IMA

N° de groupe de tutorat, date et heure de la séance de tutorat suivie

GROUPE 19. Lundì 20 fevrier 2017. 13.00-13.30

Sujet

1.
Realisation of an embedded solution for Raspberry powered Thymio robots. Thymio were originally designed at EPFL, and mostly targeted for educational use. For this sytem it has been developed *ThymioPYPI* a framework in Python 2.X. The requested solution is a framework extension for image processing, with the implementation of a tag detection software to be used in an embodied evolutionary robotics experiments in order to make robots aware of the sorroundings and recognize other robots.

2.
Robotics, Computer Vision, Embedded Solution, Tag Detection, Embodied Evolutionary Robotics, On Line Algorithm, Concurrent Programming, Edge Detection, Feature Detection, Motion Detection, Boundary Description, Projective Invariat Descriptor, Image Rectification, Image Encoding, Two Dimensional Code.

3.
Papers:

- "A computational Approach to Edge Detection":
  State of the art algorythms for computer vision.
- "Hierarchical model-based motion estimation":
  State of the art algorythms for computer vision.
- "Performance Evaluation of Object Tracking Algorithms": a series of good practices and metrics of evaluation regarding Object Tracking Algorithms.
- "On-Line, On-Board Evolution of Robot Controllers": Results of embodied evolutionary robotics experiment describing fitness function used during experiment design.
- "Behavioral specialization in embodied evolutionary robotics: Why so Difficult?": A reference study on embodied evolutionary robotics used as a guide for experiment design.

Patent:

- "Optically readable two-dimensional code and method and apparatus using the same": documentation of a well known techonolgy (Denso Wave Inc. QR code) for information encoding in images.

WebSite:

- "Opencv": c++/python library used for image prcessing and computer vision.

4.
In chronological order:

- J. Canny, "A Computational Approach to Edge Detection," vol. PAMI-8, no. 6, pp. 679-698, Nov. 1986.
- J.R. Bergen, P. Anandan, K. J. Hanna, R. Hingorani, "Hierarchical model-based motion estimation", Computer Vision - ECCV'92 pp. 237-252, May 1992.
- M. Hara, M. Watabe, T. Nojiri, T. Nagaya, Y. Uchiyama, "Optically readable two-dimensional code and method and apparatus using the same" US 5 726 435, 10 mar 1998.
- F. Yin, D. Makris, S. Velastin and Digital Imaging Research Centre, Kingston University London, UK "Performance Evaluation of Object Tracking Algorithms" Computer Vision – ACCV 2006, pp. 151–161, Jan. 2006.
- N. Bredeche, E. Haasdijk, A. E. Eiben, On-Line, "On-Board Evolution of Robot Controllers", in Artifical Evolution: 9th International Conference, Evolution Artificielle, EA, 2009, Strasbourg, France, pp. 110-121, Oct 2009.
- J.M. Montanier, S. Carrignon, N. Bredeche "Behavioral specialization in embodied evolutionary robotics: Why so Difficult?" Front. Robot. AI vol.3 art 38, Jul 2016.
- OpenCV Computer Vision Library. [Online]. Accessible: http://opencv.org/ [Accessed:23-May-2017].

5.

- "On-Board Evolution of Robot Controllers" and "Behavioral specialization in embodied evolutionary robotics: Why so Difficult?".

These papers show results of embodied evolutionary robotics (eer) experiments, during the project I was proposed to work with other two students in team to develop and run experiments using environmental informations extracted from the vision system, these two papers served as guideline for design and development, we've been testing how vision based information broadcasting affects the learning of behaviours in a distributed environment, this experiment also served as a stress test for the vision system.

- "Hierarchical model-based motion estimation".

During the development of the vision system I've encountered limitations to the edge detection approach in terms of throutghput. A motion estimation algorithm could cope with this by estimating the shift of cornerlike features between consecutive frames and therefore providing an estimate of the current location of the tag, if the real motion is not too large the use of a motion estimation algorithm improves performances as this paper shows how to estimate larger and larger motion of interest points in inbetween frames need more and more computations, therefore we reach optimal fps with the caveat of accepting a tread-off in terms of precision and throutghput.

- "OpenCV Computer Vision Library".

This library is at the core of many computer vision research projects and as it has being released under a BSD license it's also used in the industry, it gained popularity thanks to the python API which made robust and performing implementations of state of the art computer vision algorithm available to this versatile scripting language. This solution was obviously adopted for this project as it suited all its needs, both for performance and compatibility with the ThymioPYPI framework.

1. Introduction (5- 10 lignes max) : le sujet de recherche, ses différentes dimensions, l'angle sous lequel vous avez décidé de le traiter.

2. Les mots clés retenus : du général au particulier (5- 10 lignes max). On cherche à comprendre comment vous avez transformé vos idées de départ en mots-clés utiles à la recherche.

3. Descriptif de la recherche documentaire : mentionner tous les outils utilisés (descriptif en 15-20 lignes : et expliquer comment ils ont été utilisés). Recherche, rebonds, réorientations au sein de l'outil…Bilan de chaque outil.

4. La bibliographie produite dans le cadre du projet (norme IEEE – http://library2.epfl.ch/files/content/sites/library2/files/shared/pdf/guide-redaction-references-web.pdf)

5. Analyse de 3 sources (5 lignes minimum par sources) : comment, pourquoi, niveau de fiabilité, en quoi ces sources vous ont été utiles.