

## Asst. Prof. HALİL ERSİN SÖKEN

### Personal Information

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### Biography

Dr. Halil Ersin Soken is an Assistant Professor at Aerospace Engineering Department of Middle East Technical University, Ankara, Turkey. Previously he worked at TUBITAK Space Technologies Research Institute (TUBITAK Uzay) and contributed to the institute's ongoing satellite projects. In addition, he was a project research associate at JAXA Institute of Space and Astronautical Science, where he worked on attitude determination algorithms for small satellites. He has collaborations at international level for various researches on attitude determination and control system design for small satellites.

### Education Information

Doctorate, Graduate University for Advanced Studies, Physical Sciences, Space and Astronautical Science, Japan 2010 - 2013

Post Graduate, Istanbul Technical University, Uçak Ve Uzay Bilimleri, Turkey 2007 - 2009

Under Graduate, Istanbul Technical University, Uçak Ve Uzay Bilimleri, Uçak Mühendisliği, Turkey 2003 - 2008

Under Graduate, Istanbul Technical University, Uçak Ve Uzay Bilimleri, Uzay Mühendisliği, Turkey 2003 - 2007

### Foreign Languages

Japanese, A2 Elementary

English, C2 Mastery

### Dissertations

Doctorate, UKF Adaptation and Filter Integration for Attitude Determination and Control of Nanosatellites with Magnetic Sensors and Actuators, Graduate University for Advanced Studies, Physical Sciences, Space and Astronautical Science, 2013

Post Graduate, Kalman Filtering Applications on Attitude Determination of ITU-PSAT I Satellite, Istanbul Technical University, Uçak Ve Uzay Bilimleri, Uzay Mühendisliği, 2009

### Research Areas

Aeronautical Engineering , Space Engineering

### Academic Titles / Tasks

Assistant Professor, Middle East Technical University, Faculty of Engineering, Department of Aerospace Engineering, 2020 - Continues  
Research Assistant, Japan Aerospace Exploration Agency, Institute of Space and Astronautical Science, 2010 - 2013  
Research Assistant, Istanbul Technical University, Uçak Ve Uzay Bilimleri, Uçak Mühendisliği, 2010 - 2010

## Courses

Inertial Navigation Systems, Under Graduate, 2018 - 2019, 2019 - 2020  
Applied Orbital Mechanics, Post Graduate, 2019 - 2020, 2020 - 2021  
System Dynamics, Under Graduate, 2020 - 2021

## Articles Published in Journals That Entered SCI, SSCI and AHCI Indexes

- I. **Attitude estimation and magnetometer calibration using reconfigurable TRIAD plus filtering approach**  
Soken H. E. , Sakai S.  
AEROSPACE SCIENCE AND TECHNOLOGY, vol.99, 2020 (Journal Indexed in SCI)
- II. **A new likelihood approach to autonomous multiple model estimation**  
Soken H. E. , Sakai S.  
ISA TRANSACTIONS, vol.99, pp.50-58, 2020 (Journal Indexed in SCI)
- III. **Nontraditional Attitude Filtering with Simultaneous Process and Measurement Covariance Adaptation**  
Hacizade C., Soken H. E. , Cilden-Guler D.  
JOURNAL OF AEROSPACE ENGINEERING, vol.32, no.5, 2019 (Journal Indexed in SCI)
- IV. **A survey of calibration algorithms for small satellite magnetometers**  
Soken H. E.  
MEASUREMENT, vol.122, pp.417-423, 2018 (Journal Indexed in SCI)
- V. **Exploration of energization and radiation in geospace (ERG): challenges, development, and operation of satellite systems**  
Nakamura Y., Fukuda S., Shibano Y., Ogawa H., Sakai S., Shimizu S., Soken E., Miyazawa Y., Toyota H., Kukita A., et al.  
EARTH PLANETS AND SPACE, vol.70, 2018 (Journal Indexed in SCI)
- VI. **An Attitude Filtering and Magnetometer Calibration Approach for Nanosatellites**  
Soken H. E.  
INTERNATIONAL JOURNAL OF AERONAUTICAL AND SPACE SCIENCES, vol.19, no.1, pp.164-171, 2018 (Journal Indexed in SCI)
- VII. **Real-Time Attitude-Independent Magnetometer Bias Estimation for Spinning Spacecraft**  
Soken H. E. , Sakai S.  
JOURNAL OF GUIDANCE CONTROL AND DYNAMICS, vol.41, no.1, pp.276-279, 2018 (Journal Indexed in SCI)
- VIII. **NANOSATELLITE ATTITUDE ESTIMATION FROM VECTOR MEASUREMENTS USING SVD-AIDED UKF ALGORITHM**  
Cilden D., Soken H. E. , Hacizade C.  
METROLOGY AND MEASUREMENT SYSTEMS, vol.24, no.1, pp.113-125, 2017 (Journal Indexed in SCI)
- IX. **Small satellite attitude determination during plasma brake deorbiting experiment**  
Khurshid O., Selkainaho J., Soken H. E. , Kallio E., Visala A.  
ACTA ASTRONAUTICA, vol.129, pp.52-58, 2016 (Journal Indexed in SCI)
- X. **Adaptive Tuning of the Unscented Kalman Filter for Satellite Attitude Estimation**  
Soken H. E. , Sakai S.  
JOURNAL OF AEROSPACE ENGINEERING, vol.28, no.3, 2015 (Journal Indexed in SCI)
- XI. **In-Orbit Estimation of Time-Varying Residual Magnetic Moment**

Soken H. E. , Sakai S., Wisniewski R.

IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS, vol.50, no.4, pp.3126-3136, 2014 (Journal Indexed in SCI)

- XII. **REKF and RUKF for pico satellite attitude estimation in the presence of measurement faults**  
Soeken H. E. , Hacızade C.  
JOURNAL OF SYSTEMS ENGINEERING AND ELECTRONICS, vol.25, no.2, pp.288-297, 2014 (Journal Indexed in SCI)
- XIII. **Robust Kalman filtering for small satellite attitude estimation in the presence of measurement faults**  
Soken H. E. , Hacızade C., Sakai S.  
EUROPEAN JOURNAL OF CONTROL, vol.20, no.2, pp.64-72, 2014 (Journal Indexed in SCI)
- XIV. **Robust adaptive unscented Kalman filter for attitude estimation of pico satellites**  
Hacızade C., Soken H. E.  
INTERNATIONAL JOURNAL OF ADAPTIVE CONTROL AND SIGNAL PROCESSING, vol.28, no.2, pp.107-120, 2014 (Journal Indexed in SCI)
- XV. **Robust Adaptive Kalman Filter for estimation of UAV dynamics in the presence of sensor/actuator faults**  
Hacızade C., Soken H. E.  
AEROSPACE SCIENCE AND TECHNOLOGY, vol.28, no.1, pp.376-383, 2013 (Journal Indexed in SCI)
- XVI. **Adaptive Fading UKF with Q-Adaptation: Application to Picosatellite Attitude Estimation**  
Soken H. E. , Hacızade C.  
JOURNAL OF AEROSPACE ENGINEERING, vol.26, no.3, pp.628-636, 2013 (Journal Indexed in SCI)
- XVII. **UKF-Based Reconfigurable Attitude Parameters Estimation and Magnetometer Calibration**  
Soken H. E. , Hacızade C.  
IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS, vol.48, no.3, pp.2614-2627, 2012 (Journal Indexed in SCI)
- XVIII. **UKF based in-flight calibration of magnetometers and rate gyros for pico satellite attitude determination**  
Soeken H. E. , Hacızade C.  
ASIAN JOURNAL OF CONTROL, vol.14, no.3, pp.707-715, 2012 (Journal Indexed in SCI)
- XIX. **Robust Estimation of UAV Dynamics in the Presence of Measurement Faults**  
Hacızade C., Soken H. E.  
JOURNAL OF AEROSPACE ENGINEERING, vol.25, no.1, pp.80-89, 2012 (Journal Indexed in SCI)
- XX. **Pico satellite attitude estimation via Robust Unscented Kalman Filter in the presence of measurement faults**  
Soken H. E. , Hacızade C.  
ISA TRANSACTIONS, vol.49, no.3, pp.249-256, 2010 (Journal Indexed in SCI)

## Articles Published in Other Journals

- I. **Filtering-Based Three-Axis Attitude Determination Package for Spinning Spacecraft: Preliminary Results with Arase**  
SÖKEN H. E. , Sakai S., Asamura K., Nakamura Y., Takashima T., Shinohara I.  
AEROSPACE, vol.7, no.7, 2020 (Journal Indexed in ESCI)
- II. **Estimation of pico-satellite attitude dynamics and external torques via Unscented Kalman Filter**  
SÖKEN H. E. , Hajiyev C.  
Journal of Aerospace Technology and Management, vol.6, no.2, pp.149-157, 2014 (Refereed Journals of Other Institutions)
- III. **In-flight calibration of pico satellite attitude sensors via unscented kalman filter**  
SÖKEN H. E. , Hajiyev C.  
Gyroscopy and Navigation, vol.2, no.3, pp.156-163, 2011 (Refereed Journals of Other Institutions)
- IV. **Reconfigurable UKF for in-flight magnetometer calibration and attitude parameter estimation**

SÖKEN H. E. , Hajiyev C.

IFAC Proceedings Volumes (IFAC-PapersOnline), vol.44, pp.741-746, 2011 (Refereed Journals of Other Institutions)

## Books & Book Chapters

- I. **Fault Tolerant Attitude Estimation for Small Satellites**  
Söken H. E. , Hacızade C.  
CRC, New York , Florida, 2020
- II. **Integration of Single-Frame and Filtering Methods for Nanosatellite Attitude Estimation**  
Söken H. E. , Hacızade C., Çilden Güler D.  
in: Multisensor Attitude Estimation, Hassen Fourati,Djamel Eddine Chouaib Belkhiat, Editor, CRC, New York , Florida, pp.463-484, 2016
- III. **Fault Tolerant Estimation of UAV Dynamics via Robust Adaptive Kalman Filter**  
Söken H. E. , Hacızade C.  
in: Complex Systems, Georgi M. Dimirovski, Editor, Springer, London/Berlin , Bern, pp.369-394, 2016
- IV. **State Estimation and Control for Low-cost Unmanned Aerial Vehicles**  
Söken H. E. , Hacızade C.  
Springer, London/Berlin , Bern, 2015
- V. **Multiple-Model Adaptive Estimation of Time-Varying Residual Magnetic Moment for Small Satellites**  
Söken H. E. , Sakai S.  
in: Advances in Aerospace Guidance, Navigation and Control, Joël Bordeneuve-Guibé,Antoine Drouin,Clément Roos, Editor, Springer, London/Berlin , Bern, pp.303-321, 2015
- VI. **Robust Kalman Filtering with Single and Multiple Scale Factors for Small Satellite Attitude Estimation**  
Söken H. E. , Hacızade C., Sakai S.  
in: Advances in Estimation, Navigation, and Spacecraft Control, Daniel Choukroun,Yaakov Oshman,Julie Thienel,Moshe Idan, Editor, Springer, London/Berlin , Berlin, pp.391-411, 2015
- VII. **Robust Self-adaptive Kalman Filter with the R and Q Adaptations against Sensor/Actuator Failures**  
Söken H. E. , Hacızade C.  
in: Self-organization: Theories and Methods, WenJun Zhang, Editor, NOVA Science Publishers Inc. , New York, pp.201-224, 2013

## Refereed Congress / Symposium Publications in Proceedings

- I. **Mission Experience for Spinning Spacecraft Attitude Filtering with Spin Parameters**  
Söken H. E. , Sakai S., Asamura K., Nakamura Y., Takashima T., Shinohara I.  
32nd International Symposium on Space Technology and Science, Fukui, Japan, 17 - 21 June 2019, pp.1-8
- II. **TRIAD+Filtering approach for complete magnetometer calibration**  
SÖKEN H. E. , Sakai S.  
9th International Conference on Recent Advances in Space Technologies, RAST 2019, İstanbul, Turkey, 11 - 14 June 2019, pp.703-708
- III. **Tuning the attitude filter: A comparison of intuitive and adaptive approaches**  
SÖKEN H. E. , Hacızade C.  
9th International Conference on Recent Advances in Space Technologies, RAST 2019, İstanbul, Turkey, 11 - 14 June 2019, pp.747-752
- IV. **Advanced attitude determination algorithm for arase: Preliminary mission experience**  
SÖKEN H. E. , Sakai S., Asamura K., Nakamura Y., Takashima T.  
AAS/AIAA Astrodynamics Specialist Conference, 2017, Washington, United States Of America, 20 - 24 August 2017, vol.162, pp.1175-1193

- V. **Pseudo-Linear Kalman Filter for Attitude Estimation of a Spinning Nanosatellite**  
Söken H. E. , Khurshid O., Kallio E., Visala A., Selkainaho J.  
8th Nano-satellite Symposium, Matsuyama, Japan, 3 - 09 June 2017, pp.1-6
- VI. **Spinning Spacecraft Attitude Filtering with Spin Parameters: Performance Evaluation with Real Data**  
Söken H. E. , Sakai S., Van Der Ha J. C.  
26th International Symposium on Space Flight Dynamics, Matsuyama, Japan, 3 - 09 June 2017, pp.1-6
- VII. **Non-Traditional Robust UKF against Attitude Sensors Faults**  
Söken H. E. , Hacızade C., Çilden Güler D.  
26th International Symposium on Space Flight Dynamics, Matsuyama, Japan, 3 - 09 June 2017, pp.1-6
- VIII. **Study on an Advanced Attitude Determination Algorithm for the ERG Spacecraft**  
Söken H. E. , Sakai S., Asamura K., Nakamura Y., Takashima T.  
26th International Symposium on Space Flight Dynamics, Matsuyama, Japan, 3 - 09 June 2017, pp.1-6
- IX. **A Survey of Calibration Algorithms for Small Satellite Magnetometers**  
Soken H. E.  
4th IEEE International Workshop on Metrology for AeroSpace, Padua, Italy, 21 - 23 June 2017, pp.62-67
- X. **Pseudo-Linear Approach to Nanosatellite Attitude Estimation and Magnetometer Calibration**  
Khurshid O., Selkainaho J., Kallio E., Visala A., Soken H. E.  
8th International Conference on Recent Advances in Space Technologies (RAST), İstanbul, Turkey, 19 - 22 June 2017, pp.355-360
- XI. **Magnetometer Only Attitude Estimation for Spinning Small Satellites**  
Soken H. E. , Sakai S.  
8th International Conference on Recent Advances in Space Technologies (RAST), İstanbul, Turkey, 19 - 22 June 2017, pp.369-374
- XII. **Spin parameters and nonlinear kalman filtering for spinning spacecraft attitude estimation**  
SÖKEN H. E. , Sakai S., Asamura K., Nakamura Y., Takashima T.  
27th AAS/AIAA Space Flight Mechanics Meeting, 2017, Texas, United States Of America, 5 - 09 February 2017, vol.160, pp.2615-2629
- XIII. **Spin-axis tilt estimation algorithm with validation by real data**  
SÖKEN H. E. , Van Der Ha J. C. , Sakai S.  
27th AAS/AIAA Space Flight Mechanics Meeting, 2017, Texas, United States Of America, 5 - 09 February 2017, vol.160, pp.2631-2645
- XIV. **Q-Adaptation of SVD-aided UKF Algorithm for Nanosatellite Attitude Estimation**  
Hacızade C., Soken H. E. , Guler D. C.  
20th World Congress of the International-Federation-of-Automatic-Control (IFAC), Toulouse, France, 9 - 14 July 2017, vol.50, pp.8273-8278
- XV. **Nontraditional UKF Based Nanosatellite Attitude Estimation with the Process and Measurement Noise Covariances Adaptation**  
Hacızade C., Guler D. C. , Soken H. E.  
8th International Conference on Recent Advances in Space Technologies (RAST), İstanbul, Turkey, 19 - 22 June 2017, pp.381-386
- XVI. **IAC-17.C1.1.3: Time-varying errors for magnetometers on small satellites**  
SÖKEN H. E. , Sakai S.  
68th International Astronautical Congress: Unlocking Imagination, Fostering Innovation and Strengthening Security, IAC 2017, Adelaide, Australia, 25 - 29 September 2017, vol.10, pp.6809-6815
- XVII. **Multiple Model Adaptive Estimation Algorithm for Systems with Parameter Change**  
Soken H. E. , Sakai S.  
55th Annual Conference of the Society of Instrument and Control Engineers of Japan (SICE), Tsukuba, Japan, 20 - 23 September 2016, pp.1718-1723
- XVIII. **Spin-axis tilt estimation for spinning spacecraft**  
SÖKEN H. E. , Sakai S., Asamura K., Nakamura Y., Takashima T.  
AIAA Guidance, Navigation, and Control Conference, 2016, California, United States Of America, 4 - 08 January

2016

- XIX. Magnetometer Calibration for Advanced Small Satellite Missions**  
Söken H. E. , Sakai S.  
30th International Symposium on Space Technology and Science, Kobe, Japan, 3 - 10 July 2015, pp.1-6
- XX. Attitude Estimation for Nanosatellites Using Singular Value Decomposition and Unscented Kalman Filter**  
Söken H. E. , Hacızade C., Çilden Güler D.  
30th International Symposium on Space Technology and Science, Kobe, Japan, 3 - 10 July 2015, pp.1-6
- XXI. Attitude and Attitude Rate Estimation for a Nanosatellite Using SVD and UKF**  
Cilden D., Hacızade C., Soken H. E.  
7th International Conference on Recent Advances in Space Technologies (RAST), İstanbul, Turkey, 16 - 19 June 2015, pp.695-700
- XXII. Investigation of Estimation Methods for Time-varying Residual Magnetic Moment**  
Soken H. E. , Sakai S.  
Asia-Pacific International Symposium on Aerospace Technology (APISAT), Shanghai, China, 24 - 26 September 2014, vol.99, pp.1146-1151
- XXIII. Simultaneous adaptation of the process and measurement noise covariances for the UKF applied to nanosatellite attitude estimation**  
SÖKEN H. E. , Hacızade C., Sakai S.  
19th IFAC World Congress on International Federation of Automatic Control, IFAC 2014, Cape-Town, South Africa, 24 - 29 August 2014, vol.19, pp.5921-5926
- XXIV. In-orbit estimation of time-varying residual magnetic moment for small satellite applications**  
SÖKEN H. E. , Sakai S.  
AIAA Guidance, Navigation, and Control (GNC) Conference, Boston, MA, United States Of America, 19 - 22 August 2013
- XXV. Residual based Adaptive Unscented Kalman filter for satellite attitude estimation**  
SÖKEN H. E. , Sakai S.  
AIAA Guidance, Navigation, and Control Conference 2012, Minneapolis, MN, United States Of America, 13 - 16 August 2012
- XXVI. Fault tolerant attitude estimation for pico satellites using robust adaptive UKF**  
SÖKEN H. E. , Hajiyev C.  
8th IFAC Symposium on Fault Detection, Supervision and Safety of Technical Processes, SAFEPROCESS 2012, Mexico City, Mexico, 29 - 31 August 2012, vol.8, pp.726-731
- XXVII. Fault tolerant estimation of autonomous underwater vehicle dynamics via robust UKF**  
Hajiyev C., Ata M., Dinc M., SÖKEN H. E.  
2012 13th International Carpathian Control Conference, ICC 2012, High Tatras, Slovakia, 28 - 31 May 2012, pp.203-208
- XXVIII. UKF based on-orbit gyro and magnetometer bias estimation as a part of the attitude determination procedure for a small satellite**  
SÖKEN H. E. , Sakai S.  
2011 11th International Conference on Control, Automation and Systems, ICCAS 2011, Gyeonggi-do, South Korea, 26 - 29 October 2011, pp.1891-1896
- XXIX. A novel adaptive unscented Kalman filter for pico satellite attitude estimation**  
Söken H. E. , Hacızade C.  
Physics Congress, Leon, Spain, 5 - 08 September 2011, pp.1-7
- XXX. In flight magnetometer calibration via unscented Kalman filter**  
SÖKEN H. E. , Hajiyev C.  
5th International Conference on Recent Advances in Space Technologies, RAST 2011, İstanbul, Turkey, 9 - 11 June 2011, pp.885-890
- XXXI. REKF and RUKF development for pico satellite attitude estimation in the presence of measurement faults**

SÖKEN H. E. , Hajiyev C.

5th International Conference on Recent Advances in Space Technologies, RAST 2011, İstanbul, Turkey, 9 - 11 June 2011, pp.891-896

**XXXII. UKF based in-flight calibration of magnetometers and rate gyros for pico satellite attitude determination**

SÖKEN H. E. , Hajiyev C.

17th Saint Petersburg International Conference on Integrated Navigation Systems, ICINS 2010, Saint Petersburg, Russia, 31 May - 02 June 2010, pp.233-240

**XXXIII. Adaptive Kalman filter with multiple fading factors for UAV state estimation**

Hajiyev C., SÖKEN H. E.

7th IFAC International Symposium on Fault Detection, Supervision and Safety of Technical Systems, SAFEPROCESS'09, Barcelona, Spain, 30 June - 03 July 2009, pp.77-82

**XXXIV. Adaptive Unscented Kalman Filter with Multiple Fading Factors for Pico Satellite Attitude Estimation**

Soken H. E. , Hacızade C.

4th International Conference on Recent Advances in Space Technologies, İstanbul, Turkey, 11 - 13 June 2009, pp.541-546

**XXXV. UKF for the Identification of the Pico Satellite Attitude Dynamics Parameters and the External Torques on IMU and Magnetometer Measurements**

Soken H. E. , Hacızade C.

4th International Conference on Recent Advances in Space Technologies, İstanbul, Turkey, 11 - 13 June 2009, pp.547-552

**XXXVI. Adaptive Kalman Filter with the Filter Gain Correction Applied to UAV Flight Dynamics**

Hacızade C., Soken H. E.

17th Mediterranean Conference on Control and Automation, Thessaloniki, Greece, 24 - 26 June 2009, pp.892-897

## Activities in Scientific Journals

IEEE Access, Assistant Editor, 2017 - Continues

## Memberships / Tasks in Scientific Organizations

American Institute of Aeronautics and Astronautics, Member, 2012 - Continues, United States Of America

## Scientific Refereeing

IET RADAR SONAR AND NAVIGATION, Journal Indexed in SCI-E, November 2020

IEEE ACCESS, Journal Indexed in SCI-E, October 2020

IEEE Access, Journal Indexed in SCI-E, October 2020

IEEE SENSORS JOURNAL, Journal Indexed in SCI-E, July 2020

IEEE TRANSACTIONS ON AUTOMATION SCIENCE AND ENGINEERING, SCI Journal, July 2020

AEROSPACE SCIENCE AND TECHNOLOGY, SCI Journal, June 2020

IEEE SENSORS JOURNAL, SCI Journal, May 2020

IEEE ACCESS, SCI Journal, April 2020

IEEE Access, SCI Journal, April 2020

Journal of Aerospace Information Systems, Other Indexed Journal, April 2020

AEROSPACE SCIENCE AND TECHNOLOGY, SCI Journal, April 2020

AEROSPACE SCIENCE AND TECHNOLOGY, SCI Journal, March 2020

MEASUREMENT, SCI Journal, March 2020

IEEE ACCESS, SCI Journal, March 2020  
IEEE SENSORS JOURNAL, SCI Journal, February 2020  
IEEE ACCESS, National Scientific Refreed Journal, February 2020  
IEEE ACCESS, SCI Journal, February 2020  
IEEE ACCESS, SCI Journal, January 2020

## **Tasks In Event Organizations**

Söken H. E. , Recent Advances in Space Technologies, Scientific Congress, İstanbul, Turkey, Haziran 2019  
Söken H. E. , Recent Advances in Space Technologies, Scientific Congress, İstanbul, Turkey, Haziran 2017  
Söken H. E. , Recent Advances in Space Technologies, Scientific Congress, İstanbul, Turkey, Haziran 2015

## **Citations**

Total Citations (WOS):371  
h-index (WOS):10

## **Invited Talks**

Attitude Determination and Control for Small Satellites: A Review in the Perspective of Recent Problems, Seminar, Türk Hava Kurumu Üniversitesi, Turkey, March 2020

## **Scholarships**

MEXT, Official Institutions of Foreign Countries, 2010 - 2013  
2211 Yurt İçi Lisansüstü Burs Programı, TÜBİTAK, 2007 - 2009

## **Non Academic Experience**

TÜBİTAK, Tubitak Space Technologies Research Institute  
Other, Japan Aerospace Exploration Agency  
Other, Japan Aerospace Exploration Agency