ISSUE 6

PAINLESS

An innovative training network (ITN) on

Energy-autonomous portable access points for infrastructure-less networks

NEWSLETTER DATE
October 2020

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

PAINLESS supports the collaboration of the participating teams at two levels: training activities and research objectives.

PAINLESS participants have conducted many successful bilateral collaborations in the recent past. This is an important legacy that will be tapped in order to gain in synergy and fruitful productivity.

Inside this issue

PAINLESS RESEARCH PROJECTS' UPDATES

Collaboration leads to significant progress!

This newsletter reports on the collaborative activities withing Painless Study-group 2 whose contributions are aimed at providing effective Enabling Techniques for Energy Neutrality.

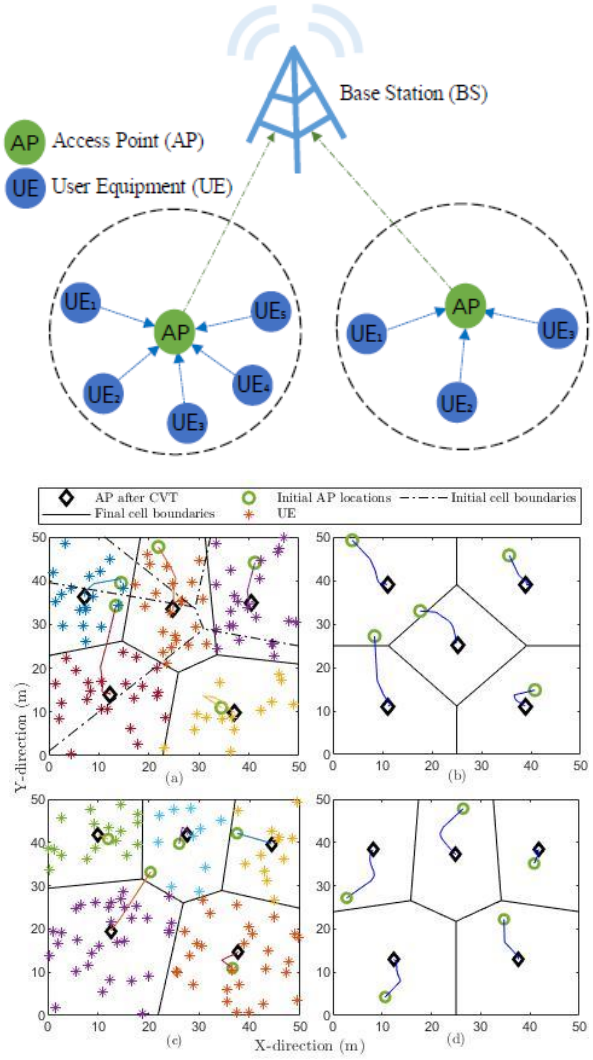
PAINLESS Research projects' Updates

Mahmoud AlaaEldin, UMAN
ESR #14

Mohammad Al-Jarrah, UMAN
ESR#6

On Optimizing Assistive Transmission and Adaptive Clustering for Joint Network Coding and Routing in Energy Autonomous Wireless Networks

ESR14 have collaborated with ESR6 on the design and optimization of an energy-efficient adaptive physical layer network coding based routing algorithm for enhancing the longevity of energy neutral networks using dedicated access points. This work proposes a joint network coding and routing algorithm based on optimized adaptive users clustering (AUC) and assistive transmission (AT) in energy-autonomous wireless networks. Specifically, minimizing transmission power consumption per user equipment (UE) is achieved through utilizing Voronoi tessellation to create optimal UE clusters, while maximizing network energy efficiency is derived through diversity gain and constructive interference exploitation of known sequences transmitted by neighboring UEs. In the proposed architecture, the detector is designed to utilize the AT signals in a physical layer network coding (PNC) fashion to maximize the potential gains. Overall, it is demonstrated that combining PNC-AT and AUC results in superior improvements in UE energy efficiency and network longevity, compared to alternative routing protocols. This work is being submitted to IEEE Transactions on Internet of Things (October 2020).

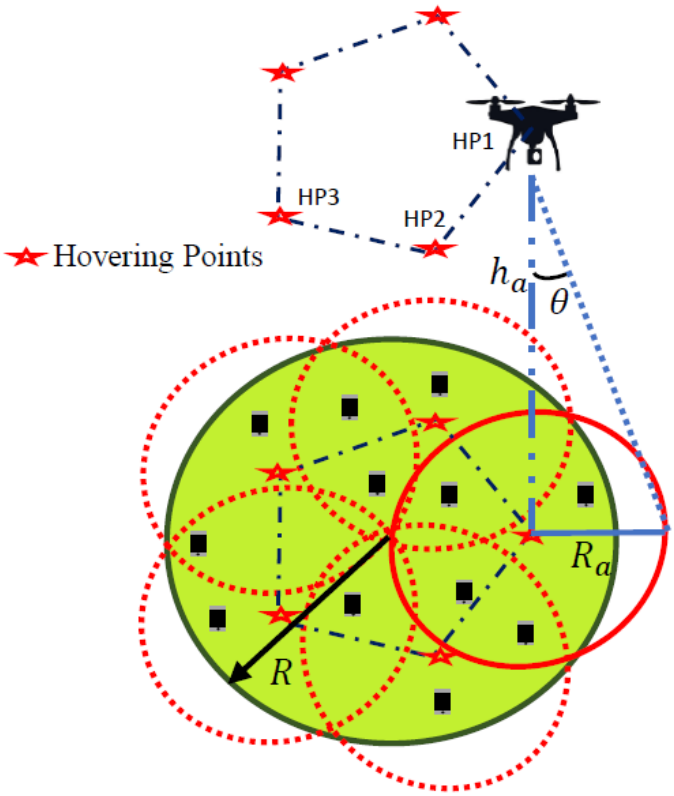


Marco Virgili, Lyra
ESR #8

Nithin Babu, ALBA
ESR #10

Cost and Energy- Efficient deployment of a Portable Access Point Network

ESR8 and ESR10 worked together on the design of a cost-and energy-efficient UAV-based connectivity network. The optimal UAV locations were determined by decoupling the placement optimization problem in horizontal and vertical dimensions using a novel multilevel circle packing algorithm, then they carried out a sensitivity analysis on operational parameters of the on-board battery, relating these to the economic feasibility of the network. The main findings are; the energy consumed by the UAV plays a significant role in the optimal UAV positioning; the operational cost of the portable access point network can be minimized by suitably selecting the on-board battery parameters. This work is being submitted to Transactions on Vehicular Technology (November 2020).



PAINLESS Research projects' Updates

Xiaoye Jing, UCL
ESR #9

Marco, Lyra
ESR #8

UAV trajectory design for cost and energy efficient in UAV-based BSs communication

ESR8 and ESR9 have started joint collaborative work on the UAV trajectory optimization for cost and energy efficient UAV-based BSs communications considering battery constraints. The objectives of this work are:

- UAV communication cost minimization
- UAV cover area maximization
- UAV energy balance

Optimization aim:

- Recharging site location/amount
- Area coverage
- Number of UAVs
- Recharge and service schedule
- UAV trajectory

Constraints:

- Coverage constraint
- Recharge constraints
- Recharging station constraints
- UAV mobility constraints
- Battery constraints