RF-Identity: Non-Intrusive Person Identification Based on Commodity RFID Devices

CHAO FENG, Northwest University, IoT Research Center-Northwest University, China
JIE XIONG, University of Massachusetts Amherst, USA
LIQIONG CHANG, Northwest University, International Joint Research Centre for Battery-free IoT, China
FUWEI WANG*, Northwest University, Northwest University-Jingdong Wisdom Cloud Joint Research Center for AI & IoT, China
JU WANG, IoT Research Center- Northwest University, China
DINGYI FANG, Northwest University, IoT Research Center-Northwest University, International Joint Research Centre for Battery-free IoT, China

Person identification plays a critical role in a large range of applications. Recently, RF based person identification becomes a hot research topic due to the contact-free nature of RF sensing that is particularly appealing in current COVID-19 pandemic. However, existing systems still have multiple limitations: i) heavily rely on the gait patterns of users for identification; ii) require a large amount of data to train the model and also extensive retraining for new users and iii) require a large frequency bandwidth which is not available on most commodity RF devices for static person identification. This paper proposes RF-Identity, an RFID-based identification system to address the above limitations and the contribution is threefold. First, by integrating walking pattern features with unique body shape features (e.g., height), RF-Identity achieves a high accuracy in person identification. Second, RF-Identity develops a data augmentation scheme to expand the size of the training data set, thus reducing the human effort in data collection. Third, RF-Identity utilizes the tag diversity in spatial domain to identify static users without a need of large frequency bandwidth. Extensive experiments show an identification accuracy of 94.2% and 95.9% for 50 dynamic and static users, respectively.

CCS Concepts: • **Human-centered computing → Ubiquitous and mobile computing**.

Additional Key Words and Phrases: Person identification, RFID tag, body feature, Deep learning

ACM Reference Format:
Chao Feng, Jie Xiong, Liqiong Chang, Fuwei Wang, Ju Wang, and Dingyi Fang. 2021. RF-Identity: Non-Intrusive Person Identification Based on Commodity RFID Devices. *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.* 5, 1, Article 9 (March 2021), 23 pages. https://doi.org/10.1145/3448101

*This is the corresponding author

Authors' addresses: Chao Feng, Northwest University, IoT Research Center-Northwest University, China, chaofeng@stumail.nwu.edu.cn; Jie Xiong, University of Massachusetts Amherst, USA, jxiong@cs.umass.edu; Liqiong Chang, Northwest University, International Joint Research Centre for Battery-free IoT, China, clq.nwu.edu.cn; Fuwei Wang, Northwest University, Northwest University-Jingdong Wisdom Cloud Joint Research Center for AI & IoT, China, wfw.nwu.edu.cn; Ju Wang, IoT Research Center- Northwest University, China, wangju@nwu.edu.cn; Dingyi Fang, Northwest University, IoT Research Center-Northwest University, International Joint Research Centre for Battery-free IoT, China, dyf.nwu.edu.cn.

2474-9567/2021/3-ART9 $15.00
https://doi.org/10.1145/3448101