

## HiWi-Stelle

### Setup of a mobile 5G indoor positioning testbed

Indoor positioning is a field of research that enables location aware services for consumers, as well as industry. As such, smartphone users may be navigated to a desired product in a large shopping centre. In the industry and healthcare sector, the tracking of an asset allows machines to provide context aware assistance to human operators and allows the intelligent interconnection of medical devices. The 5G standard allows the setup of local indoor networks, e.g. for hospitals, offices or factory sites, and defines various indoor positioning methods as part of the standard. As such, 5G poses as an exciting alternative to traditional local networks based on Wifi or Bluetooth and enables the transition of networked devices from outdoor cellular communication to local indoor networking with one unifying standard.

We want to build a mobile test environment for 5G based indoor positioning. This testbed will be an integral part of our research on localization algorithms in challenging environments, such as hospital rooms/hallways with obstructed line-of-sight to base stations. Because suitable 5G hardware is still hard to come by, the first step will be a pre-study based on Bluetooth 5.1 transmitters and the integration of angle-of-arrival sensing capabilities. The goal is to quickly setup the base stations and related hardware and have the ability to conduct measurement campaigns in various environments (office rooms and corridors, lecture halls, hospitals).

In order to do that, we need the help of a motivated student, who is interested in

- indoor positioning technologies
- embedded systems
- software engineering
- wireless communication schemes
- working out creative solutions on their own

Under the guidance of your supervisor, you will work on the following tasks:

- Learning about the Bluetooth 5.1 communication architecture and related positioning methods
- Familiarization with an existing Python/C implementation of a previous testbed using Texas Instruments CC2652R1 LaunchPads and a TI AoA antenna array.
- Modification of the testbed for fast setup and ease of use
  - Replacing wired connections with Bluetooth links.
  - Engineering an easy to use software API to conduct measurements with the testbed.

Experience with programming software, ideally using C and Python, is required. Some knowledge of wireless communication schemes like Bluetooth is a bonus.

Contact: Dr.-Ing. Frank Gólatowski  
M.Sc. Fabian Hólzke