Murat Ambarkutuk

402 Ellett Road, Blacksburg, VA 204060 302-772-8419 murata@vt.edu
https://murat.ambarkutuk.com muratambarkutuk eroniki https://code.vt.edu/murata

Education

PhD in Computer Engineering **2018 – August 2023 (Anticipated)**
The Bradley Department of Electrical and Computer Engineering at Virginia Tech *Blacksburg, VA*

- Paul E. Torgersen Research Excellence Award
- The Outstanding Research Award and Fellowship from the Turkish Ministry of National Education

Dissertation: A Sensor Fusion Technique for Gait Analysis from Structural Vibration and Computer Vision

MS in Mechanical Engineering **2015 – 2018**
Mechanical Engineering at Virginia Tech *Blacksburg, VA*
Thesis: A Grid based Indoor Radiolocation Technique Based on Spatially Coherent Path Loss Model

BS in Mechatronics Engineering **2008 – 2013**
Mechatronics Engineering Department at Kocaeli University *Kocaeli, Turkey*
Thesis: Box Dimensioning System with Kinect Sensor

Technical & Language Skills

Languages: Python, MATLAB, C, C++, HTML/CSS, JavaScript, PHP
Frameworks: OpenCV, numpy, scipy, matplotlib, scikit-learn, scikit-image, Flask, keras, Tensorflow, Jupyter, ROS, LaTeX
Technologies: Linux, Version Control, GitHub, GitLab, CI/CD
Language Proficiency: Turkish (Native), English (Proficient), German (Novice)

Relevant Coursework

- Robust Estimation & Filtering
- Computer Vision
- Advanced Computer Vision
- Advanced Machine Learning
- Bayesian Robotics
- Experimental Robotics
- Experimental Methods & Signal Processing
- Advanced Robotics & Automation

Relevant Professional Experience

Baykar Defense (TR) - Atlas Imaging (US) **2018 – 2020**
Computer Vision Engineer developing orthorechtified maps with aeral photos taken by on autonomous UAVs. *Remote*

- Derived and actualize pose information (location+orientation) of an UAV and its components based on the distributed measurements of the Inertial Navigation System. These measurements are then used to in an iterative Computer Vision algorithm to project the corners of the images to the ground while considering the elevation changes in the scene.
- Developed a Sensor Fusion algorithm to correct results of the previous stages of the map-making algorithm with statistical representation.
- Implemented Test-driven Development paradigm in the dev-team. On that front, generated tests to check coverage, style requirements, and performance & accuracy of the developed algorithms.
- Architected the CI/CD pipeline to automate the aforementioned tests and generated automated reports from the results of the tests.

Achievements

Mentorship Web Platform for School of Construction
Supervisors: A Akanmu, J Iorio | Website | Sponsor: MLSoC DEI Committee

- Developed a Web application (frontend + backend) to match mentees to mentors by considering mentree preferences and mentor expertise. The backend makes use of a RESTful interface to manipulate the data in consideration & expose some features to the users while the frontend system that let's users & administrator enter data into the backend system and organize information visually.

Analysis of Operational Modes of Deployable Booms in Cube Satellites | Ut ProSat - I
Supervisors: J Black, L Harding | Website | Sponsor: Virginia Space Space@VT & NASA

- Contributed to the hardware selection and design process in the manufacturing of a cube satellite that is missioned to test deployers in lower-orbit space.
- Compile the mission plan, provide premilinary analysis of data and power budget specifically with the selected components of the deployer mechanism.
- Developed the necessary embedded software and test procedures required by the deployer subsystem.

Sensor Fusion for Occupant Localization in Smart Buildings

Advisors: P Plassmann, CF Jones | Related publications: [9, 8, 2, 1]

- Developed a robust algorithm that estimates heel-strike locations from the accelerometer measurements of a vibrating floor.
- Developed a Computer Vision-based algorithm to localize heel-strike locations from images taken by a stereoscopic camera.
- Developed a sensor fusion framework to incorporate the vibration- and vision-based heel-strike locations.
- Developed a combined simulation environment that can generate the vibration and visual information necessary for the validation of the algorithms developed.
- Quantified the efficacy and accuracy of implementations with simulations and controlled experiments.

Quantification of Collaboration and Communication among Students in a Smart Classroom

Advisors: T Baird, PA Tarazaga | News Article | Project Website

- Designed a sensor-suite (frontend + backend), a multiple-view camera-based system, for a smart classroom to quantify the collaboration among students. The backend creates many functionalities of the suite, i.e., controlling the sensor-suite, scheduling auto-start/stop times as well as employing automated Computer Vision techniques on the collected data. The frontend, on the other hand, exposes the functionality of the backend to remotely control and monitor the system.

A Grid-based Indoor Radiolocation Technique based on Spatially Coherent Path Loss Model

Advisor: T Furukawa | Publications: [7]

- Derived a probablistic framework of a passive radio-localization technique under multipath propagation that can determine the location of different entities, namely, occupants, robots, and invenvorty, in indoor enviroments.
- Developed the localization algorithm based on the probablistic framework.
- Validated the efficacy of the algorithm with controlled experiments whose results were presented at IEEE RAS conference.

Community Service & Leadership

Graduate Student Ambassador
The Bradley Department of Electrical and Computer Eng.

IEEE Robotics and Automation Society
Student Member & Reviewer

Society of Experimental Mechanics
Student Member

Turkish Student Assoc. at Virginia Tech
Secretary

Relevant Publications

[1] S. Alajlouni, **Ambarkutuk, Murat**, and P. Tarazaga. Towards the detection and localization of multiple occupant footsteps from vibroacoustic measurements. In *Dynamics of Civil Structures, Volume 2: Proceedings of the 38th IMAC, A Conference and Exposition on Structural Dynamics 2020*, page 193. Springer Nature, 2020.

[2] S. Alajlouni, V. V. S. Malladi, and **Ambarkutuk, Murat**. Investigation of using log-spectrum averaging (cepstral averaging) for blind reconstruction of an unknown impact input force. Springer Nature, 2022.

[3] H. E. Güner, **Ambarkutuk, Murat**, L. Bilginer, and C. Oysu. Magnetic braking and speed stabilization. In *Proceedings of 18th International Conference*, pages 83–86. Proceedings of 18th International Conference. Mechanika 2013., 2013.

[4] H. E. Guner, O. Tekelioglu, **Ambarkutuk, Murat**, L. Bilginer, A. Aşkın, and S. Erkan. Distance mechatronic laboratory for sme's universities and vocational high schools in turkey. In *The 16th International Conference on Mechatronics, Mechatronica 2014*. Brno University of Technology, 2014.

[5] H. E. Guner, O. Tekelioglu, **Ambarkutuk, Murat**, L. Bilginer, A. Aşkın, and S. Erkan. Meslek yüksek okullari ve üniversiteler için internet tabanli mekatronik laboratuvari uygulamasi. In *3rd International Symposium on Innovative Technologies in Engineering and Science, 215*, 2015.

[6] H. Ocak, **Ambarkütük, Murat**, G. Küçükyıldız, and S. Karakaya. Image processing based package volume detection with kinect. In *2015 23nd Signal Processing and Communications Applications Conference (SIU)*, pages 515–518. IEEE, 2015.

[7] **Ambarkutuk, Murat** and T. Furukawa. A grid-based indoor radiolocation technique based on spatially coherent path loss model. In *2017 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)*, pages 220–226. IEEE, 2017.

[8] **Ambarkutuk, Murat** and P. Tarazaga. Uncertainty analysis of an occupant localization technique based on simulated structural vibrations. Springer Nature, 2022.

[9] **Ambarkutuk, Murat**, S. Alajlouni, and P. Tarazaga. A sensor fusion technique for spatial gait parameters from structural vibration and computer vision. MDPI Sensors, 2022.