Intelligent Decision Lab

How to read a paper

Why need to read a paper

- Professor asks to read
- Review a work
- Keep us updated in the field
- Learning the state-of-the-art studies/survey of new fields

Source to search papers

- IEEE Explorer
- ScienceDirect
- Papers with code (available code)
- Computer Vision Open Access (available code)
- Open Access Store (prefer accepted papers)
- Google Scholar
- Github (check code)

Select high quality papers to read

- Avoid wasting our time on bad ideas/unverified studies
- Learn good skills from the experts/ top researchers to enhance our level
- Have a good list of references for our citations

REFERENCES

[1] M. Du, F. Li, G. Zheng, and V. Srikumar, "DeepLog: Anomaly detection and diagnosis from system logs through deep learning," in *Proc. ACM SIGSAC Conf. Comput. Commun. Security*, 2017, pp. 1285–1298.

[2] A. L. Buczak and E. Guven, "A survey of data mining and machine learning methods for cyber security intrusion detection," *IEEE Commun. Surveys Tuts.*, vol. 18, no. 2, pp. 1153–1176, 2nd Quart., 2016.

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How a paper looks

Journal paper

1 Journal name

994 IEEE COMMUNICATIONS SURVEYS & TUTORIALS, VOL. 24, NO. 2, SECOND QUARTER 2022

2 Paper title

A Survey on Fundamental Limits of Integrated Sensing and Communication

An Liu, *Senior Member, IEEE*, Zhe Huang, *Graduate Student Member, IEEE*, Min Li, *Member, IEEE*, Yubo Wan, Wenrui Li, Tony Xiao Han, *Member, IEEE*, Chenchen Liu, Rui Du, *Member, IEEE*, Danny Kai Pin Tan, Jianmin Lu, Yuan Shen, *Senior Member, IEEE*, Fabiola Colone, *Senior Member, IEEE*, and Kevin Chetty

Author 3

4 Abstract

Abstract—The integrated sensing and communication (ISAC), in which the sensing and communication share the same frequency band and hardware, has emerged as a key technology in future wireless systems due to two main reasons. First, many important application scenarios in fifth generation (5G) and beyond, such as autonomous vehicles, Wi-Fi sensing and extended reality, requires both high-performance sensing and wireless communications. Second, with millimeter wave and massive multiple-input multiple-output (MIMO) technologies widely employed in 5G and beyond, the future communication signals tend to have high-resolution in both time and angular domain, opening up the possibility for ISAC. As such, ISAC has attracted tremendous research interest and attentions in both academia and industry. Early works on ISAC have been focused on the design, analysis and optimization of practical ISAC technologies for various ISAC systems. While this line of works are necessary, it is equally important to study the fundamental limits of ISAC in order to understand the gap between the current state-of-the-art technologies and the performance limits, and provide useful insights and guidance for the development of better ISAC technologies that can approach the performance limits. In this paper, we aim to provide a comprehensive survey for the current research progress on the fundamental limits of ISAC. Particularly, we first propose a systematic classification method of the traditional sensing and ISAC systems. Finally, the open problems and future research directions are discussed.

Index Terms—Integrated sensing and communication, radar sensing, localization, fundamental limits.

I. INTRODUCTION

FUTURE beyond 5G and sixth generation (6G) wireless systems are expected to provide various high-accuracy sensing services, such as indoor localization for robot navigation, Wi-Fi sensing for smart home and radar sensing for autonomous vehicles. Sensing and communication systems are usually designed separately and occupy different frequency bands. However, due to the wide deployment of the millimeter wave and massive MIMO technologies, communication signals in future wireless systems tend to have high-resolution in both time and angular domain, making it possible to enable high-accuracy sensing using communication signals. As such, it is desirable to jointly design the sensing and communication

Journal paper

Vehicular Communications 33 (2022) 100397

Contents lists available at ScienceDirect

ELSEVIER

1 Vehicular Communications

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2 Applying DQN solutions in fog-based vehicular networks: Scheduling, caching, and collision control

3 Seongjin Park [a], Younghwan Yoo [b,*], Chang-Woo Pyo [c]

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ARTICLE INFO

Article history:
Received 11 June 2020
Received in revised form 24 February 2021
Accepted 18 August 2021
Available online 24 August 2021

Keywords:
Fog computing
Deep Q Network (DQN)
Dynamic priority scheduling
Cache replacement
Collision control

ABSTRACT 4

In the near future, vehicular networks are expected to provide and consume a variety c autonomous driving, connected car, and Internet of Things (IoT). For reliable service s necessary to consider the characteristics of the dynamic environment and Quality of Servi vehicular network. The goal of this paper is to maximize service delivery ratio while meetin We present three issues to be addressed by a road side unit (RSU) acting as a fog server. Th the scheduling of services with different effective time. The second is the RSU cache replace considering limited storage space. The third is the QoS-based message collision control that multiple vehicles share. This paper solves these three issues by leveraging Deep Q Ne one of deep reinforcement learning techniques. To this end, the three problems are defin Decision Process (MDP) problems and the effectiveness of the proposed method is demonst experiments. Experimental results substantiate that the proposed method based on DQN ca that is adaptive to situations through learning for each defined problem.

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How a paper looks

Conference paper

1 Conference name

Short name

2019 IEEE Wireless Communications and Networking Conference (WCNC)

2 Paper title

Power and Beam Optimization for Uplink Millimeter-Wave Hotspot Communication Systems

Author 3

Affiliation

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Email

4 Abstract

***Abstract*—We propose an effective interference management and beamforming mechanism for uplink communication systems that yields fair allocation of rates. In particular, we consider a hotspot area of a millimeter-wave (mmWave) access network consisting of multiple user equipment (UE) in the uplink and multiple access points (APs) with directional antennas and adjustable beam widths and directions (beam configurations). This network suffers tremendously from multi-beam multi-user interference, and, to improve the uplink transmission performance, we propose a centralized scheme that optimizes the power, the beam width, the beam direction of the APs, and the UE - AP assignments. This problem involves both continuous and discrete variables, and it has the following structure. If we fix all discrete variables, except for those related to the UE-AP assignment, the resulting optimization problem can be solved optimally. This property enables us to propose a heuristic based on simulated annealing (SA) to address the intractable joint optimization problem with all discrete variables. In more detail, for a fixed configuration of beams, we formulate a weighted rate allocation problem where each user gets the same portion of its maximum achievable rate that it would have under non-interfered conditions. We solve this problem with an iterative fixed point algorithm that optimizes the power of UEs and the UE - AP assignment in the uplink. This fixed point algorithm is combined with SA to improve the beam configurations. Theoretical and numerical results show that the proposed method improves both the UE rates in the lower percentiles and the overall fairness in the network.**

***Index Terms*—Radio resource management, Interference management, Millimeter-wave networks, Power optimization, Beamforming, 5G, Uplink**

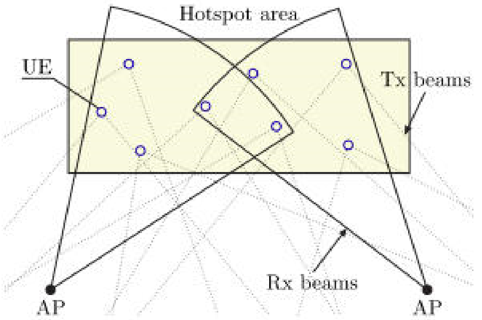


Fig. 1: A mmWave network with transmit and receive beamforming for uplink connectivity in areas of high user density, where interference management is a key challenge.

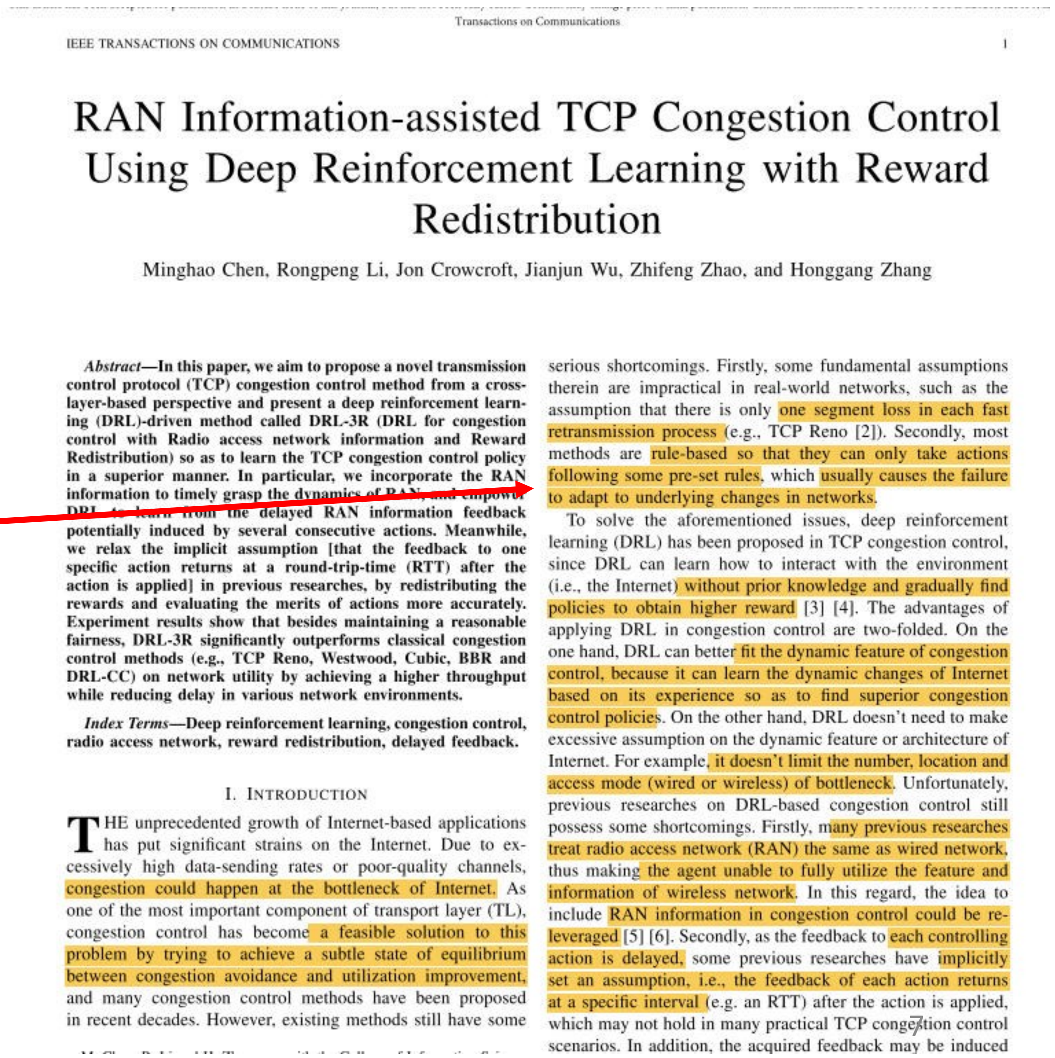
In contrast to traditional radio resource management (RRM) with physical (PHY) and medium access control (MAC) cross-layer approaches, where resources are usually managed in a time-frequency domain, mmWave communication systems also need to select appropriate transmit and receive beam directions and widths (beam configurations) of the network entities. As illustrated in Fig. 1, the large numbers of user equipment (UE) connected to different access points (APs)

Good habits in reading

- Store papers and categorize them by topics
  - ✓ Use EndNote program (see in the next slide)

- Mark key information in the paper

- Summarize key information of checked papers



Transactions on Communications

IEEE TRANSACTIONS ON COMMUNICATIONS 1

RAN Information-assisted TCP Congestion Control Using Deep Reinforcement Learning with Reward Redistribution

Minghao Chen, Rongpeng Li, Jon Crowcroft, Jianjun Wu, Zhifeng Zhao, and Honggang Zhang

***Abstract*—In this paper, we aim to propose a novel transmission control protocol (TCP) congestion control method from a cross-layer-based perspective and present a deep reinforcement learning (DRL)-driven method called DRL-3R (DRL for congestion control with Radio access network information and Reward Redistribution) so as to learn the TCP congestion control policy in a superior manner. In particular, we incorporate the RAN information to timely grasp the dynamics of RAN, and empower DRL to learn from the delayed RAN information feedback potentially induced by several consecutive actions. Meanwhile, we relax the implicit assumption [that the feedback to one specific action returns at a round-trip-time (RTT) after the action is applied] in previous researches, by redistributing the rewards and evaluating the merits of actions more accurately. Experiment results show that besides maintaining a reasonable fairness, DRL-3R significantly outperforms classical congestion control methods (e.g., TCP Reno, Westwood, Cubic, BBR and DRL-CC) on network utility by achieving a higher throughput while reducing delay in various network environments.**

***Index Terms*—Deep reinforcement learning, congestion control, radio access network, reward redistribution, delayed feedback.**

I. Introduction

THE unprecedented growth of Internet-based applications has put significant strains on the Internet. Due to excessively high data-sending rates or poor-quality channels, congestion could happen at the bottleneck of Internet. As one of the most important component of transport layer (TL), congestion control has become a feasible solution to this problem by trying to achieve a subtle state of equilibrium between congestion avoidance and utilization improvement, and many congestion control methods have been proposed in recent decades. However, existing methods still have some serious shortcomings. Firstly, some fundamental assumptions therein are impractical in real-world networks, such as the assumption that there is only one segment loss in each fast retransmission process (e.g., TCP Reno [2]). Secondly, most methods are rule-based so that they can only take actions following some pre-set rules, which usually causes the failure to adapt to underlying changes in networks.

To solve the aforementioned issues, deep reinforcement learning (DRL) has been proposed in TCP congestion control, since DRL can learn how to interact with the environment (i.e., the Internet) without prior knowledge and gradually find policies to obtain higher reward [3] [4]. The advantages of applying DRL in congestion control are two-folded. On the one hand, DRL can better fit the dynamic feature of congestion control, because it can learn the dynamic changes of Internet based on its experience so as to find superior congestion control policies. On the other hand, DRL doesn't need to make excessive assumption on the dynamic feature or architecture of Internet. For example, it doesn't limit the number, location and access mode (wired or wireless) of bottleneck. Unfortunately, previous researches on DRL-based congestion control still possess some shortcomings. Firstly, many previous researches treat radio access network (RAN) the same as wired network, thus making the agent unable to fully utilize the feature and information of wireless network. In this regard, the idea to include RAN information in congestion control could be re-leveraged [5] [6]. Secondly, as the feedback to each controlling action is delayed, some previous researches have implicitly set an assumption, i.e., the feedback of each action returns at a specific interval (e.g. an RTT) after the action is applied, which may not hold in many practical TCP congestion control scenarios. In addition, the acquired feedback may be induced

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Summarize key information of checked papers

Features for comparison

Problem statement

Category

Our method

TABLE I: Features comparison with the related works.

	Deployment of UAVs and Coverage		UAV-assisted VANETs		DRL-based UAV-assisted systems				
Features	Ref. [9]	Ref. [11]	Ref. [13]	Ref. [14]	Ref. [15]	Ref. [16]	Ref. [17]	Ref. [18]	Our framework
Basic ideology	Optimization of UAV coverage over disaster areas	Deploying a reduced number of UAVs to serve UEs while preserving their connectivity	Optimization of VANET routing process using UAVs	Improvement of VANET connectivity	Integration of cellular-connected UAVs and UAV-BSs through 3D cellular networks	Minimization of latency based on interference-aware path planning of cellular-connected UAVs	A DRL-based method to provide optimized energy-efficient UAV trajectory while minimizing AoI	A multi-UAV long-term coverage using DRL	DRL-based UAV-assisted VANET
Type of assisted networks	VANET	UEs	VANET	VANET	UAV Network	BSs/UEs	UEs	IoT	VANET
Optimized metrics	UAV trajectory, Throughput, Fairness	Coverage, Load balance, Throughput	Packet loss, Delivery delay	Routing path availability, Delivery delay	Latency, Throughput	Latency, Throughput	AoI, Energy consumption, Resource utilization	Energy consumption, Coverage, Fairness	Energy consumption, Coverage, Routing path, Delivery Delay
UAV density	Multiple UAVs	Multiple UAVs	Multiple UAVs	Single UAV	Multiple UAVs/UAV-BSs	Multiple UAVs	Multiple UAVs	Multiple UAVs	Multiple UAVs
Mobility of UAV(s)	Dynamic	Dynamic	Dynamic	Dynamic	Dynamic	Static	Dynamic	Dynamic/Static	Dynamic/Static
Mobility of assisted nodes	Dynamic	Static	Dynamic	Dynamic	Static	Static	Static	Static	Dynamic
Major advantage	Throughput is fairly maximized among vehicles	A high coverage ratio is ensured through a reduced number of UAVs	UAVs are used as alternatives (relays) in case of disconnections	Fill in communication gaps between vehicles using UAVs	Latency and spectral efficiency of cellular-connected UAVs are optimized	A better latency and rate are achieved per each UAV and UE, respectively	Enhancement of energy efficiency and collected data freshness	Maximizing the fair temporal coverage of IoT devices	Optimization of UAV trajectory while considering its energy consumption and connectivity
Major Limitation	UAV energy consumption is not considered	Unexpected disconnections and UAV energy consumption are not considered	Optimization of trajectory and energy consumption of UAVs are overlooked	High delivery delays due to UAV movements	Energy consumption and mobility of different UAVs are not considered	Energy consumption of UAVs is not considered and evaluated	Mobility of UEs is not considered	Collisions between UAVs are overlooked during the training process	king fairness ge of sparse reas

Key information need to carefully summarize

Contribution

Summarize key information of checked papers

Features for comparison

TABLE I

SUMMARY OF SEVERAL CONVENTIONAL AND MACHINE LEARNING-BASED FLIGHT OPTIMIZATION METHODS FOR MULTI-UAVS

Study	**Problem identification**				**Learning model**					
	Application type	Performance comparison	Ground traffic	Optimization objective	Solution approach	Accumulated training	Multi-UAVs	Measurement metric	Unknow parameter	Limitation
[3]	IoT data collection	✗	✗	UAV trajectory	Ant colony	✗	✗	Age of information Flight time	Request rate	For sensor networks
[6]	Data broadcast	✗	✗	UAV trajectory	Monotonic optimization	✗	✗	Throughput Energy usage	Request rate	Solar-based UAV sensor networks
[7]	IoT data collection	✓	✗	UAV trajectory	DRL	✓	✓	Successful rate	Request rate	Know IoT sensors map in advance
[8]	On-demand service	✗	✗	UAV trajectory	CNN learning	✗	✗	Throughput	Demand service rate	Require global information for classification
[9]	IoT data collection	✗	✗	UAV trajectory	Sequential Convex	✗	✓	Energy usage Trajectory length	Request rate	IoT data collection at a fixed locations
[10]	IoT data collection	✓	✗	UAV trajectory	CA2C	✓	✓	Age of information	Request rate	IoT data collection at a fixed locations
[11]	Game	✗	✗	Object trajectory	DDPG	✓	✓	Successful rate	Behavior movement	Game simulation
[12]	Digital twin	✓	✗	Flock motion	DDPG	✓	✗	Energy usage Travel distance	Arrival rate	Small errors cause big sim-to-real mismatch
[13]	Surveillance	✓	✓	UAV trajectory	Graph networks	✗	✓	Observation drop rate	Navigation request	Support discrete action only, long training time
[14]	Energy transfer	✗	✗	UAV trajectory	DDQN	✓	✓	Energy delivery Fairness index	Request rate	Energy transfer and harvesting networks
Ours	**Remote driving**	✓	✓	**UAV trajectory & power allocation**	**Search MADDPG**	✓	✓	**Number of UAVs Energy usage Data rate**	**Vehicle arrival time**	**Specify for remote driving coverage, require many trials**

Deep Deterministic Policy Gradient (DDPG), Deep Reinforcement Learning (DRL), Compounded-Action Actor-Critic (CA2C);

How to read a paper

- First pass: 10 mins
- Second pass: 1 hour
- Three pass: 4-5 hours (beginners), 1 hours (experienced reader)

Please read the paper, *How to Read a Paper* (S. Keshav)

1. https://web.stanford.edu/class/ee384m/Handouts/HowtoReadPaper.pdf

First pass: Get a general idea of the paper

- Carefully read the title, abstract, and introduction
- Read the section and sub-section headings, but ignore everything else
- Read the conclusions
- Glance over the references, mentally ticking off the ones you've already read

The title

A good paper will have a meaningful title

The problem to focus in the paper

The specific target

Adversarial Attacks Against Deep Learning-Based Network Intrusion Detection Systems and Defense Mechanisms

Chaoyun Zhang, Xavier Costa-Pérez, *Senior Member, IEEE*, and Paul Patras, *Senior Member, IEEE*

The title

A good paper will have a meaningful title

The problem to focus in the paper

IRS-Assisted Secure UAV Transmission via Joint Trajectory and Beamforming Design

Xiaowei Pang, *Graduate Student Member, IEEE*, Nan Zhao, *Senior Member, IEEE*, Jie Tang, *Senior Member, IEEE*, Celimuge Wu, *Senior Member, IEEE*, Dusit Niyato, *Fellow, IEEE*, and Kai-Kit Wong, *Fellow, IEEE*

Solution

Abstract: Understand basic ideas (1/2)

- Check the paper's motivation
- Check the paper's goal
- Check the paper's basic idea
- Highlight the contributions

A good paper should have all these parts

Abstract—Neural networks (NNs) are increasingly popular in developing NIDS, yet can prove vulnerable to adversarial examples. Through these, attackers that may be oblivious to the precise mechanics of the targeted NIDS add subtle perturbations to malicious traffic features, with the aim of evading detection and disrupting critical systems. Defending against such adversarial attacks is of high importance, but requires to address daunting challenges. Here, we introduce TIKI-TAKA, a general framework for *(i)* assessing the robustness of state-of-the-art deep learning-based NIDS against adversarial manipulations, and which *(ii)* incorporates defense mechanisms that we propose to increase resistance to attacks employing such evasion techniques. Specifically, we select five cutting-edge adversarial attack types to subvert three popular malicious traffic detectors that employ NNs. We experiment with publicly available datasets and consider both one-to-all and one-to-one classification scenarios, i.e., discriminating illicit vs benign traffic and respectively identifying specific types of anomalous traffic among many observed. The results obtained reveal that attackers can evade NIDS with up to 35.7% success rates, by only altering time-based features of the traffic generated. To counteract these weaknesses, we propose three defense mechanisms: model voting ensembling, ensembling adversarial training, and query detection. We demonstrate that these methods can restore intrusion detection rates to nearly 100% against most types of malicious traffic, and attacks with potentially catastrophic consequences (e.g., botnet) can be thwarted. This confirms the effectiveness of our solutions and makes the case for their adoption when designing robust and reliable deep anomaly detectors.

Journal version

Abstract: Understand basic ideas (2/2)

- Check the paper's motivation
- Check the paper's goal
- Check the paper's basic idea
- Highlight the contributions

Abstract—Directional antenna technologies are crucial to enhance high-speed data transmission in high-frequency communications (mmWave) and beyond. By focusing the beam signals and power transmission into user range and exploiting spatial-temporal signal processing, the directional antenna technologies can enable high-accuracy radio positioning. The feature can potentially be used in many future assisted living applications such as behavioral monitoring or assisting rescue forces moving inside a dark building. However, besides that good side, the radio positioning potentially poses significant security risks to mobile users, particularly being tracked illegally. In this work, we demonstrate a case study to track a user in a building based on passively received signals. We then build an efficient mechanism to regenerate the trajectory of a target device by exploiting the characteristics of directional signals and the capability of radio-based localization and mapping using multipath channel information. Through theoretical analysis and simulation [1], we found that tracking risks in high-frequency wireless communications are real and challenging to resolve.

Index Terms—Wireless security, User tracking, Radio-based Localization.

A good paper should have all these parts

Conference paper

Introduction (1/5)

- Similar with Abstract but more details of
    1. Motivation
    2. State-of-the-art studies/Literature survey
    3. Remaining challenges to solve
    4. Brief solution
    5. Contributions

A good paper should have this stuff

Given the high demand for network capability in high-end applications such as tactile/haptic Internet and metaverse, antenna design and data transmission technologies will evolve significantly. One of the most featured enhancements is the introduction of directional transmission techniques. By focusing the beam signals and power transmission into the user range and exploiting spatial-temporal signal processing, the directional antenna technologies can enable high-accuracy localization [1], [2]. Accurate location in the indoor environment is also critical information for many assisted living applications (activity trackers, geofencing for people with dementia, or augmented reality) [2].

However, the side effect of radio positioning, particularly the passive positioning technology, is that it can be potentially used for user tracking/surveillance. For example, adversaries can exploit our habit of using smartphones or WiFi in the building (without going in) to track us accurately. The tracking information can reveal where we often go or the in/out routes. The accurate location and movement behavior patterns are then abused for inappropriate or harmful purposes, e.g., illegal intrusion. As illustrated in Figure 1, the coordinated truck agents can be dispatched to infer cellular/WiFi signals and track the location/trajectory of a target user. A typical example

Introduction (2/5)

- Similar with Abstract but more details of
  1. Motivation
  2. State-of-the-art studies/Literature survey
  3. Remaining challenges to solve
  4. Brief solution
  5. Contributions

Reveal limitations of the papers

A. State-of-the-art studies

Many efforts from the research community have been made for years to enhance the accuracy of radio indoor positioning methods. The accuracy of the state-of-the-art studies reached up to a centimeter in various environments, including for 5G mmWave and Gigabit WiFi standards (IEEE 802.11ad 60 GHz) [2]–[5]. The positioning algorithms can be categorized into five main types. The first type is to exploit uplink and downlink Angle of Arrival (AoA) or Time Difference of Arrival (TDOA) measurements to calculate position via geometry, e.g., triangulation and trilateration [1]. However, this approach often requires at least three base stations or anchors, while the accuracy error can be up to several meters. In high-density sensor networks, cooperative localization is a promising approach [6]. This method can enhance the accuracy by exploiting side-link (peer-to-peer) measurements to complement base-station-to-user-based estimation [7]. However, the requirement of having communications between the target user and surrounding users may limit the scope to some

Introduction (3/5)

- Similar with Abstract but more details of
  1. Motivation
  2. State-of-the-art studies/Literature survey
  3. Remaining challenges to solve
  4. Brief solution
  5. Contributions

the closest location to the user from online received signal patterns, e.g., by using K-nearest neighbor [2] or deep neural networks [5], [8]. However, this high-accuracy method requires the availability of a dense fingerprinting database, which can be a challenge in unknown structures or merely the dataset is not easy to collect in large. The fourth type is the multipath exploiting technique, which is based on the position information extracted from multipath components [1]. However, the inference or overlap issues in multipath components can significantly degrade the localization accuracy due to the complexity of accurately detecting each component with corresponding sources. The last type is the hybrid method based on a combination of multiple positioning methods and data fusion, e.g., Bayesian [7] and Kalman filter [9]. However, the existence of a diversity of data sources and incompatibility in data processing is the main challenge to making the hybrid approach gain high accuracy as the machine learning-based and the multipath-based.

Highlight
remaining challenges

Introduction (4/5)

- Similar with Abstract but more details of
    1. Motivation
    2. State-of-the-art studies/Literature survey
    3. Remaining challenges to solve
    4. Brief solution
    5. Contributions

This work presents a novel approach to demonstrate user tracking risks by using the cooperative information from reflected Multi-Path Components (MPC), the localization estimation of multiple anchors (aka spy agents), and data fusion from Kalman filters. Instead of using a fingerprint database, we exploit the propagation models and path loss statistics of well-known material penetration to estimate the relative location of a user. The estimations are then refined with empirical mapping results from ray tracing techniques or time-based tracking. The results demonstrate that passive positioning in directional wireless communications like millimeter-wave can yield high-accuracy indoor tracking capability, even without physical intrusion to the target environment or empirical signal sample collection.

A good paper should have this stuff

Introduction (5/5)

- Similar with Abstract but more details of
    1. Motivation
    2. State-of-the-art studies/Literature survey
    3. Remaining challenges to solve
    4. Brief solution
    5. Contributions

A good paper should have this stuff

This work presents a novel approach to demonstrate user tracking risks by using the cooperative information from reflected Multi-Path Components (MPC), the localization estimation of multiple anchors (aka spy agents), and data fusion from Kalman filters. Instead of using a fingerprint database, we exploit the propagation models and path loss statistics of well-known material penetration to estimate the relative location of a user. The estimations are then refined with empirical mapping results from ray tracing techniques or time-based tracking. The results demonstrate that passive positioning in directional wireless communications like millimeter-wave can yield high-accuracy indoor tracking capability, even without physical intrusion to the target environment or empirical signal sample collection.

Subsection title

- Highlight key information
    1. System model and problem formulation
    2. Proposed method and algorithms
    3. Evaluations
    4. Discussions

A good paper should have this stuff

II. SYSTEM MODEL AND PROBLEM FORMULATION

III. OUR PROPOSED SCHEME FOR TRACKING INDOOR MOBILE USERS

A. Multi-path localization and tracking algorithm

Conclusion

- Highlight key information
    1. Reaffirm the problem
    2. Reaffirm the solution + key contributions
    3. Show future work

A good paper should have all these parts

V. Conclusion and Future Work

In this paper, the secrecy rate maximization problem has been studied for IRS-assisted UAV wireless networks. To exploit the mobility of UAV and the beamforming gain of antennas and reflecting elements, we jointly optimize the transmit beamforming and trajectory of UAV and the passive beamforming of IRS. Due to the fact that the joint optimization problem is non-convex and intractable, we decompose it into three sub-problems and propose an iterative algorithm to solve them alternately. Specifically, the active beamforming vectors for UAV can be obtained directly. Then, the phase shift optimization problem which pertains to fractional programming is converted into a set of sub-problems in a parametric subtractive form. On this basis, we proceed to handle the UAV trajectory optimization problem, which is non-convex thereby approximated by a convex problem. The effectiveness of the proposed algorithm is demonstrated by the numerical results. It is worth noticing that several challenges, such as the endurance and stability of UAV and the accurate channel estimation, need to be resolved in the joint design. Moreover, the proposed scheme can be extended to a more general scenario with multiple legitimate and eavesdropping users after adopting proper multi-access methods and some imperative transformations. In our future work, robust and secure designs for IRS-assisted UAV networks considering multiple users and imperfect eavesdropping CSI will be investigated.

Expected information to get from first pass

Put to a table like Slide #9

Abstract

Introduction

- Category:
  1. What type of paper is this?
  2. A measurement paper?
  3. An analysis of an existing system?
  4. A description of a research prototype?
- Context
  1. Which other papers is it related to?
  2. Which theoretical bases were used to analyze the problem?
- Correctness: Do the assumptions appear to be valid?

  Check Introduction if there are reasonable assumptions/ feasible to build apps
- Contributions: What are the paper's main contributions?

  Check the consistency of contributions in Abstract → Introduction → Conclusion
- Clarity: Is the paper well written?

  If you cannot get all the above points, the paper is not well-written

Decide to read further? (go to Second pass)

- You can skip NOT to read further the paper if
  - ✓ The paper doesn't interest you
  - ✓ You don't know enough about the area to understand the paper

    (if professor gives you, try to read again and train yourselves)
  - ✓ The authors make invalid assumptions or pursue unrealistic applications

- Please remember these rules when writing a paper since the others may use this reading method too.
  1. Take care to choose coherent section and sub-section titles and to write concise and comprehensive abstracts.
  2. If a reviewer cannot understand the gist after one pass, the paper will likely be rejected.
  3. If a reader cannot understand the highlights of the paper after five minutes, the paper will likely never be read.

Second pass: Grasp the paper's content

- Look carefully at the figures, diagrams and other illustrations in the paper. Pay special attention to graphs.
  - ✓ Are the axes properly labeled?
  - ✓ Are results shown with error bars, so that conclusions are statistically significant?

  Common mistakes like these will separate rushed, shoddy work from the truly excellent.

- Remember to mark relevant unread references for further reading (this is a good way to learn more about the background of the paper).

Expected output from second pass

- You should be able to summarize the main thrust of the paper, with supporting evidence.

- This level of detail is appropriate for a paper in which you are interested, but does not lie in your research speciality.

- Sometimes you won’t understand a paper even at the end of the second pass. This may be because the subject matter is new to you, with unfamiliar terminology and acronyms or the authors may use a proof or experimental technique that you don’t understand

You can choose the next step

- Set the paper aside, hoping you don't need to understand the material to be successful in your career
- Return to the paper later, perhaps after reading background material
- Persevere and go on to the third pass

Third pass: Understand the paper in depth (1/3)

- To fully understand a paper, particularly if you are a reviewer, requires a third pass

- The key to the third pass is to attempt to virtually re-implement the paper (the most difficult part)
  - ✓ Making the same assumptions as the authors, re-create the work.
  - ✓ By comparing this re-creation with the actual paper, you can easily identify not only a paper's innovations, but also its hidden failings and assumptions.

Third pass: Understand the paper in depth (2/3)

- You should identify and challenge every assumption in every statement.

- Moreover, you should think about how you yourself would present a particular idea. This comparison of the actual with the virtual lends a sharp insight into the proof and presentation techniques in the paper and you can very likely add this to your repertoire of tools.

- During this pass, you should also jot down ideas for future work.

Third pass: Understand the paper in depth (3/3)

- At the end of this pass, you should be able to reconstruct the entire structure of the paper from memory, as well as be able to identify its strong and weak points.
- In particular, you should be able to pinpoint implicit assumptions, missing citations to relevant work, and potential issues with experimental or analytical techniques

Summary Tips: Reading research papers

- Some questions to ask yourself while reading a research paper:What problem are they solving? Why is it important?
- What did they really do?
- What is interesting or new about the work?
- What methods are they using?
- Do all the pieces of their work fit together?
- What results did they get? Did they do what they set out to do?

Writing reading reports

Some tips on writing reading reports:

- Answers to the above questions are key in understanding a research paper.
- A reading report should give a concise summary of the paper, providing an overview of what they actually did, what methods they used, and what their results were.
- A reading report should also contain a brief critique of the paper, telling what you think of the work, what things were unclear or not addressed, and the merits of the work.
- Pretend that you're writing this report for me, that I haven't read the paper, and I'm very busy. (Some of these things aren't pretend!) I am pretty knowledgeable about robotics, so you don't need to go into detailed explanations, particularly not in the motivations for the work.

For a survey paper reading

- Read Section 3 of [1]

- Academic search engines can be the sources listed in Slide #3

Reference

1. S. Keshav, *How to Read a Paper, Stanford course*