Indoor Navigation

Indoor Navigation in the TU-Mensa

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Table of Contents

The mensa problem

Use cases

- User wants to locate his/her friends using our app
- todo: Add produced user stories and use cases in a nice graphic

Resulting project questions

- How to get own position inside buildings?
- How to find other people inside buildings?
- Which privacy and security concern can be addressed?

Occuring problems

- No GPS in buildings etc. => topic **Indoor navigation**
- todo: More...

Possible approaches to indoor positioning

- WiFi, Bluetooth, NFC, QR-Code, manual position pinning[**?**].
- todo: Add technology matrix (last meeting)

WiFi positioning

- With use of tubIT API.
- Provides building name, floor, coordinates.
- Problem: no coordinates in mensa and library, inaccurate coordinates elsewhere.

Bluetooth [?]

- Estimote beacons
- Possible positioning approaches
  - Indoor-Region Based Navigation
  - Live Indoor-Location Feedback Navigation
  - D2D Indoor-Navigation via Virtual Beacons
- Problem: possibly high battery usage

NFC / QR code

NFC

- Precondition: NFC tag on every table in mensa.
- Scenario: First group member that sits down puts phone on the table, phone reads tag and sends location to other group members.
- Cons: Requires user putting phone on table. High cost of initial NFC tags set-up. Requires NFC-enabled mobile device.

QR code

- Precondition: QR code on every table in mensa.
- Scenario: First group member that sits down scans QR code on the table, phone sends location to other group members.
- Cons: Requires user scanning codes; impractical, time-consuming.

Manual position pinning

- Fallback option, if no location can be received automatically.
- User will have option, to pin own location inside mobile application.
- Useful in cases of broken infrastructure (WiFi is down, dead batteries in Bluetooth beacons...).
- Provides alternative for users with high privacy concerns who don’t want to automatically share their locations.

Questions of concern

- How much interaction with mobile device are users willing to do?
- Always-on positioning. Requires always-on Bluetooth.
- Always-on positioning. Bluetooth turns on when WiFi positioning detects we are in mensa or library.
- Time based positioning. Application activates only in certain time intervals.
- Positioning while application is running and Bluetooth is on.
- Positioning on demand. User have to press a button to share position.
- User pins own position on map inside application.
- todo: Ask the 3 - 4 most important questions

Technology matrix

	Accuracy	Battery Consumption	User Interaction	Platform Independency
iBeacon (Bluetooth LE)				
Bluetooth/Pairing (Device to Device)				
WiFi (Localization)				
NFC (Check-In)				
QR-Code (Check-In)				

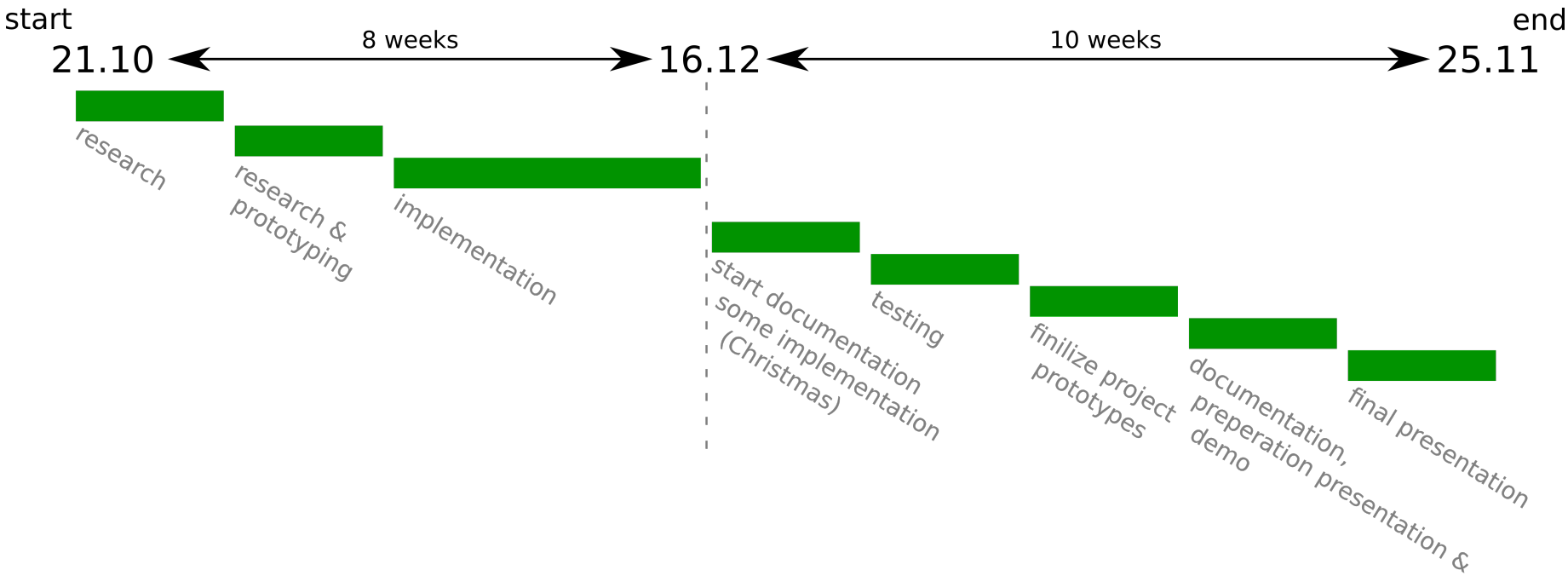
Our approach - vision

- todo: Add graphic - include (at least): Android app, iOS app, loca

Our approach - specifics

- Client-server architecture
- Server tasks
  - Retrieve details about bluetooth beacons.
  - Share location between users.
- todo: Finalize this

Timeline


start
21.10
8 weeks
16.12
10 weeks
end
25.11
research
research & prototyping
implementation
start documentation some implementation (Christmas)
testing
finilize project prototypes
documentation, preperation presentation & demo
final presentation

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Do you have questions?

If not - we have! :)

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Survey.

References

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Location-based services and geo-information engineering, volume 21.
John Wiley & Sons, 2009.

Silke Feldmann, Kyandoghere Kyamakya, Ana Zapater, and Zighuo Lue.
An indoor bluetooth-based positioning system: Concept, implementation and experimental evaluation.
In *International Conference on Wireless Networks*, pages 109–113, 2003.