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Academic Backgrounds***University of Science & Technology Beijing – 2016.09-now***

- PhD degree of Computer Science, in University of Science & Technology Beijing. I am conducting research in the area of wearable sensor based human motion tracking applications, including human motion modeling and accurate tracking algorithms.

University of Science & Technology Beijing – 2012.09-2015.01

- Master degree of Computer Science, in University of Science & Technology Beijing. I did research in the area of TOA based indoor localization techniques, including TOA ranging error modeling and localization algorithm design.

University of Science & Technology Beijing – 2008.09-2012.06

- Bachelor degree of Computer Science, in University of Science & Technology Beijing. I did research in the area of TOA based indoor localization techniques and contributed to the software of mobile application “StarLoc: a smartphone based indoor localization application”.

Research Topics

- Internet of Things→Wireless Localization Techniques
 - ➡ Familiar with embedded software programming.
 - ➡ Skilled on RFID (CSS/UWB) based wireless localization techniques, including error modeling, protocol design, algorithm design and platform construction.
 - ➡ Familiar with inertial navigation and multi-source fusion navigation systems.
 - ➡ One journal paper and three conference papers are got published under this topic.
- Intelligent Computing→Human Motion Tracking and Activity Recognition
 - ➡ Familiar with human motion tracking and activity recognition techniques based on wearable sensors (such as inertial sensors and TOA sensors), including the design of recognition and tracking algorithms and the construction of software and hardware platforms
 - ➡ Familiar with statistical machine learning and deep learning methods
 - ➡ Three journal papers and four conference papers are got published under this topic.
- Experienced in leading a team to develop practical projects

Publications

Journal Papers:

- [1] Xu C, He J, Zhang X, et al. Geometrical Kinematic Modeling on Human Motion using Method of Multi-Sensor Fusion[J]. Information Fusion, 2017, 41. (SCI, IF=6.639)
- [2] Xu C, He J, Zhang X, et al. Toward Near-Ground Localization: Modeling and Applications for TOA Ranging Error[J]. IEEE Transactions on Antennas & Propagation, 2017, 65(10):5658-5662. (SCI, IF=4.130)
- [3] Xu C, He J, Zhang X, et al. Detection of Freezing of Gait Using Template-Matching-Based Approaches[J]. Journal of Sensors, 2017, 2017(2):1-8. (SCI, IF=2.057)
- [4] Xu C, He J, Zhang X, et al. Recurrent Transformation of Prior Knowledge Based Model for Human Motion Recognition[J]. Computational Intelligence & Neuroscience, 2018, 2018:1-12. (SCI, IF=1.649)
- [5] Xu C, He J, Zhang X, et al. Towards Human Motion Tracking: Fundamental Limits of Multi-sensory IMU/TOA Fusion[J]. Submitted to IEEE Sensors Journal (SCI, IF=2.617), under minor revision.
- [6] He J, Yu Y, Liu F, Xu C, et al. A query-driven TOA-based indoor geolocation system using smart phone[J]. Journal of Convergence Information Technology, 2012, 7(18):1-10. (EI indexed)

Conference Papers:

- [7] Xu C, He J, Zhang X. Toward Human Motion Sensing: Design and Performance Evaluation of a Minimized Wearable Platform using Inertial and TOA Sensors[M]// Advances in Intelligent Systems and Interactive Applications. 2019. (Accepted, to appear, EI indexed)
- [8] Xu C, He J, Zhang X, et al. DFSA: A Classification Capability Quantification Method for Human Action Recognition, 2017 IEEE Ubiquitous Intelligence and Computing (UIC 2017), Aug.4-8, 2017, San Francisco, USA. (EI indexed)
- [9] Xu C, He J, Zhang X. Hierarchical Decision Tree Model for Human Activity Recognition Using Wearable Sensors[M]// Advances in Intelligent Systems and Interactive Applications. 2018:367-372. (EI indexed)
- [10] Xu C, He J, Zhang X, et al. Template-Matching-Based Detection of Freezing of Gait Using Wearable Sensors, 2017 Conference on Identification, Information & Knowledge in the Internet of Things (IIKI 2017), Oct. 19-21, Qufu, China. (EI indexed)
- [11] He J, Wang C, Xu C, et al. Human Motion Monitoring Platform Based on Positional Relationship and Inertial Features[C]// International Conference on Intelligent and Interactive Systems and Applications. Springer, Cham, 2017:373-379. (EI indexed)

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- [12] Xu C, He J, Liu F, et al. ZTDMA: A Multi-zones and Multi-objectives Channel Allocation Protocol Based on TOA Real-Time Geolocation System[M]// Advanced Technologies in Ad Hoc and Sensor Networks. Springer Berlin Heidelberg, 2014. (EI indexed)
 - [13] Xu C, He J, Liu F, et al. MLOC: A Multiple Service Fusion Self-Organizing Geolocation System[M]// Advanced Technologies in Ad Hoc and Sensor Networks. Springer Berlin Heidelberg, 2014:247-261.(EI indexed)
 - [14] He J, Xu C, Liu B, et al. DLTDMA: A dynamic layout time division multiple access channel allocation protocol based on real-time geolocation system[C]// International Conference on Cyberspace Technology. IET, 2013:199-205. (EI indexed)
 - [15] He J, Geng Y, Xu C, et al. Height dependent TOA ranging error model for near ground localization applications[C]// IEEE, International Symposium on Personal, Indoor, and Mobile Radio Communication. IEEE, 2015:2045-2050.

Fundings

- National Natural Science Foundation of China (NSFC) project: “Study on the signal propagation model and key algorithms for TOA based firefighter localization system in complicated architectural environment”(wrote the application, and got funded)
- National Natural Science Foundation of China (NSFC) project: “Research on the effect of human body on ranging for TOA based human tracking”(wrote the application, and got funded)

Software Copyright

- TOA ad-hoc network positioning system communication protocol software
- Radio Ranging Technology Software
- Indoor Positioning and Tracking System Monitoring Platform Software
- Indoor Positioning and Tracking System Monitoring Platform Embedded Software
- Query-driven indoor positioning service system based on Android software

Project Experience

PhD Thesis: Study on Human Motion Tracking Model and Algorithms using IMU/TOA Fusion

- Brief overview: This project aims to solve the drift problem of traditional inertial measurement units (IMUs) based human motion tracking systems, by integrating Time of Arrival (TOA) sensors (a kind of wireless ranging sensor). With the introduction of distance parameters, it can significantly reduce the cost and the complexity of the system. We mainly focus on the study of IMU/TOA fusion model and key algorithms, to improve human

motion tracking accuracy. The main research contents of the project include:

- ➡ Performance study and visualization of human motion tracking theory based on IMU/TOA fusion;
- ➡ Research on human motion tracking model based on geometric dynamics and its multi-source fusion algorithm;
- ➡ Location optimization method based on error online evaluation and its system implementation.

Tunnel borer vehicle positioning system

2018.02-now

Responsibility: Key R&D

Participant: 4

- **Brief overview:** The whole project aims to realize the accurate positioning of tunnel borer vehicle and the transmission of operational data collected by PLC device.
- **Personal work:** Lead the team to complete tasks (hardware and software design, communication protocol design and the positioning algorithm design) pre-defined by schedule.

Firefighter positioning and rescue system

2015.02-2017.08

Responsibility: Key R&D

Participant: 4

- **Brief overview:** The whole project aims to realize the accurate positioning of firefighters working in complicated buildings and the P2P searching of trapped firefighters, namely helping with rescue. The product is for sell now.
- **Personal work:** Lead the team to complete tasks pre-defined by schedule. The main jobs of our research group is positioning and P2P searching algorithms design and the realization of prototype system. It has been commercialized by a collaborative third party company.

Future Research Directions (Proposal)

- **UWB Channel Modeling in Wireless Body Area Network:** My previous study put forward an IMU/TOA fusion based method to realize accurate human motion tracking. As the human body is a specific conducting medium, the WBAN conditions may influence the TOA measuring results. A channel transmission model in WBAN is essential for further applications.
- **CSI based Human Motion Sensing:** Recent advances in Wi-Fi Channel State Information (i.e., CSI) enable a new human sensing paradigm, which is able to recognize behaviors in a device-free and non-intrusive manner. The data obtained from CSI method is very large and deep learning could be utilized to realize human motion sensing.
- **UWB based Human Posture Capturing:** Wireless signal, especially UWB radar, is of great advantages in device-free human posture capturing applications. We intend to utilize UWB radar information to reconstruct the human posture by machine learning methods.