ISSUE 7

PAINLESS

An innovative training network (ITN) on

Energy-autonomous portable access points for infrastructure-less networks

NEWSLETTER DATE
December 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 812991

PAINLESS creates an environment to train future research leaders by integrating a range of different technical domains that exist in leading universities across Europe. It draws on expertise in green communications and networking, UAV-based networks and energy harvesting to provide a holistic picture to the researchers involved of the architectures and systems they will be designing and deploying

Inside this issue

PAINLESS RESEARCH PROJECTS' UPDATES

PAINLESS Research projects' Updates

Andreas Nicolaides, UCY
ESR #4

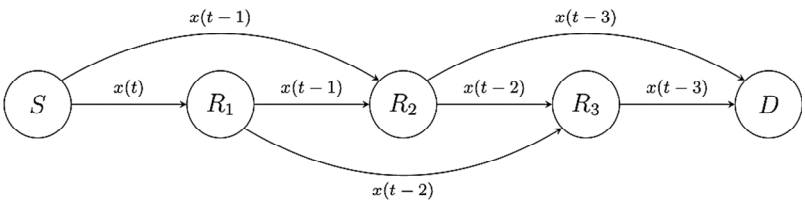
New ESR joined the group

Andreas studied Electrical and Computer Engineering at the National Technical University of Athens, Greece, where he specialized in Communications and Networking and graduated with a five-year Diploma in 2019. He is currently a PhD student in the Department of Electrical and Computer Engineering at the University of Cyprus and a Researcher for the European ITN project PAINLESS at the IRIDA Research Centre for Communication Technologies. His research interests focus on the field of wireless powered communication networks, where he will study efficient techniques and protocols that combine wireless power transfer with wireless cooperative communication systems.

Recently, Andreas presented the following article in the **Globecom 2020 Conference** (Taipei, Taiwan - Virtual):

"**Outage Analysis of Myopic Multi-hop Relaying: A Markov Chain Approach**" Nicolaides, Andreas; Psomas, Constantinos; Krikidis, Ioannis
https://zenodo.org/record/4314345

In this paper, a cooperative protocol is investigated for a multi-hop network with buffers of finite size at the relay nodes. The protocol is based on the myopic decode-and-forward coding strategy, where each node of the network cooperates with a limited number of neighbouring nodes for the transmission of the signals. Each relay stores in its buffer the messages that were successfully decoded, in order to forward them through the appropriate channel links. A complete theoretical framework is investigated that models the evolution of the buffers as a state Markov chain (MC). the performance of the proposed protocol is analysed in terms of outage probability and diversity gain by using the state transition matrix and the related steady state of the MC. Results show that the proposed protocol outperforms the conventional multi-hop relaying scheme and the system's outage probability as well as the achieved diversity order depend on the degree of cooperation among neighbouring nodes.



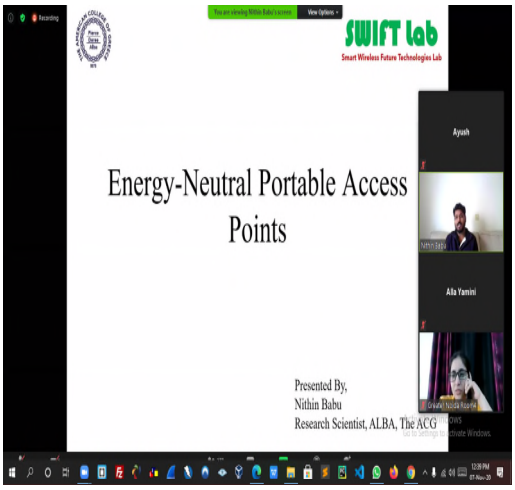
PAINLESS Research projects' Updates

Virtual talk on Energy- Neutral Portable Access Points as a part of the E-Seminar on Innovations in Electronic & Electrical Systems

Nithin gave a virtual talk on Energy-Neutral Portable Access Points as a part of the E-Seminar on Innovations in Electronic & Electrical Systems organized by the Department of Electronic & Electrical Systems, IILM, India, on 7th November 2020. The talk received 202 attendees.

The talk discussed various topics like the need for energy-efficiency in information and communication theory and the main modules of an energy-neutral network in the context of the project PAINLESS.

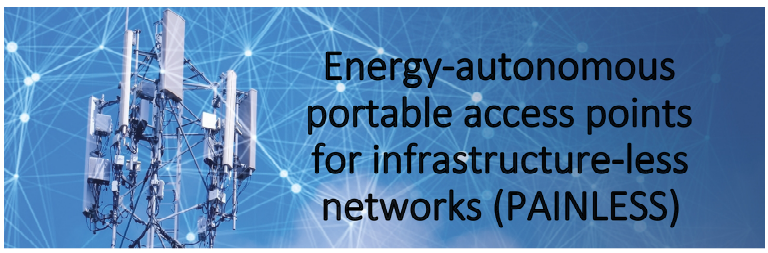
Details are available on:
http://painless-itn.com/esr-10-talk-virtual-on-energy-neutral-portable-access-points/



Nithin Babu, ALBA
ESR #10

European Researchers' Night 2020 (UCY)

The IRIDA Research Centre for Communication Technologies through the University of Cyprus participated in this year's European Researchers' Night in Cyprus that took place on 27 November 2020. Due to the current pandemic conditions, the event was held virtually through an online platform. The event's central theme was on ***"Green and Smart cities"*** and each group presented its research work and actions in several ways, such as video presentations, posters and other interactive methods.
Our Research Centre participated with the title ***"Go smart, go wireless!"*** where we presented various ways in which a smart city can leverage the technologies of modern wireless communications systems. Among other activities, we informed the public about the actions of the PAINLESS research project by making a video presentation. Specifically, the attendees had the chance to find out about the objectives and activities of our program, emphasizing on how our research findings could contribute to the development of truly green and smart cities with the implementation of flexible, energy-autonomous wireless networks.



Andreas Nicolaides, Yuan Guo, Ioannis Krikidis
IRIDA Research Centre for Communication Technologies

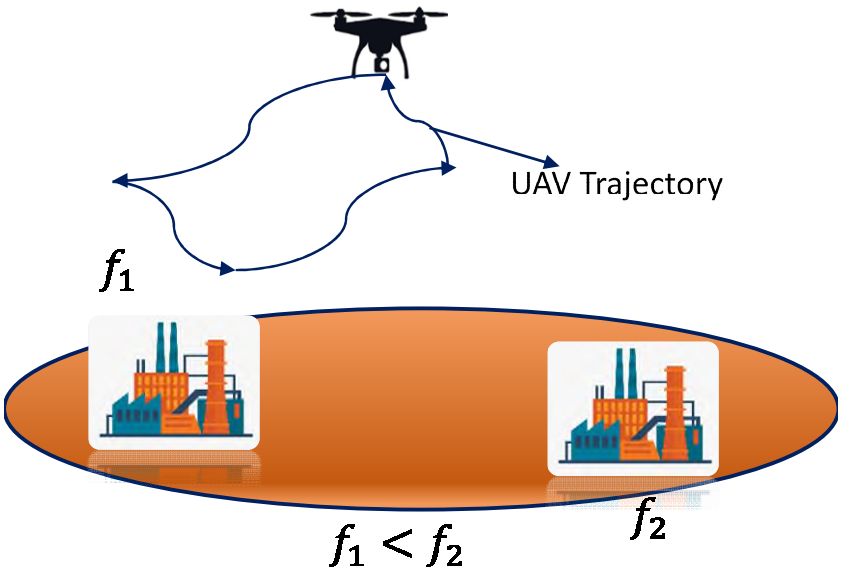
PAINLESS Research projects' Updates

Igor Donevski, AAU
ESR#15

Nithin Babu, ALBA
ESR #10

Trajectory Optimization of a Drone Orchestrator in a Federated Learning Network

The collaboration between ESR10 and ESR15 is to verify the potential of two different solutions (Successive Convex Programming (SCP) and Deep Reinforcement Learning (DRL)) for trajectory optimization in service of distributing tasks in a federated learning network where the drone takes the role of an orchestrator. The main objective is to reduce the learning time discrepancy among the nodes. The trajectory of the drone is adjusted to aid the learning phase of the slow nodes. The results show that the DRL-based trajectories are better than the SCP-based ones with an increased overhead cost.



Upcoming Events and Journals by the PI Team:

1. [Special Issue] Aerial Wireless Networks, led by Professor. Papadias (ALBA), Professor. C. Masouros (UCL), in the IEEE Open Journal of the Communication Society OJComSoc, **Deadline - 15/01/2020**: https://www.comsoc.org/publications/journals/ieee-ojcoms/cfp/aerial-wireless-networksdrones-communications-and
2. [ICC2021 Workshop] Integrating UAVs into 5G and Beyond, led by Dr. G. Geraci, **Deadline - 20/01/2020**: https://icc2021.ieee-icc.org/workshop/ws-4-4th-workshop-integrating-uavs-5g-and-beyond
3. [Special Issue] Joint Communication and Radar Sensing for Emerging Applications, led by Professor. C. Masouros (UCL), in the IEEE Journal of Selected Topics Signal Processing JSTSP, **Deadline - 31/01/2020**: https://signalprocessingsociety.org/blog/ieee-jstsp-special-issue-jointcommunication-and-radar-sensing-emerging-applications
4. [Special Issue] Wireless Powered Communications, led by Professor. Krikidis (UCY), in the IEEE Open Journal of the Communication Society OJComSoc, **Deadline - 30/03/2020**: https://www.comsoc.org/publications/journals/ieee-ojcoms/cfp/wireless-powered-communications-futurewireless-networks