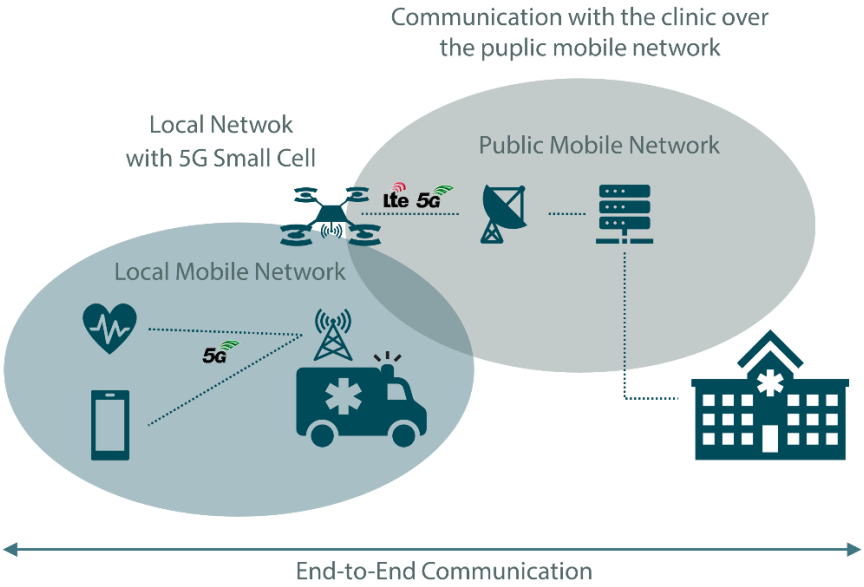
UNIVERSITÄT ZU LÜBECK
INSTITUT FÜR
MEDIZINISCHE ELEKTROTECHNIK

Bachelor/Master Thesis / Internship Project / Student Assistant

Programming of Autonomous Drone Flights



Project Background

In the first aid of patients at the scene of an emergency, the first responders are cut off from the flow of information, which means that at present, assistance can often only be provided by telephone via the central office and is hardly ever used due to time constraints. Simultaneously, the specialists in the shock room often lack the information they need to prepare themselves for the emergency. Thanks to mobile integrated medical technology, which is connected to the mobile phone network, resources, technologies, and information of the hospital can already be accessed at the point of care. In addition, up-to-date information can be transmitted to the hospital.
Within the MOMENTUM project's scope, an autonomous repeater infrastructure is to be implemented [1]. Especially in areas with insufficient network coverage during a rescue service operation, this infrastructure should enable a connection to the public mobile network for portable medical devices. For this purpose, drones can autonomously find an optimal location for receiving the radio signal.

Project Description

A drone equipped with a mobile modem is used to measure various mobile network parameters. A distinction can be made between metrics measured by the receiver and parameters specified by the radio cell [2]. The latter can only be determined using cost-intensive hardware. Receiver-side metrics can be measured with commercially available mobile devices. Based on the measured data, models can determine the next measuring point to be approached [3]. A second constraint is given by the connection to the ground users [4]. The air to ground connection to be optimized is achieved by a WLAN link or a tethered ethernet connection. The relevant signal parameters of this connection can be read both on the access point and on the client-side.

Within the internship or thesis scope, the concept of an autonomous positioning of the drone that considers both constraints should be developed and implemented. The MAVLink drone communication protocol (see [5]) is used to receive telemetry data from the drone and send position commands in return.

Possible Tasks

- Literature research on the positioning task
- Development of a positioning concept
- Familiarization with the MAVlink protocol
- Getting code examples working in the simulation
- Trial flights with preprogrammed missions
- First autonomous flight missions

References

[1] https://momentum-5g.net/
[2] Sae J, Wiren R, Kauppi J, Maattanen H, Torsner J, Valkama M, editors. Public LTE Network Measurements with Drones in Rural Environment. In: 2019 IEEE 89th Vehicular Technology Conference (VTC2019-Spring). 2019.
[3] Taranto R Di, Muppirisetty S, Raulefs R, Slock D, Svensson T, Wymeersch H. Location-Aware Communications for 5G Networks: How location information can improve scalability, latency, and robustness of 5G. IEEE Signal Process Mag 2014;31(6):102–12. Available from: http://publications.lib.chalmers.se/records/fulltext/208857/local_208857.pdf
[4] Nunns GJ, Chen YJ, Chang DK, Liao KM, Tso FP, Cui L. Autonomous Flying WiFi Access Point. Proc - Int Symp Comput Commun 2019;2019.
[5] https://mavlink.io/en/

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