Indoor walk round a building floor with shoe-mounted INS

- Estimate
- Reference walking track
- Start/Stop
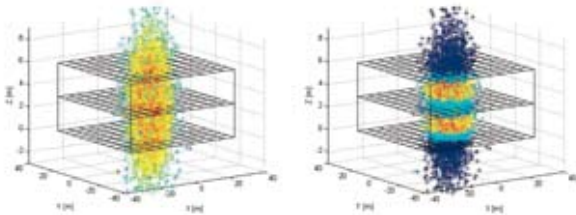
Probabilistic Map Matching in Three Dimensions: Example of a multimodal distribution where a Gaussian Probability Density Function (PDF) from a GNSS receiver (left) has been multiplied into a simple floor plan Figure 2: with two stories (right). One can see that the resulting PDF on the right has two ambiguity modes: One for each building floor.

DLR at a glance

DLR is Germany´s national research center for aeronautics and space. Its extensive research and development work is integrated into national and international cooperative ventures. As Germany´s space agency, DLR has been given responsibility for the forward planning and the implementation of the German space program by the German federal government as well as for the international representation of German interests. Furthermore, Germany's largest project-management agency is also part of DLR.

Approximately 5,100 people are employed in DLR´s 27 institutes and facilities at nine locations in Germany: Koeln-Porz (headquarters), Berlin-Adlershof, Bonn-Oberkassel, Braunschweig, Bremen, Goettingen, Lampoldshausen, Oberpfaffenhofen, and Stuttgart. DLR also operates offices in Brussels, Paris, and Washington, D.C.

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Information

Galileo for Mass Market Applications

Galileo for
Mass Market Applications

Several key technologies will substantially change the mobile experience in the next years: higher data rate mobile communications, satellite navigation, mobile computing platforms, and newly emerging web-services standards. This will enable a new class of mobile services: those that are classified as context or situation aware. They began their evolution from simple location based services. The location of a mobile user is perhaps the most powerful service and content discriminator. The generalisation from location to context has been driven by the Institute since 1999. Our work has focussed on the theoretical understanding of context awareness, the development of context aware platforms and service models and ways of inferring users' context from lower level sensor data, especially when related to movement, activity, and location.

Galileo will significantly contribute to new location and context-aware services. Together with GPS, the European satellite navigation system will drastically increase the availability in critical environments such as urban canyons. Compared to GPS, Galileo will provide more signal power at the user's device and not only one but two open signals. Thus, Galileo will open the door for applications inside buildings. As a consequence, Galileo prepares new mass market service scenarios with the navigation device no longer just a fixed inside the car but ubiquitous on everybody's personal mobile device. We are confident that a large potpourri of new location based and context-aware community services and "Web 2.0" applications will appear. Since mobile devices are very often used inside buildings, new technical solutions to enable accurate indoor positioning and navigation have to be developed.

During our work on localisation technology we have pioneered the Soft Location principle that allows us to optimally combine localisation sources such as signal level measurements of radio systems, satellite navigation (GNSS), orientation sensors, INS, RFID, as well as appropriate probabilistic models of subjects' movement patterns. The purpose is to ensure consistent Bayesian inference (in particular Particle Filtering) the subject's movement, activity, and location. Furthermore, applications benefit from the availability of soft location whereby the reliability of the estimated parameters is taken into account.

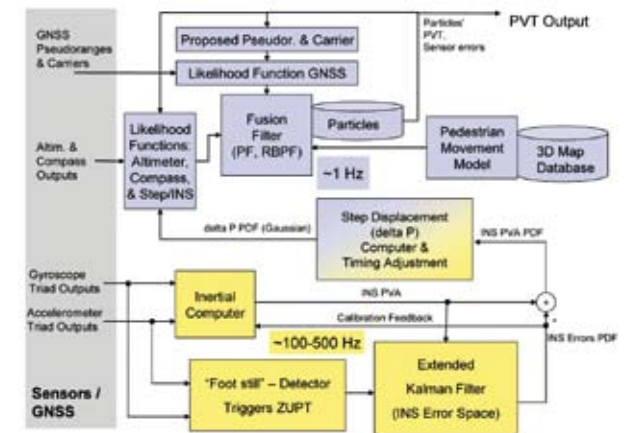Applications that we are targeting include:

- Land mark oriented navigation in urban areas
- Guidance services for personal multimodal transportation solutions
- Community-driven applications (such as collaborative "Information Spaces")
- Personalised, ubiquitous guidance systems encompassing wearables, body area networks and new interfaces ("WayWatch").

The WayWatch is a future application target for personalised navigation. It will show not just time, but also pictograms suggesting the next steps on an itinerary such as how to get to the right departure gate, a certain office room, or a product in a department store.

DLR has implemented, and operates, a personalised mobile service, called "UV Check", to indicate the time which a user can safely sunbathe at a certain place and time. The raw data was calculated using geo-physical models and satellite based ozone measurements and adapted to the users' context by drawing on a database of preferences, including skin type, language, and the user's location and current weather conditions. Extensive work has been conducted within the DLR-led "Heywow" Project to develop platforms for new services and to integrate heterogeneous networks. This has led to the development of a test-bed in the town of "Landsberg am Lech", and which is being extended by a lab environment to test and demonstrate indoor positioning. As a partner within the European Integrated Project "Daidalos", DLR is developing a context-awareness middleware to support future mobile services across all network, domain and device boundaries; the focus here lies on location and context inference, context-aware service discovery as well as personalisation and learning.

Every two years, DLR organises and hosts the international "Workshop on Location- and Context-Awareness" (LoCA) in Oberpfaffenhofen, in co-operation with other major conferences in the field.

Block diagram of sensor fusion