The main topic or the headline is that we want to generate movement trajectories for mobile subscribers!

Introduction:

There are two types of mobile networks simulations. The first one is used during the design and development stage of the network. These simulations are used to test individual parts, sub systems or the whole network. On the other hand, there are simulations that focus on the operation of the network. These simulations, however, are used to investigate how the subscriber behavior affects the network. The network can either be a virtual network to develop and test and develop algorithms or to investigate a particular scenario in a real network.

In our research we focus on real network simulations and how to estimate the subscribers mobility . These simulation uses a model of the real network. Therefore it needs information about the environment (cell site location, soil conditions, and elevation profiles) and the subscriber mobility. For our work we are using events captured in a core network. From this events we derive the subscribers mobility by analyzing handover events.

Another part of our work is to model the real network as good as possible with freely available datasets, since mobile network operator are not providing these datasets to third parties. We are investigating how well a mobile network can be modeled without having to rely on the network operator itself.

What data do we have:

* Core Network Subscriber Information:  
  We have information about call establishment / termination, handover updates and location area updates. All of these events consists of a subscriber ID, timestamp, cell Id ,location area
* Cell Site Location:  
  For each cell site we have the latitude longitude coordinates and the angle

What we don’t have:

* Cell Coverage:
  + Voronoi Tessellation taking cell site location
  + Coverage Prediction with transmitter power and building information
* Population and Land use information
  + European Union Census
* Transmitter Power
  + FMK
  + Interpolation
* Building model
  + Open Street Map
  + Wien Gebäudehöhe Model
* Handover Position
  + Connected
  + Unconnected Handover

How we do it:

We are taking a subscriber session defined as events between a call establishment and termination. From this session we are estimating the start and end position by using a population information within the extent of the coverage area of the first and last event.

Handover events will be used to validate the route geometry (Eucledian Distance). Another aspect is the duration of the call which will be divided by the time it takes to drive the route.

The velocity of the subscriber was derived from the handover location and the timestamp of the occurrence of the handover. Velocity adaption

How we validate our work:

To validate our work we have conducted data during four test rides. During each test rides an active speech connection was made to another handset. We captured the events in the core network of the operator and additionally captured the location of the subscriber with GPS. GPS was used to validate the route, the velocity and the handover location.