Topic:

The influence of human posture on wireless signal and positioning and the solution

Background:

Indoor positioning technology is a hot topic in the field of navigation and location services. The current indoor positioning technology is mainly based on wireless positioning. According to the hot research on indoor positioning in recent years, Bluetooth 4.0 technology has advantages in high precision, low power consumption, easy deployment and low cost. At the same time, smartphones, iPhone, iPad, and other smart mobile devices are developing rapidly, and most of them support the BLE function, which further promotes the application of indoor iBeacon technology. It can be said that the positioning technology based on Bluetooth has a broad prospect.

However, many research results have not considered the effect of human shielding on Bluetooth signal and wireless indoor positioning system. Since the human body contains about 70% water, it can absorb the wireless signal of 2.4GHz, and the signal attenuation caused by human shielding is as high as 5dB.

Therefore, it is necessary to fully consider the influence of human posture on signal shielding, and to propose a corresponding solution to improve indoor positioning accuracy.

Goal:

1. Measure the difference in signal strength caused by different body posture.
2. Measure the positioning errors caused by different body posture.
3. Propose a solution to reduce the impact of human body shielding on wireless positioning and improve positioning accuracy.

Plan:

1. In the indoor environment, mobile phones can be divided into two states: (1) Static placement; (2) Dynamic carrying. Usually, the static placement state is less affected by human body shading. The dynamic carrying state is greatly affected by human body shielding. And dynamic carrying state can be divided into the following three categories: (1) Front hand-holding. (2) Put in the pocket. (3) Hand movement. I will measure the effect of three kinds of dynamic carrying states on the wireless signal. The experiment will include multiple controllable variables (direction, distance, area, etc.)
2. Position the mobile devices in static placement status and dynamic carrying status, and measure the positioning error. Among them, the front hand state has the highest requirement on positioning accuracy, because the user has the highest possibility to ask the positioning result.
3. To calculate the direction of the human occlusion signal, I plan to use the 9-axis sensor data of the mobile phone to distinguish the direction. Then collect the directional fingerprint database for the online position. Of course, I can’t collect all of the direction in a point, so I decided to just collect four direction each point and it will be based on people's habits of using mobile phones indoors.

Agenda:

1. 2019.10.10 — 2019.10.15: Read papers and survey relevant methods.
2. 2019.10.16 — 2019.10.20: Coding to collect Bluetooth signal and positioning.
3. 2019.10.21 — 2019.10.25: Design and conduct experiments.
4. 2019.10.26 — 2019.10.30: Analyze results and write the report.