

Institute for Robotics and Intelligence Machines  
Georgia Institute of Technology  
801 Atlantic Drive, Atlanta, GA 30332, USA

duynguyen@gatech.edu  
<http://www.cc.gatech.edu/~dnth/>  
+1 617 415 8387

## Objectives

- **Realize** high-speed, robust and reliable perception and control for autonomous navigation systems
- **Explore** and **push forward** theoretical and practical limits of robotics in perception, control and learning

## Research Interests

- **Perception**: vision-based SLAM (monocular, stereo), vision-IMU fusion, object tracking
- **Control/Planning**: deterministic and stochastic optimal control, obstacle avoidance, optimization methods
- **Unified framework** for both perception and control

## Research and Work Experience

**Research Assistant**, College of Computing, Georgia Institute of Technology

- **A unified framework for perception and optimal control in factor graphs** *2013–Now*  
Enhance factor graph capabilities in representing and solving deterministic optimal control problem to exploit the sparsity and enable consistent coordination between perception and control. Represent dynamics as constrained factors using integrators on Lie-group manifolds. SQP for optimizing constrained factor graphs.
- **Object-centric approaches for fast autonomous navigation** *2013–Now*  
Design linear-time object-centric approximation for filtering-based SLAM. Discover the equivalence of allo-centric model predictive control and reactive control in LQR. Learning and combining control policies for multiple obstacle avoidance in dynamic environments.
- **Perception for autonomous navigation on a small quad-rotor** *2011–2012*  
Explore practical SLAM solutions to support autonomous navigation for an inexpensive ARDrone quadrotor in challenging environments: outdoor forests and indoor hallways, using mainly a single frontal camera.
- **Tracking and pose estimation for Augmented Reality on mobile devices** *2007–2010*  
Develop robust feature-based tracking, model-based edge tracking, and template patch tracking using direct method for Augmented Reality applications.

**Research Intern**, Nokia Research Center

- **Urban Scene Recognition for Augmented Reality** *Summer 2010*  
Implement vocabulary tree for scene recognition. Experiment with many feature detectors and descriptors.
- **Real-time Planar Target Tracking for Handheld AR** *Summer 2009*  
Implement a robust feature-based system for tracking planar targets on mobile devices. Deployed on N900.
- **Real-time Tracking for Mobile AR with Database of Geo-tagged Labeled Images** *Summer 2008*  
Develop a novel outdoor tracking method for AR using SURF features with a database of geo-tagged and labeled images, deployed on Nokia N95 phone (8-12fps). CVPR 2009 oral presentation (*5% acceptance rate*)

**Developer**, Interaction and Entertainment Research Center, Nanyang Technological University, Singapore

- **Augmented Reality and Interactive Systems for Arts and Entertainment** *2005–2007*  
Develop many interaction systems for arts and entertainment with AR and computer vision for various national and international exhibitions and theater performances.

**Research Assistant**, Dept. of Electrical and Computer Engineering, National University of Singapore

- **Magic Land** *2003–2005*  
Improve a shape-from-silhouette 3D-Live capture system with 9 cameras. Render captured images from a virtual viewpoint in AR in real-time. Develop Magic Land, an interactive tabletop AR game that allows players to see and interact with their own 3D images and other virtual characters. Various demonstrations and exhibitions at Singapore Science Center, SIGCHI'05, WIRED NextFest'05. Journal paper in TVCG'05.

## Skills

### Theoretical:

- Specialization: SLAM, monocular SLAM, visual SLAM, factor graph, linear algebra
- Experienced in machine learning, Bayesian methods, optimal control, unconstrained and constrained optimization, Lie-group methods.

### Practical:

- Programming languages: C/C++, Matlab, Python
- Libraries: GTSAM, OpenCV, Qt, OpenGL, various graphics engines
- Platforms: Linux

## Publications

### Journals

1. D.-N. Ta, K. Ok, F. Dellaert, **Vistas and parallel tracking and mapping with Wall-Floor Features: Enabling autonomous flight in man-made environments**, Robotics and Autonomous Systems, Available online 28 March 2014, ISSN 0921-8890.
2. Nguyen, T.H.D., Qui, T.C.T., Xu, K., Cheok, A.D., Teo, S.L., Zhou, Z.Y., Mallawaarachchi, A., Lee, S.P., Liu, W., Teo, H.S., Thang, L.N., Li, Y., and Kato, H. 2005. **Real Time 3D Human Capture System for Mixed-Reality Art and Entertainment**, IEEE Transaction on Visualization and Computer Graphics (TVCG), 11, 6 (November-December 2005), 706 - 721.
3. Khoo, E.T., Lee, S.P., Cheok, A.D., Nguyen, T.H.D. **Age Invaders: Social and Physical Inter-Generational Family Entertainment**. Special Issue of Springer Journal Virtual Reality, VR-based Edutainment, 2006.
4. Cheok, A.D., Teh, K.S., Nguyen, T.H.D., Qui, T.C., Lee, S.P., Liu, W., Li, C.C., Diaz, D., and Boj, C. 2006. **Social and Physical Interactive Paradigms for Mixed-Reality Entertainment**, ACM Computer in Entertainment (CIE), 4, 2 (April 2006), 5.

### Conferences and Workshops

1. D.N. Ta, F. Dellaert, "Linear-Time Estimation with Tree Assumed Density Filtering and Low-Rank Approximation." IROS 2014.
2. D.N. Ta, M. Kobilarov, F. Dellaert, "A Factor Graph Approach to Estimation and Model Predictive Control on Unmanned Aerial Vehicles." ICUAS 2014.
3. D.N. Ta, K. Ok, F. Dellaert, "Monocular Parallel Tracking and Mapping with Odometry Fusion for MAV Navigation in Feature-lacking Environments." IEEE/RSJ IROS'13 International Workshop on Vision-based Closed-Loop Control and Navigation of Micro Helicopters in GPS-denied Environments, 2013.
4. R. Roberts, D.N. Ta, J. Straub, and F. Dellaert. "Saliency detection and model-based tracking: a two part vision system for small robot navigation in forested environment." In SPIE Defense, Security, and Sensing, pp. 83870S-83870S. International Society for Optics and Photonics, 2012.
5. C. Beall, D.N. Ta, K. Ok, F. Dellaert. "Attitude heading reference system with rotation-aiding visual landmarks," Information Fusion (FUSION), 2012 15th International Conference on. IEEE, 2012.
6. K. Ok, D.N. Ta, and F. Dellaert. "Vistas and wall-floor intersection features-enabling autonomous flight in man-made environments," IROS Workshop on Visual Control of Mobile Robots. 2012.
7. D.N. Ta, W.C. Chen, N. Gelfand, and K. Pulli, "SURFTrac: Efficient tracking and continuous object recognition using local feature descriptors," Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2009. (*Oral, 5% acceptance rate*)
8. D.N. Ta, K. Raveendran, Y. Xu, K. Spreen, and B. MacIntyre, "Art of defense: a collaborative handheld augmented reality board game," Proceedings of the 2009 ACM SIGGRAPH Symposium on Video Games, 2009, pp. 135-142.
9. Boj, C., Diaz, D., Nguyen, T.H.D., Liu, W., Cheok, A.D. 2006. **Free Network Visible Network**. In 11th International Symposium of Electronic Arts, ISEA06. San Jose, USA. 7-13 August 2006.

10. Qui, T.C.T., Nguyen, T.H.D., Cheok, A.D., Teo, S.L., Xu, K., Zhou, Z.Y., Mallawaarachchi, A., Lee, S.P., Liu, W., Teo, H.S., Thang, L.N., Li, Y., Kato, H. 2005. **Magic Land: a 3D Human Capture Mixed Reality System for Museum Experiences**. In International Workshop: Re-Thinking Technology in Museums: Towards a new understanding of visitors experiences in museums. Limerick, Ireland. 2005.
11. Qui, T.C.T., Nguyen, T.H.D., Mallawaarachchi, A., Xu, K., Liu, W., Lee, S.P., Zhou, Z.Y., Teo, S.L., Teo, H.S., Thang, L.N., Li, Y., Cheok, A.D., Kato, H. 2005. **Magic Land: Live 3d Human Capture Mixed Reality Interactive System**. In CHI '05 Extended Abstracts on Human Factors in Computing Systems (Portland, OR, USA, April 02 - 07, 2005). CHI '05. ACM Press, New York, NY, 1142-1143.
12. Cao, T.H., Nguyen, T.H.D., Qui, T.C.T. 2005. **Searching the Web: a Semantics-Based Approach**. In Bock, H.G.et al.(Eds): Modelling, Simulation and Optimization of Complex Processes, Proceedings of the 2003 International Conference on High Performance Scientific Computing (HPSC2003). Ha Noi, Viet Nam, 10th-14th March. Springer-Verlag, 57-68.

## Demonstrations, Exhibitions:

- **SURFTrac**: ISMAR 2008, CVPR 2009
- **Art-of-Defense**: ISMAR 2008
- **Periphery**: The Second International Art and Science Exhibition, Tsinghua University, Beijing China 2006
- **Ultimate Commodity**: Esplanade Theater on the Bay, Singapore, 2006, and Fringe Festival, Toronto, 2007
- **Free Network Visible Network**: ISEA06 Zero One, San Jose, 2006
- **Magic Land**: WIRED NextFest Chicago 2005, SIGCHI 2005, Singapore Science Center 2004

## Education

- **Ph.D.**, College of Computing, Georgia Institute of Technology  
 Advisor: Prof. Frank Dellaert, in perception and control for autonomous navigation *2011–Now*  
 Advisor: Prof. Blair MacIntyre, in perception for Augmented Reality *2007–2010*
- **M.Eng.**, Dept. of Electrical and Computer Engineering, National University of Singapore *2003–2005*
- **B.Eng.**, School of Computer Engineering, HCMC University of Technology, Vietnam. *1998–2003*  
*Summa cum laude* (Top 5 out of 220 students)

## Teaching Experience

- Teaching Assistant**, College of Computing, Georgia Institute of Technology *2011*
- CS 7495 Advanced Computer Vision
- Teaching Assistant**, Dept. of Electrical and Computer Engineering, National University of Singapore *2004*
- EE 2007 Microprocessor System. Assembly language programming for Intel 8086/8088 microprocessor

## Honors and Awards

- Research scholarship, National University of Singapore *2003–2005*
- Academic excellence scholarship, HCMC University of Technology, Vietnam *1998–2003*
- Academic excellence scholarship, High School for the Gifted, National University, Vietnam *1995–1998*

## Professional Services

- Reviewer: ISMAR 2009–Now
- External reviewer: ISMAR 2008, CVPR 2011–Now
- Student volunteer: ISMAR 2008, ISMAR 2009