

10 November 2018

**R E S U M E**  
**Assist. Prof. Vadim Indelman**

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**ACADEMIC DEGREES**

- B.Sc. (Summa Cum Laude), Aerospace Engineering, Technion - IIT, 2002
- B.A. (Cum Laude), Computer Science, Technion – IIT, 2002
- M.A., Aerospace Engineering, Technion - IIT, 2008
- Ph.D. (direct track), Aerospace Engineering, Technion - IIT, 2011

**ACADEMIC APPOINTMENTS**

07/2014 - Present      Assistant Professor, Department of Aerospace Engineering, Technion – IIT

2012-2014              Post Doctorate Fellow, Institute of Robotics and Intelligent Machines Georgia  
Institute of Technology, Atlanta, USA

**PROFESSIONAL EXPERIENCE**

2017                      Independent consultant to Mobileye ltd.

2011-2012              Researcher and algorithm developer, Computer vision department, RAFAEL,  
Advanced Defense Systems, Israel

2004-2007              Algorithm developer, Navigation and Control departments, RAFAEL,  
Advanced Defense Systems, Israel

2002-2008              Technical project officer Engineering-level projects supervision in defense  
industries on behalf of the Israel Air Force (IAF).

**RESEARCH INTERESTS**

Autonomous navigation and mapping, consistent distributed information fusion, belief-space planning and active sensing, decision making under uncertainty, distributed robust perception, inference with probabilistic graphical models, data-driven and end-to-end autonomous perception, vision-aided navigation (VAN) and simultaneous localization and mapping (SLAM).

## **TEACHING EXPERIENCE**

- Introduced and developed the course “Vision Aided Navigation” (joint level), Department of Aerospace Engineering, Technion.
- Lecturer in additional courses in Department of Aerospace Engineering, Technion: “Navigation and Guidance Systems”, “Flight Mechanics”, “Advanced Control Laboratory”
- Guest lecturing in “Introduction to Robotics” (joint level), Computer Science Department, Technion.
- Guest lecturing in “Algorithmic Robotics and Motion Planning” (graduate level course), Computer Science Department, Tel Aviv University.
- Guest lecturing in “3D Reconstruction” (graduate level course), College of Computing, Georgia Institute of Technology.
- Teaching assistant, “Dynamic Systems” (undergraduate level course), Department of Aerospace Engineering, Technion.

## **DEPARTMENTAL ACTIVITIES**

- 2018-present, Aerospace Department representative in Technion’s Autonomous Systems Program (TASP).
- 2017-present, Faculty Council Secretary, Department of Aerospace Engineering, Technion.
- 2015-2017, Aerospace Department representative in Department of Scientific and Technological Education, Technion.

## **PUBLIC PROFESSIONAL ACTIVITIES & SERVICE**

### **Editorial Board:**

- 09/2017-present, Associate Editor, IEEE Robotics and Automation Letters (RA-L)

### **Conference and Workshop Activities:**

- Session chair at the 58th Israel Annual Conference on Aerospace Sciences (58th IACAS), 2018: *Autonomous Systems*
- Workshop co-organizer: Israeli Association for Automatic Control (IAAC) workshop “Navigation Systems and Applications”, 2018
- Session chair at the IEEE International Conference on Robotics and Automation (ICRA), 2017: *SLAM*
- Session chair at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2016: *Mobile Robots*
- Session chair at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2016: *Sensor Based Planning*
- Session co-chair at the IEEE International Conference on Robotics and Automation (ICRA), 2016: *AI Reasoning Methods*
- Session chair at the Israeli Conference on Robotics (ICR), 2016: *SLAM and Autonomous Navigation*
- Session chair at the IEEE International Conference on Robotics and Automation (ICRA), 2014: *Path planning: Multiple Mobile Robots and Agents*

- Session co-chair at the IEEE International Conference on Robotics and Automation (ICRA), 2014: *SLAM: Visual Odometry*
- Workshop Co-organizer: Workshop on Multi-View Geometry in Robotics, Robotics: Science and Systems (RSS), 2013 – 2015
- Program committee (PC) member: ICRA'18 Workshop on Perception, Inference, and Learning for Joint Semantic, Geometric, and Physical Understanding, 2018
- Program committee (PC) member, Robotics: Science and Systems (RSS), 2012, 2013, 2015
- Program committee (PC) member, IEEE Symposium on Safety, Security and Rescue Robotics, 2013

#### **Journal Reviewer:**

- International Journal of Robotics Research (IJRR): 2016-2018, 2014, 2012
- IEEE Transactions on Robotics (T-RO): 2013-2015
- Transactions on Pattern Analysis and Machine Intelligence (TPAMI): 2018
- IEEE Robotics and Automation Letters (RA-L): 2015
- Journal of Guidance, Control and Dynamics (JGCD): 2015
- Advances in Space Research: 2014
- Robotics Journal: 2015
- Autonomous Robots: 2014
- IET Control Theory & Applications (CTA): 2014
- IEEE Transactions on Vehicular Technology (TVT): 2013
- IEEE Sensors Journal: 2012
- Computer Vision and Image Understanding (CVIU): 2011
- Journal of Field Robotics (JFR): 2011

#### **Conference Reviewer:**

- Robotics Science and Systems Conference (RSS): 2012, 2013, 2015, 2016
- International Symposium on Robotics Research (ISRR): 2015, 2017
- IEEE International Conference on Robotics and Automation (ICRA): 2014-2019
- IEEE Conference on Intelligent Robotic Systems (IROS): 2012-2018
- International Symposium on Multi-Robot and Multi-Agent Systems (MRS): 2017
- Computer Vision and Pattern Recognition (CVPR): 2014, 2013
- IEEE Symposium on Safety, Security and Rescue Robotics (SSRR): 2013
- Third Joint 3DIM/3DPVT Conference Conference: 2013
- IEEE Workshop on Robot Vision (WORV): 2013
- International Conference on 3D Imaging, Modeling, Processing, Visualization, and Transmission (3DIMPVT): 2012
- BarSym Symposium on Estimation, Navigation, and Spacecraft Control: 2012

#### **MEMBERSHIP IN PROFESSIONAL SOCIETIES**

- IEEE membership
- Member of the Technical Committee on Multi-Robot Systems (TC MRS) of the IEEE Robotics and Automation Society

## FELLOWSHIPS, AWARDS AND HONORS

- 2015: **Best Workshop Poster Award**, workshop on the Problem of Mobile Sensors, in conjunction with Robotics Science and Systems (RSS) conference, 2015
- 2013: **Merhav Award** for top PhD research in GNC-related areas
- 2013: **Best Poster Award**, Workshop on Robot Vision (WoRV 2013)
- 2010: **Hanin Award** for excellence in research
- 2009: **Ilan Ramon Excellence Scholarship Award**
- 2008: **Best Teaching Assistant Award**, Aerospace Engineering, Technion
- 2002,2006: **Quarterly Excellence Awards**, RAFAEL ltd.
- 2002: B.Sc. **Summa Cum Laude**, Aerospace Engineering, Technion
- 2002: B.A. **Cum Laude**, Computer Science, Technion
- 1998-2002: **President's Excellence Honor Awards**, Technion

## GRADUATE STUDENTS

(PA=Primary Adviser, AA=Additional Adviser)

### Completed

#### M.Sc. Students:

- 2014-2016 Tal Regev, Department of Computer Science, Technion, PA  
Thesis title: "Multi-Robot Decentralized Belief Space Planning in Unknown Environments"
- 2015-2017 Shira Har-Nes, Department of Aerospace Engineering, Technion, PA  
Thesis title: "Belief Space Planning for Autonomous Navigation while Modeling Landmark Identification"
- 2015-2017 Antony Thomas, Department of Aerospace Engineering, Technion, PA  
Recipient of the **Sherman Interdisciplinary fellowship for graduate students**, 2016  
Thesis title: "Incorporating Data Association Within Belief Space Planning For Robust Autonomous Navigation"
- 2015-2017 Michael Chojnacki, TASP, Technion, PA (AA: Ehud Rivlin)  
Thesis title: "Vision-based Dynamic Target Trajectory and Ego-motion Estimation Using Incremental Light Bundle Adjustment"
- 2015-2017 Dmitry Kopitkov, TASP, Technion, PA  
**Summa Cum Laude** MSc degree  
Recipient of the **Gutwirth and Jacobs excellence fellowship**, 2016 and 2017  
Thesis title: "Efficient Belief Space Planning in High-dimensional State Spaces by Exploiting Sparsity and Calculation Re-use"
- 2014-2017 Yair Ben Elisha, Department of Aerospace Engineering, Technion, PA  
Thesis title: "Cooperative Multi-Robot Belief Space Planning for Visual-Inertial Navigation and Online Sensor Calibration"

2016-2018 Vladimir Ovechkin, TASP, Technion, PA  
 Thesis title: "Bundle Adjustment with Feature Scale Constraints for Enhanced Estimation Accuracy"

M.E. Students:

2016-2017 Itay Guy, TASP, Technion, PA

**In Progress**

Ph.D. Students:

2015- Elad Farhi, direct track Ph.D., TASP, Technion, PA  
 Recipient of the **Excellence Dean's support scholarship**, 2016

2017- Dmitry Kopitkov, TASP, Technion, PA

2017- Vladimr Tchoyev, Department of Aerospace Engineering, Technion, PA

2015- Khen Elimelech, direct track Ph.D., TASP, Technion, PA

2015- Yuri Feldman, direct track Ph.D., Department of Computer Science, Technion, PA

M.Sc. Students:

2016- Roe Mor, Department of Computer Science, Technion, PA (AA: Michael Lindenbaum)

2018- Ohad Shelly, TASP, Technion, PA

2018- Omri Asraf, Department of Aerospace Engineering, Technion, PA

M.E. Students:

2016- Or Salmon, TASP, Technion, PA

**UNDERGRADUATE STUDENTS**

(CS=Computer Science, AE=Aerospace Engineering, ME=Mechanical Engineering)

Dan Goldberg (CS, 2014-2015), Dror Hurwitz (AE, 2016), Maor Kereth (ME, summer 2016), Dror Bar On (AE, 2016), Nikita Dizhur (CS, 2016-2017), Roy Velich (CS, 2016-2017), Steven Athouel (CS, 2017 Spring), Amit Weiss (CS, 2017 Fall), Amit Solomon (CS, 2017 Fall), Margarita Zabolotny (AE, 2017-Present), Nimrod Sideman (AE, 2017 Fall), Daniel Khapun (CS, 2018-Present), Dvir Perry (CS, 2018-Present), Tom Norman (EE, 2018-Present), Amitai Haimovich (AE, 2018-Present), Ariel Dobrovenski (EE, 2018-Present), Eva Epelbaum (CS, 2018-Present)

**VISITING STUDENTS & INTERNATIONAL INTERNS**

Sarah Brent (Clark University, summer 2016), Steven Athouel (L'Ecole polytechnique Université Paris, Spring 2018), Talia Wise (McGill University, Fall 2018-Present)

**POSTDOC AND RESEARCH SCIENTISTS SUPPORTED**

- Dr. Andrej Kitanov, since April 2017
- Dr. Shashank Pathak, November 2015 – June 2017
- Dr. Elina Moldavskaya, October 2015 – June 2016

**ADDITIONAL STAFF SUPPORTED**

- Asaf Feniger, lab engineer, April 2015 - June 2018
- Tal Regev, software engineer, October 2016 - August 2017, July 2018 - Present

**RESEARCH GRANTS**

09/2014-09/2016	Technion Autonomous Systems Program (TASP) Role: Principal Investigator Amount: \$42,000
10/2015-10/2019	Israel Science Foundation (ISF) Role: Principal Investigator Amount: \$280,000 (\$70,000 per year, for 4 years)
12/2015-12/2018	Ministry of Science Technology and Space (MOST) Russian-Israeli Cooperative Scientific Research Role: Principal Investigator Amount: \$120,000 (\$40,000 per year, for 3 years)
08/2015-08/2016	Technion Autonomous Systems Program (TASP) Role: Principal Investigator Amount: \$27,500
09/2015-09/2016	Israel Ministry of Defence (MAFAT) Role: Principal Investigator Amount: \$50,000
11/2016-11/2017	Technion Autonomous Systems Program (TASP) Role: Principal Investigator Amount: \$25,000
11/2017-11/2018	Technion Autonomous Systems Program (TASP) Role: Principal Investigator Amount: \$15,000
02/2017-02/2018	Israel Ministry of Defence (MAFAT) Role: Principal Investigator Amount: \$78,000
02/2018-02/2019	Israel Ministry of Defence (MAFAT)

Role: Principal Investigator  
Amount: \$78,000

03/2018-02/2019 Technion Applied Research Grant  
Role: Principal Investigator  
Amount: \$20,000

07/2018-06/2019 Intel ltd.  
Role: Principal Investigator  
Amount: \$20,000

09/2018-08/2019 Hyundai ltd.  
Role: Principal Investigator  
Amount: \$200,000

### **INVITED TALKS (International)**

- “Distributed perception and estimation in multi-robot systems”, workshop on Principles of Multi-Robot Systems, in conjunction with Robotics Science and Systems (RSS) conference, Rome, Italy, July 2015.
- “Advances in Computationally Efficient and Robust (Multi-Robot) Belief Space Planning in High-Dimensional State Spaces”, 2nd Workshop on Multi-Robot Perception-Driven Control and Planning at the 2018 IEEE/RSJ International Conference on Intelligent Robot and Systems (IROS), October 2018.

### **INVITED TALKS (In Israel)**

- “Distributed Cooperative Robust Localization and Mapping from Arbitrary Initial Poses via EM and Model Selection”, Israeli Navigation Workshop, July 2014.
- “Decision Making and Planning in Sparse (Conservative) Belief Space”, the Israeli Association for Automatic Control (IAAC) workshop “Motion Control Methods in Robotics”, November 2015.
- “Towards Robust Autonomous Navigation in Perceptually Aliased GPS-Deprived Environments”, Israeli Navigation Workshop, February 2016.
- “Autonomous Navigation and Perception for Aerial Vehicles”, IBM Research Cognitive Computing Colloquium on Computer Vision and Video Technologies, IBM Haifa Research Lab, November 2016.

### **GUEST LECTURES**

- “Advances in autonomous operation in uncertain or unknown environments: distributed robust inference and data association, and planning in generalized belief space”, Department of Computer Science, Technion, 2014
- “Autonomous operation in uncertain and partially unknown large-scale environments: perception, information fusion and planning”, Department of Computer Science, Technion, Ben Gurion and Haifa University; Faculty of Engineering, Bar Ilan University, November 2013.
- “Autonomous navigation in uncertain and partially unknown environments”, Faculty of Aerospace Engineering, Technion, November 2013.

- “Efficient incremental structure from motion and vision-based single- and multi-agent localization”, Computer Science and Electrical Engineering Departments in: Weizmann Institute of Science, Technion, Tel-Aviv University, Bar Ilan University, Hebrew University of Jerusalem, March 2013.
- “Vision-Aided Single- and Multi-Robot Navigation in Unknown Environments”, Faculty of Aerospace Engineering, Technion, March 2013 (Merhav award seminar).
- “Incremental light bundle adjustment for SfM and robotics”, Department of Computer Science, University College London, September 2012.
- “Incremental light bundle adjustment for SfM and multi-robot localization”, Computer Science and Electrical Engineering departments, Technion, May 2012.
- “Graph-Based Cooperative Navigation Based on Three-View Constraints”, Sarnoff/SRI International, Princeton, NJ, January 2012.
- “Graph-Based Cooperative Navigation Based on Three-View Geometry Constraints”, Computer Science and Artificial Intelligence Laboratory (CSAIL), MIT, Cambridge, September 2011.

### **SIGNIFICANT PROFESSIONAL PROJECTS**

- 2013-2014, ARL Micro Autonomous Systems and Technology (MAST)
- 2012, DARPA All Source Positioning Navigation (ASPN)
- 2012-2014, participation in GTSAM (open source library) implementation
- 2015-Present, OMEK Consortium
- 2014-Present, founder and head of Autonomous Navigation and Perception Laboratory (ANPL)
- 2017, independent consultant to Mobileye ltd.

### **PUBLICATIONS**

Graduate students are underlined; undergraduate students are double-underlined; other group members (postdocs etc.) are marked with \*.

#### **Theses**

[1] V. Indelman, “Navigation Performance Enhancement Using Online Mosaicking”, Ph.D. dissertation, Technion - Israel Institute of Technology, April 2011. Advisors: Pini Gurfil, Ehud Rivlin and Hector Rotstein.

#### **Refereed Papers in Professional Journals**

[1] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, “Navigation Aiding Based on Coupled Online Mosaicking and Camera Scanning”, Journal of Guidance, Control and Dynamics, 33(6): 1866-1882, 2010.

[2] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, “Real-Time Vision-Aided Localization and Navigation Based on Three-View Geometry”, IEEE Transactions on Aerospace and Electronic Systems, 48(3): 2239-2259, 2012.



- [3] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, “Distributed Vision-Aided Cooperative Localization and Navigation Based on Three-View Geometry”, *Robotics and Autonomous Systems*, 60(6): 822-840, 2012.
- [4] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, “Graph-Based Distributed Cooperative Navigation for a General Multi-Robot Measurement Model”, *International Journal of Robotics Research*, 31(9): 1057-1080, 2012.
- [5] V. Indelman, S. Williams, M. Kaess and F. Dellaert, “Information Fusion in Navigation Systems via Factor Graph Based Incremental Smoothing”, *Robotics and Autonomous Systems*, 961(8): 721-738, 2013.
- [6] S. Williams, V. Indelman, M. Kaess, R. Roberts, J. J. Leonard and F. Dellaert, “Concurrent Filtering and Smoothing: A Parallel Architecture for Real-Time Navigation and Full Smoothing”, *International Journal of Robotics Research*, 33(12): 1544-1568, 2014.
- [7] V. Indelman, L. Carlone and F. Dellaert, “Planning in the Continuous Domain: a Generalized Belief Space Approach for Autonomous Navigation in Unknown Environments”, *International Journal of Robotics Research*, 34(7): 849-882, 2015.
- [8] V. Indelman, R. Roberts and F. Dellaert, “Incremental Light Bundle Adjustment for Structure from Motion and Robotics”, *Robotics and Autonomous Systems*, vol. 70, 63-82, 2015.
- [9] V. Indelman, E. Nelson, J. Dong, N. Michael, and F. Dellaert, “Incremental Distributed Inference from Arbitrary Poses and Unknown Data Association”, *IEEE Control Systems Magazine, Special Issue on Distributed Control and Estimation for Robotic Vehicle Networks*, vol. 36, no. 2, 41-74, 2016.
- [10] V. Indelman, “No Correlations Involved: Decision Making Under Uncertainty in the Conservative Information Space”, *IEEE Robotics and Automation Letters (RA-L)*, vol. 1, no. 1, 407-414, 2016.
- [11] X. Yan, V. Indelman and B. Boots, “Incremental Sparse GP Regression for Continuous-time Trajectory Estimation & Mapping”, *Robotics and Autonomous Systems*, 87:120-132, 2017.
- [12] V. Indelman, “Cooperative Multi-Robot Belief Space Planning for Autonomous Navigation in Unknown Environments”, *Autonomous Robots*, special issue on active perception, 2017.
- [13] D. Kopitkov and V. Indelman, “Computationally Efficient Belief Space Planning via Augmented Matrix Determinant Lemma and Re-Use of Calculations”, *IEEE Robotics and Automation Letters (RA-L)*, 2(2):506-513, 2017.
- [14] T. Regev and V. Indelman, “Decentralized Multi-Robot Belief Space Planning in Unknown Environments via Identification and Efficient Re-Evaluation of Impacted Paths”, *Autonomous Robots*, special issue on Online Decision Making in Multi-Robot Coordination, 42(4): 691-713, 2017.
- [15] D. Kopitkov and V. Indelman, “No Belief Propagation Required: Belief Space Planning in High-Dimensional State Spaces via Factor Graphs, Matrix Determinant Lemma and Re-use of Calculation”, *International Journal of Robotics Research*, 36(10): 1088-1130, 2017.

- [16] S. Pathak\*, A. Thomas and V. Indelman, “A Unified Framework for Data Association Aware Belief Space Planning and Perception”, *International Journal of Robotics Research*, 32(2-3): 287-315, 2018.
- [17] M. Chojnacki and V. Indelman, “Vision-based Dynamic Target Trajectory and Ego-motion Estimation Using Incremental Light Bundle Adjustment”, *International Journal of Micro Air Vehicles (SAGE), Special Collection on Estimation and Control for MAV Navigation in GPS-denied Cluttered Environments*, 10(2): 157-170, 2018.
- [18] V. Ovechkin and V. Indelman, “BAFS: Bundle Adjustment with Feature Scale Constraints for Enhanced Estimation Accuracy”, *IEEE Robotics and Automation Letters (RA-L)*, 3(2), April 2018.
- [19] D. Kopitkov and V. Indelman, “General Purpose Incremental Covariance Update and Efficient Belief Space Planning via Factor-Graph Propagation Action Tree”, *International Journal of Robotics Research*, conditionally accepted.
- [20] V. Tchuiev and V. Indelman, “Inference over Distribution of Posterior Class Probabilities for Reliable Bayesian Classification and Object-Level Perception”, *IEEE Robotics and Automation Letters (RA-L)*, 3(4): 4329-4336, 2018.
- [21] E. Farhi and V. Indelman, “Bayesian Incremental Inference Update by Re-using Calculations from Belief Space Planning: A New Paradigm”, *International Journal of Robotics Research*, submitted.

### **Books and Book Chapters**

- [1] V. Indelman and F. Dellaert, “Incremental Light Bundle Adjustment: Probabilistic Analysis and Extension to Robotic Navigation”, in edited collection “New Developments in Robot Vision”, *Cognitive Systems Monographs Volume 23*, Springer Berlin Heidelberg, 111-136, 2015.
- [2] E. Nelson, V. Indelman, N. Michael and F. Dellaert, “An Experimental Study of Robust Distributed Multi-robot Data Association from Arbitrary Poses”, in edited collection “Experimental Robotics, the 14<sup>th</sup> International Symposium on Experimental Robotics”, *Springer Tracts in Advanced Robotics* 109, 323-338, 2016.
- [3] V. Indelman, L. Carlone and F. Dellaert, “Towards Planning in Generalized Belief Space”, in edited collection “Robotics Research, The 16th International Symposium ISRR”, *Springer Tracts in Advanced Robotics* 114, 593-609, 2016.
- [4] V. Indelman, “Towards Cooperative Multi-Robot Belief Space Planning in Unknown Environments”, *Robotics Research, Springer Proceedings, in Advanced Robotics* 2, DOI 10.1007/978-3-319-51532-8\_27, 2018.
- [5] X. Yan, V. Indelman, B. Boots, “Incremental Sparse GP Regression for Continuous-time Trajectory Estimation & Mapping”, *Robotics Research, Springer Proceedings, in Advanced Robotics* 2, DOI 978-3-319-60916-4\_31, 2018.

## **Patents**

- [1] V. Indelman, "BAFOS: Bundle Adjustment with Feature Orientation and Scale", provisional patent application number 62299579, March 2016.
- [2] V. Indelman, S. Pathak\* and A. Thomas, "A Unified Framework for Data Association Aware Belief Space Planning and Perception", provisional patent application number 62/491,292, April 2017.
- [3] V. Indelman and E. Farhi, "Efficient Inference Update using Belief Space Planning", provisional patent application number 62/639,046, March 2018.
- [4] D. Kopitkov and V. Indelman, "Deep PDF: Probabilistic Surface Optimization and Density Estimation", provisional patent application, June 2018.
- [5] Y. Feldman and V. Indelman, "Method for Improving Classification under Model and Localization Uncertainty", provisional patent application, August 2018.
- [6] V. Tchuiev and V. Indelman, "Model Uncertainty Aware Classification", provisional patent application, August 2018.

## **Refereed Papers in Conference Proceedings**

- [1] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Navigation Performance Enhancement Using Rotation and Translation Measurements from Online Mosaicking", AIAA Guidance, Navigation and Control Conference, Hilton Head, SC, USA, August 2007.
- [2] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Navigation Aiding Using On-Line Mosaicking", IEEE/ION Position Location and Navigation System (PLANS) Conference, California, USA, May 2008.
- [3] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Navigation Aiding Using Image-Based Relative Motion Measurements", 49th Israel Annual Conference on Aerospace Sciences, Paper No. IACAS49-452, Israel, March 2009.
- [4] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Real-Time Mosaic-Aided Aerial Navigation: II. Sensor Fusion", AIAA Guidance, Navigation and Control Conference, Chicago, USA, August 2009.
- [5] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Real-Time Mosaic-Aided Aerial Navigation: I. Motion Estimation", AIAA Guidance, Navigation and Control Conference, Chicago, USA, August 2009.
- [6] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Mosaic Aided Navigation: Tools, Methods and Results", IEEE/ION Position Location and Navigation System (PLANS) Conference, California, USA, May 2010.

- [7] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Handling Loop Scenarios for Vision-Aided Aerial Navigation based on Three-View Geometry", 50th Israel Annual Conference on Aerospace Sciences, Paper No. IACAS50-588, Israel, February 2010.
- [8] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Distributed Vision-Aided Cooperative Localization and Navigation based on Three-View Geometry", Proceedings of the IEEE Aerospace Conference, Montana, USA, March 2011.
- [9] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Graph-based Distributed Cooperative Navigation", Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), Shanghai, China, May 2011.
- [10] V. Indelman, P. Gurfil, E. Rivlin and H. Rotstein, "Graph-Based Cooperative Navigation Using Three-View Constraints: Method Validation", IEEE/ION Position Location and Navigation System (PLANS) Conference, South Carolina, USA, April 2012.
- [11] V. Indelman, "Bundle Adjustment Without Iterative Structure Estimation and its Application to Navigation", IEEE/ION Position Location and Navigation System (PLANS) Conference, South Carolina, USA, April 2012.
- [12] V. Indelman, S. Williams, M. Kaess and F. Dellaert, "Factor Graph Based Incremental Smoothing in Inertial Navigation Systems", International Conference on Information Fusion, Singapore, July 2012.
- [13] M. Kaess, S. Williams, V. Indelman, R. Roberts, J. J. Leonard and F. Dellaert, "Concurrent Filtering and Smoothing", International Conference on Information Fusion, Singapore, July 2012.
- [14] V. Indelman, R. Roberts, C. Beall and F. Dellaert, "Incremental Light Bundle Adjustment", British Machine Vision Conference, Surrey, UK, September 2012.
- [15] A. Cunningham, V. Indelman and F. Dellaert, "Consistent Decentralized Graphical SLAM with Anti-Factor Down-Dating", Late Breaking Report, 10th IEEE International Symposium on Safety Security and Rescue Robotics (SSRR), Texas, USA, November 2012.
- [16] V. Indelman, R. Roberts and F. Dellaert, "Probabilistic Analysis of Incremental Light Bundle Adjustment", IEEE Workshop on Robot Vision (WoRV), Clearwater, Florida, USA, January 2013.  
**Best poster award.**
- [17] A. Cunningham, V. Indelman and F. Dellaert, "DDF-SAM 2.0: Consistent Distributed Smoothing and Mapping", IEEE International Conference on Robotics and Automation (ICRA), Karlsruhe, Germany, May 2013.
- [18] V. Indelman, A. Mellim and F. Dellaert, "Incremental Light Bundle Adjustment for Robotics Navigation", IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Tokyo, Japan, November 2013.
- [19] V. Indelman, L. Carlone and F. Dellaert, "Towards Planning in Generalized Belief Space", International Symposium on Robotics Research (ISRR), December 2013.

- [20] V. Indelman, L. Carlone and F. Dellaert, “Planning Under Uncertainty in the Continuous Domain: a Generalized Belief Space Approach”, IEEE International Conference on Robotics and Automation (ICRA), Hong Kong, June China, 2014.
- [21] L. Carlone, Z. Kira, C. Beall, V. Indelman and F. Dellaert, “Eliminating Conditionally Independent Sets in Factor Graphs: A Unifying Perspective based on Smart Factors”, IEEE International Conference on Robotics and Automation (ICRA), Hong Kong, China, June 2014.
- [22] V. Indelman, E. Nelson, N. Michael and F. Dellaert, “Multi-Robot Pose Graph Localization and Data Association from Unknown Initial Relative Poses via Expectation Maximization”, IEEE International Conference on Robotics and Automation (ICRA), Hong Kong, China, June 2014.
- [23] E. Nelson, V. Indelman, N. Michael and F. Dellaert, “An Experimental Study of Robust Distributed Multi-Robot Data Association from Arbitrary Poses”, International Symposium on Experimental Robotics (ISER), Morocco, June 2014.
- [24] V. Indelman, N. Michael and F. Dellaert, “Incremental Distributed Robust Inference from Arbitrary Robot Poses via EM and Model Selection”, in Workshop on Distributed Control and Estimation for Robotic Vehicle Networks, Robotics: Science and Systems (RSS) Conference, Berkeley, USA, July 2014.
- [25] X. Yan, V. Indelman, B. Boots, “Incremental Sparse GP Regression for Continuous-time Trajectory Estimation and Mapping”, in Workshop on Autonomously Learning Robots, Neural Information Processing Systems (NIPS), Quebec, Canada, December 2014.
- [26] V. Indelman, N. Michael and F. Dellaert, “Distributed Navigation with Unknown Initial Poses and Data Association via Expectation Maximization”, in Israel Annual Conference on Aerospace Sciences (IACAS), February 2015.
- [27] V. Indelman, L. Carlone and F. Dellaert, “A Generalized Belief Space Approach for Autonomous Navigation in Unknown Environments”, Israel Annual Conference on Aerospace Sciences (IACAS), February 2015.
- [28] V. Indelman, “Resorting to Conservative Information Fusion Techniques for Autonomous Decision Making Under Uncertainty”, Israel Annual Conference on Aerospace Sciences (IACAS), February 2015.
- [29] V. Indelman, “Towards Information-Theoretic Decision Making in a Conservative Information Space”, American Control Conference (ACC), July 2015.
- [30] S. Choudhary, V. Indelman, H. I. Christensen and F. Dellaert, “Information-based Reduced Landmark SLAM,” IEEE International Conference on Robotics and Automation (ICRA), Washington, USA, May 2015.
- [31] J. Dong, E. Nelson, V. Indelman, N. Michael and F. Dellaert, “Distributed Real-time Cooperative Localization and Mapping using an Uncertainty-Aware Expectation Maximization Approach,” IEEE International Conference on Robotics and Automation (ICRA), Washington, USA, May 2015.

[32] V. Indelman, “Towards Multi-Robot Active Collaborative State Estimation via Belief Space Planning”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Hamburg, Germany, September 2015.

[33] X. Yan, V. Indelman, B. Boots, “Incremental Sparse GP Regression for Continuous-time Trajectory Estimation & Mapping”, the International Symposium on Robotics Research (ISRR), Italy, September 2015.

[34] V. Indelman, “Towards Cooperative Multi-Robot Belief Space Planning in Unknown Environments”, the International Symposium on Robotics Research (ISRR), Italy, September 2015.

[35] V. Indelman, “On Multi-Robot Active Collaborative Inference in Unknown Environments via Belief Space Planning”, workshop on Principles of Multi-Robot Systems, in conjunction with Robotics Science and Systems (RSS) conference, Rome, Italy, July 2015.

[35] V. Indelman, “Distributed Perception and Estimation: a Short Survey”, workshop on Principles of Multi-Robot Systems, in conjunction with Robotics Science and Systems (RSS) conference, Rome, Italy, July 2015.

[37] V. Indelman, “On Decision Making and Planning in the Conservative Information Space - Is the Concept Applicable to Active SLAM?”, workshop on the Problem of Mobile Sensors: Setting future goals and indicators of progress for SLAM, in conjunction with Robotics Science and Systems (RSS) conference, Rome, Italy, July 2015.

[38] X. Yan, V. Indelman and B. Boots, “Incremental Sparse GP Regression for Continuous-time Trajectory Estimation & Mapping”, workshop on the Problem of Mobile Sensors: Setting future goals and indicators of progress for SLAM, in conjunction with Robotics Science and Systems (RSS) conference, Rome, Italy, July 2015.

**Best poster award.**

[39] V. Indelman, “No Correlations Involved: Decision Making Under Uncertainty in the Conservative Information Space”, IEEE International Conference on Robotics and Automation (ICRA), Stockholm, Sweden, May 2016.

[40] T. Regev and V. Indelman, “Towards Multi-Robot Decentralized Belief Space Planning in Unknown Environments via Efficient Re-Evaluation of Impacted Paths”, Israel Annual Conference on Aerospace Sciences (IACAS), February 2016.

[41] V. Indelman, “No Correlations Involved: Decision Making Under Uncertainty in the Conservative Information Space”, Israel Annual Conference on Aerospace Sciences (IACAS), February 2016.

[42] V. Indelman, “Towards BAFOS: Bundle Adjustment with Feature Orientation and Scale”, Israel Annual Conference on Aerospace Sciences (IACAS), February 2016.

[43] S. Pathak\*, A. Thomas, A. Feniger\* and V. Indelman, “DA-BSP: Towards Data Association Aware Belief Space Planning for Robust Active Perception”, European Conference on Artificial Intelligence (ECAI), Holland, August 2016, accepted as short paper.

- [44] D. Kopitkov and V. Indelman, “Computationally Efficient Decision Making Under Uncertainty in High-Dimensional State Spaces”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Daejeon, Korea, October 2016.
- [45] T. Regev and V. Indelman, “Multi-Robot Decentralized Belief Space Planning in Unknown Environments via Efficient Re-Evaluation of Impacted Paths”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Daejeon, Korea, October 2016.
- [46] D. Kopitkov and V. Indelman, “Computationally Efficient Active Inference in High-Dimensional State Spaces”, workshop on AI for Long-term Autonomy, in conjunction with IEEE International Conference on Robotics and Automation (ICRA), Stockholm, Sweden, May 2016.
- [47] S. Pathak\*, A. Thomas, A. Feniger\* and V. Indelman, “Towards DA-BSP: Data Association Aware Belief Space Planning for Robust Active Perception”, workshop on AI for Long-term Autonomy, in conjunction with IEEE International Conference on Robotics and Automation (ICRA), Stockholm, Sweden, May 2016.
- [48] S. Pathak\*, S. Soudjani, V. Indelman and A. Abate, “Formal and Data-association aware Belief Space Planning”, the Eighth European Starting AI Researcher Symposium (STAIRS), co-located with European Conference on Artificial Intelligence (ECAI), Holland, August 2016.
- [49] S. Pathak\*, A. Thomas and V. Indelman, “Nonmyopic Data Association Aware Belief Space Planning for Robust Active Perception”, IEEE International Conference on Robotics and Automation (ICRA), Singapore, May 2017.
- [50] D. Kopitkov and V. Indelman, “Computationally Efficient Belief Space Planning via Augmented Matrix Determinant Lemma and Re-Use of Calculations”, IEEE International Conference on Robotics and Automation (ICRA), Singapore, May 2017.
- [51] E. Farhi and V. Indelman, “Efficient Inference Update through Planning via JIP - Joint Inference and Belief Space Planning”, IEEE International Conference on Robotics and Automation (ICRA), Singapore, May 2017.
- [52] K. Elimelech and V. Indelman, “Consistent Sparsification for Efficient Decision Making Under Uncertainty in High Dimensional State Spaces”, IEEE International Conference on Robotics and Automation (ICRA), Singapore, May 2017.
- [53] E. Farhi and V. Indelman, “Joint Inference and Belief Space Planning methodology for Efficient Inference Update”, Israel Annual Conference on Aerospace Sciences (IACAS), February 2017.
- [54] K. Elimelech and V. Indelman, “A Sparsification Method for Efficient Decision Making Under Uncertainty in High Dimensional State Spaces”, Israel Annual Conference on Aerospace Sciences (IACAS), February 2017.
- [55] Y. Ben Elisha and V. Indelman, “Active Online Self-Calibration and Accurate Navigation via Belief Space Planning and Factor Graph Based Incremental Smoothing”, Israel Annual Conference on Aerospace Sciences (IACAS), February 2017.

- [56] K. Elimelech and V. Indelman, “Scalable Sparsification for Efficient Decision Making Under Uncertainty in High Dimensional State Spaces”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Vancouver, Canada, September 2017.
- [57] Y. Ben Elisha and V. Indelman, “Active Online Visual-Inertial Navigation and Sensor Calibration via Belief Space Planning and Factor Graph Based Incremental Smoothing”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Vancouver, Canada, September 2017.
- [58] K. Elimelech and V. Indelman, “Fast Action Elimination for Efficient Decision Making and Planning Using Revenue Approximation”, the International Symposium on Robotics Research (ISRR), Chile, December 2017.
- [59] V. Ovechkin and V. Indelman, “BAFS: Bundle Adjustment with Feature Scale Constraints for Enhanced Estimation Accuracy”, IEEE International Conference on Robotics and Automation (ICRA), Brisbane, Australia, May 2018.
- [60] Y. Feldman and V. Indelman, “Bayesian Viewpoint-Dependent Robust Classification under Model and Localization Uncertainty”, IEEE International Conference on Robotics and Automation (ICRA), Brisbane, Australia, May 2018.
- [61] A. Kitanov\* and V. Indelman, “Topological Multi-Robot Decentralized Belief Space Planning in Unknown Environments”, IEEE International Conference on Robotics and Automation (ICRA), Brisbane, Australia, May 2018.
- [62] V. Tchuiev and V. Indelman, “Inference Over Distribution of Class Probability for Probabilistic Object Classification”, Israel Annual Conference on Aerospace Sciences (IACAS), March 2018.
- [63] A. Kitanov\* and V. Indelman, “A Topological Perspective for Information-Theoretic Multi-Robot Belief Space Planning in Unknown Environments”, Israel Annual Conference on Aerospace Sciences (IACAS), March 2018.
- [64] V. Tchuiev and V. Indelman, “Inference over Distribution of Posterior Class Probabilities for Reliable Bayesian Classification and Object-Level Perception”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Madrid, Spain, October 2018.
- [65] D. Kopitkov and V. Indelman, “Bayesian Information Recovery from CNN for Probabilistic Inference”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Madrid, Spain, October 2018.
- [66] A. Zakiev, R. Lavrenov, E. Magid and V. Indelman, “Path planning for Indoor Partially Unknown Environment Exploration and Mapping”, International Conference on Artificial Life and Robotics (ICAROB2018), Oita, Japan, February 2018.
- [67] Y. Feldman and V. Indelman, “Towards Robust Autonomous Semantic Perception”, Workshop on Representing a Complex World: Perception, Inference, and Learning for Joint Semantic, Geometric, and Physical Understanding, in conjunction with IEEE International Conference on Robotics and Automation (ICRA), Brisbane, Australia, May 2018.



[68] D. Kopitkov and V. Indelman, “Deep PDF: Density Estimation for Measurement Model Learning”, IEEE International Conference on Robotics and Automation (ICRA), Montreal, Canada, May 2019, submitted.

[69] A. Kitanov\* and V. Indelman, “Towards Online Global Optimality Guarantees for Topological Belief Space Planning”, IEEE International Conference on Robotics and Automation (ICRA), Montreal, Canada, May 2019, submitted.

[70] E. Farhi and V. Indelman, “iX-BSP: Belief Space Planning through Incremental Expectation”, IEEE International Conference on Robotics and Automation (ICRA), Montreal, Canada, May 2019, submitted.

[71] E. Farhi and V. Indelman, “Introducing Incremental eXpectation to Belief Space Planning”, Israel Annual Conference on Aerospace Sciences (IACAS), March 2019, submitted.

[72] V. Tchuiev, Y. Feldman, V. Indelman, “Semantic Data Association Aware Classification and Localization with a Viewpoint-Dependent Classifier Model”, Israel Annual Conference on Aerospace Sciences (IACAS), March 2019, submitted.

### **Un-refereed Conference and Workshop Papers (Abstract-level)**

[1] V. Indelman, R. Roberts and F. Dellaert, “Incremental Light Bundle Adjustment for Vision-based Navigation and General Structure from Motion Problems”, The 4th Israeli Conference on Robotics (ICR), Tel Aviv, Israel, November 2013.

[2] V. Indelman, L. Carlone and F. Dellaert, “Towards Planning in Generalized Belief Space with Applications to Mobile Robotics”, The 4th Israeli Conference on Robotics (ICR), Tel Aviv, Israel, November 2013.

[3] D. Kopitkov and V. Indelman, “Computationally Efficient Decision Making and Belief Space Planning in High-Dimensional State Spaces”, The 5th Israeli Conference on Robotics (ICR), Herzliya, Israel, April 2016.

[4] T. Regev and V. Indelman, “Towards Multi-Robot Decentralized Belief Space Planning in Unknown Environments via Efficient Re-Evaluation of Impacted Paths”, The 5th Israeli Conference on Robotics (ICR), Herzliya, Israel, April 2016.

[5] M. Chojnacki and V. Indelman, “Vision-based Dynamic Target Trajectory And Ego-motion Estimation Using Incremental Light Bundle Adjustment”, The 5th Israeli Conference on Robotics (ICR), Herzliya, Israel, April 2016.

[6] D. Kopitkov, X. Yan, J. Dong, B. Boots and V. Indelman, “iLBA-GP: Incorporating Sparse Gaussian Process Regression within Incremental Light Bundle Adjustment”, The 5th Israeli Conference on Robotics (ICR), Herzliya, Israel, April 2016.

[7] A. Thomas, S. Pathak\* and V. Indelman, “Robust Active Perception for Belief Space Planning in Perceptually Aliased and Uncertain Environments”, The 5th Israeli Conference on Robotics (ICR), Herzliya, Israel, April 2016.

[8] V. Ovechkin and V. Indelman, “BAFS: Bundle Adjustment with Feature Scale Constraints for Enhanced Estimation Accuracy”, Israeli Navigation Workshop, January 2018.

### **Technical Reports**

[1] V. Indelman and F. Dellaert, "Rapid Loop Updates", Technical Report GT-RIM-CP&R-2012-001, Georgia Institute of Technology, RIM Center, September 2012.

[2] V. Indelman, “No Correlations Involved: Decision Making Under Uncertainty in the Conservative Information Space - Supplementary Material”, Technical Report ANPL-2016-01, January 2016.

[3] S. Pathak\*, A. Thomas, A. Feniger\*, and V. Indelman, “Robust Active Perception via Data-association aware Belief Space planning”, arXiv preprint arXiv:1606.05124, June 2016.

[4] D. Kopitkov, and V. Indelman, “Computationally Efficient Belief Space Planning via Augmented Matrix Determinant Lemma and Re-Use of Calculations – Supplementary Material”, Technical Report ANPL-2017-01, January 2017.

[5] Y. Ben-Elisha and V. Indelman, “Active Online Visual-Inertial Navigation and Sensor Calibration via Belief Space Planning and Factor Graph Based Incremental Smoothing – Supplementary Material”, Technical Report ANPL-2017-02, September 2017.

[6] D. Kopitkov and V. Indelman, “Deep PDF: Probabilistic Surface Optimization and Density Estimation”, arXiv preprint arXiv: 1807.10728, July 2018.