



The Application of Indoor Positioning System

An introduction to IndoorAtlas' Location Technology

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Fundamental Flaws of GPS

- They don't work indoors.
- GPS utilizes an extremely weak signal that has traveled 20,200km. Passing through concrete and other solid obstacles is hard enough for a strong, short-range cellular signal.
- The situation is a little more complex when it comes to detecting a change in altitude; GPS can measure altitude, but generally the data is inaccurate and too low-resolution (on the order of 10-25 meters) for everyday use.

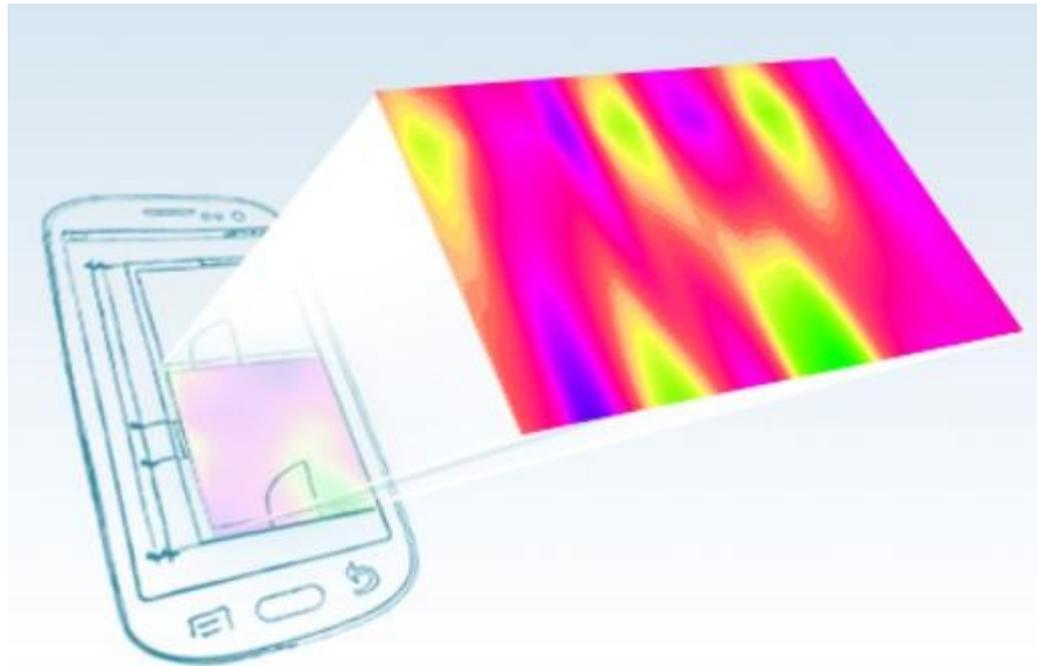
What is IPS

- An **indoor positioning system (IPS)** is a navigation system that worked *indoors*.
- Three main methods to support IPS:
WiFi, Bluetooth, NFC.



What is IndoorAtlas' IPS?

- IndoorAtlas Ltd. (Located in Oulu, Finland and Oxford, UK.)
- uses the Earth's innate magnetic field



Background

- Inspired by animals that can sense their true position rather than direction (e.g. spiny lobsters)
- Modern buildings with reinforced concrete and steel structures have unique, spatially-varying ambient magnetic fields that can be used for positioning.
- A non-uniform ambient magnetic field produces different magnetic observations.

The Principle of IndoorAtlas

- The utilization of anomalies (fluctuations) of ambient magnetic fields



How it works

Step 1: Adding floor plans

- Align the floor plans (with visible features) with geographic coordinates
- Submit the floor plans to *IndoorAtlas Maps*TM

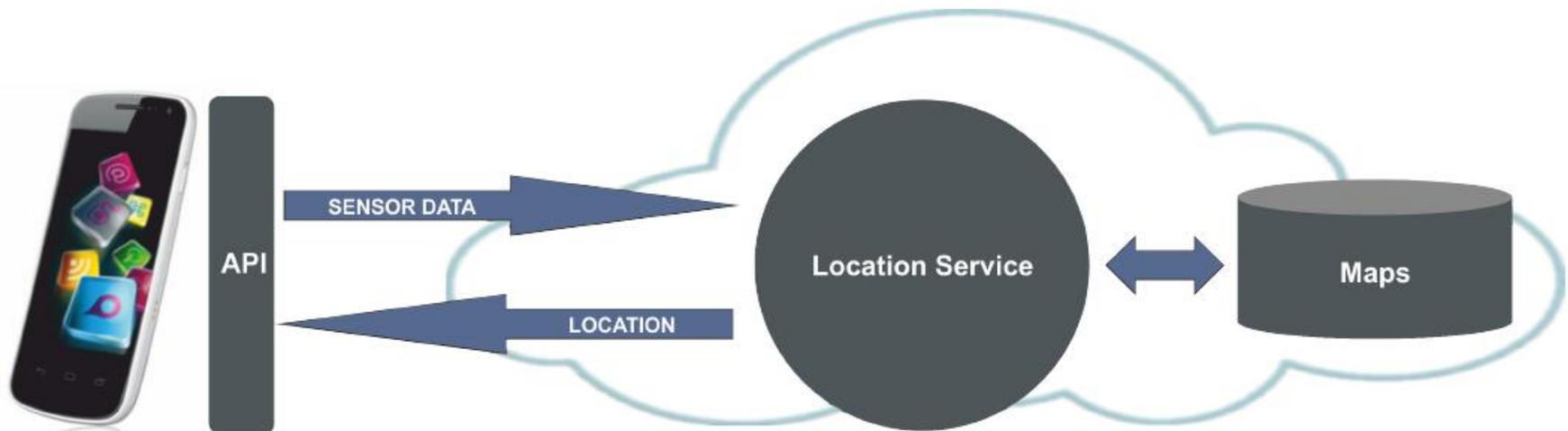
Step 2: Mapping buildings

- Depict measurement paths on the floor plan (Mark a path on the screen)
- Walk through the path and collect the magnetic data
- Upload the data to *IndoorAtlas Maps*TM and the map is created

How it works

Step 3: Creating applications

- Location service is accessed through API
- API communicates with the location service, sending processed sensor data to the location service.
- Location updates are sent back to applications.
- The location service connects to the map database, which hosts the magnetic field data collected from the building using the *IndoorAtlas Map Creator*™ application (Step2)



How it works

- <http://youtu.be/PkehW3fkpLQ>

Innovation and Benefits

- A software-only location system that only requires a smartphone with built-in sensors.(no external hardware infrastructures, such as radio access points, are needed).
- The accuracy ranges from 0.1 meter to 2.0 meters

The software

- A magnetic field map must be generated from the part of the building where the location service is going to be used.

Currently Available for Android!

- Add and manage floor plans with *IndoorAtlas Floor Plans*TM web application
- Collect magnetic field data with *IndoorAtlas Map Creator*TM mobile application
- Use IndoorAtlas`API to use the location service.

*IndoorAtlas Floor Plans*TM

- To get started with indoor location awareness, upload your building's floor plan to *IndoorAtlas Maps*TM using *Floor Plans*TM.
- Align your building's floor plan with the geographic coordinate system.
- Add the floor plan to *IndoorAtlas Maps*TM

*IndoorAtlas Map Creator*TM

- Open your floor plan in *Map Creator*TM, mark a planned path on the screen and walk it! *Map Creator*TM seamlessly connects with *IndoorAtlas Maps*TM.
- Create your location-awareness application using the *IndoorAtlas Maps*TM API.



The IndoorAtlas Maps™ API

- The API connects with *IndoorAtlas Maps™* behind the scenes and provides your app with a precise indoor position.
- You only need to implement a callback function for position update events in your application.

SUMMARY

- IndoorAtlas has developed a completely new innovation that utilizes the anomalies of ambient magnetic fields for indoor positioning.
- IndoorAtlas offers a complete software toolbox for adding and managing floor plans, collecting data to create magnetic field maps, and an API to use IndoorAtlas' location service for mobile applications.
- IndoorAtlas' core technology is independent of external hardware infrastructures and is able to pinpoint the location inside a building within 0.1-2.0 meters.

References

- HP of *IndoorAtlas* (<http://www.indooratlas.com/>)
- IndoorAtlas Ltd.(2012) *Ambient Magnetic Field-Based Indoor Location Technology-Bringing the Compass to the Next Level.*
- Think GPS is cool? IPS will blow your mind (<http://www.extremetech.com/extreme/126843-think-gps-is-cool-ips-will-blow-your-mind>)
- Indoor navigation on your smartphone, using the Earth's magnetic field — just like a pigeon (<http://www.extremetech.com/computing/132484-indoor-navigation-on-your-smartphone-using-the-earths-magnetic-field-just-like-a-homing-pigeon>)
- Inside Google's Fascinating Stash of 10,000 Indoor Maps (<http://www.wired.com/gadgetlab/2012/07/17-organizations-that-made-their-floorplans-public-on-google-maps/>)
- 像风一样自由：利用地球磁场的室内导航技术IndoorAtlas精度可达0.1至2米 (<http://www.36kr.com/p/134307.html>)