# Game Design Document - Group 3

Christos Ioannidis, Ludwig Leuschner, Pio Chibuzor Okongwu

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## 1 Version

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## 2 Creators

Christos Ioannidis, Ludwig Leuschner, Pio Chibuzor Okongwu

## 3 Game design summary

In our game multiple players can compete with each other where the goal is to beat the opponents' score, or one's own high score by physically reaching a predetermined goal in the city of Bamberg while performing better guesses of the distance between a waypoint and various landmarks.
The underlying idea of our game is part of the genre of exploration games, where the mechanics motivate players to get to know their surroundings better and ideally enrich the mental representation of the places they have visited. The main method of achieving the construction of such a mental map of a relatively unknown place will be achieved by using reasoning and giving educated guesses about spatial distances of important landmarks in the landscape. Additionally, traveling towards the final destination via checkpoints guides the player through the city along points of interest. The concept of lateration will be integral as the underlying method of assigning scores to the guesses of the players and ultimately decide the outcome of the game. The mode of playing provides a good balance of action and reasoning. As the main focus of the game will be pedestrian players, the final score will be determined by the sum of the deviations between the calculated position, based on the guesses and the landmarks, and the actual coordinates of the waypoint. By allowing to choose the number of rounds (1-7) and the final destination, this game can be over pretty quickly or can be expanded to fill a whole hour.

# 4 Players and organizers

The game is addressed at anybody who enjoys exploring the city of Bamberg for at least a few minutes, either autonomously or in a group. No prior knowledge is needed apart from the basic handling of a mobile device, especially with a Map view. Furthermore interacting with a dynamic map and orienting oneself along its lines, similar to using a navigational aide, is an advantage. Since the core mechanic is based on distance estimation, a rough grasp of the concept of distance between objects should at least be given. This should be the case with students from grade 4 upwards. Of course this varies wildly depending on what surroundings should be explored. The game is especially enjoyable in small teams (2-3) on one or multiple devices, but can also played alone. The multiplayer part and the competitive aspect is introduced by an achieved score that can be compared.

This game is mainly designed to introduce first year students to the landmarks of the city of Bamberg, where special focus lies on the buildings of the university and points of interest. An ideal scenario would encompass embedding a session of this game into the introductory days where new students are being welcomed to the institution.

Staging and organizing game sessions is pretty straightforward, since it can be started from almost any position in the city area of Bamberg. The choice at the beginning is how many rounds a game should have and what the destination should be. The first is chosen via a simple spinner, the second is chosen after the player's position is marked on the map with a click on the desired destination.

# 5 Geo-narrative and mode of locomotion

Our game is in its original vision a pedestrian game, most students have not yet settled in their new surroundings and since making as few assumptions as possible seems wise. Inherently, there is no problem with using other modes of transportation, as long as the checkpoints are reached somehow. The score is kept comparable by assigning points on a per round basis instead of a time to beat. If not playing alone, it makes sense though to have all players use the same means of transportation.

# 6 Geo-content and game relocation

Our game is in part relocatable, this aspect depends on the underlying database of interesting landmarks. In order to keep the prompting of these locations interesting and relevant, these are not generically taken from the map we are using, but rather from a curated database. The selection of these POI is not only guided by the area players should get acquainted with, but also in which setting. In our case we focus on first-year university students in Bamberg, thus the database does not only include historical and cultural sites, but buildings specific to the students' life.
Players get assigned a score for each guess/round while they are trying to close in on the target. Each guess, and each error introduce a penalty that encourage players to make edu-

cated guesses. These landmarks are taken randomly and introduce the players to interesting places in their current surrounding, which will help impress a rough map in the minds of the players. The destination of the game can be chosen, which lets the player decide along which route he or she wants to get to know their surroundings better.

# 7 Temporal balance and duration of the game

Every Geogame and Exploration game follows the principle of the temporal balancing and time duration. Our game can be played in real-time; this means the players can play independently of their respective time. It can also be played on a turn-base, when more than one players is playing on one device. We took into mind for the players to explore the chosen site within the duration of 30 minutes or more to maximize the learning effect.
When the location (i.e. the buildings of the university) are appropriately chosen, the player then guesses the correct distance of the chosen location from his starting point, this phase might take 3-5minutes depending on the spatial knowledge of the player.
The playing phase will last for about 30 minutes, the game is over as soon as the player reaches the final destination and has entered all guesses. The playtime will only increase if the player chooses more rounds or a final destination that is far away.

# 8 Technology and other equipment

There is no sophisticated technology in our game mechanics apart from an Android device. Anyone who would like to exploring the city of Bamberg can use the software which is similar to mobile maps and other mobile location assistance devices that senses the location.
For multiple players to play the game, two Android smartphones with the game software installed are what is needed. The devices must have the GPS localization switched on. The mobile data is also needed in order to load the map and route directions data.

# 9 Geogame mechanics and rules of the game

There is a starting point (your current position) and your destination you must reach (configurable by yourself). You can play as multiple players or a single player. You win when you reach the final destination and can have a lower deviation resulting from your guesses. Before the game starts you set several rounds that shows in the spinner widget ranging from 1 - 7. The app shows your position on the map and prompts you through a pop-up message (snackbar) to tap on the map in order to select your desired destination. After that, the route calculates takes place. As soon as this calculation is done, the route along its waypoints is rendered onto the mapview. The initial state can be seen in Figure 1.

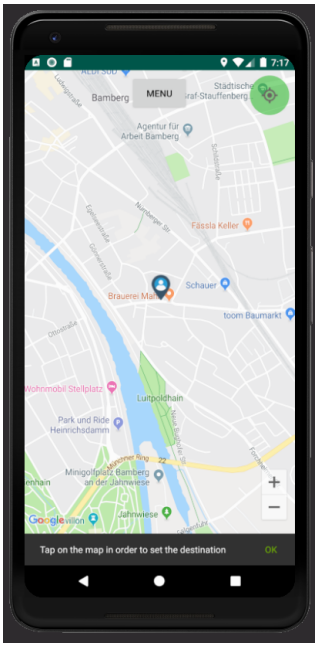
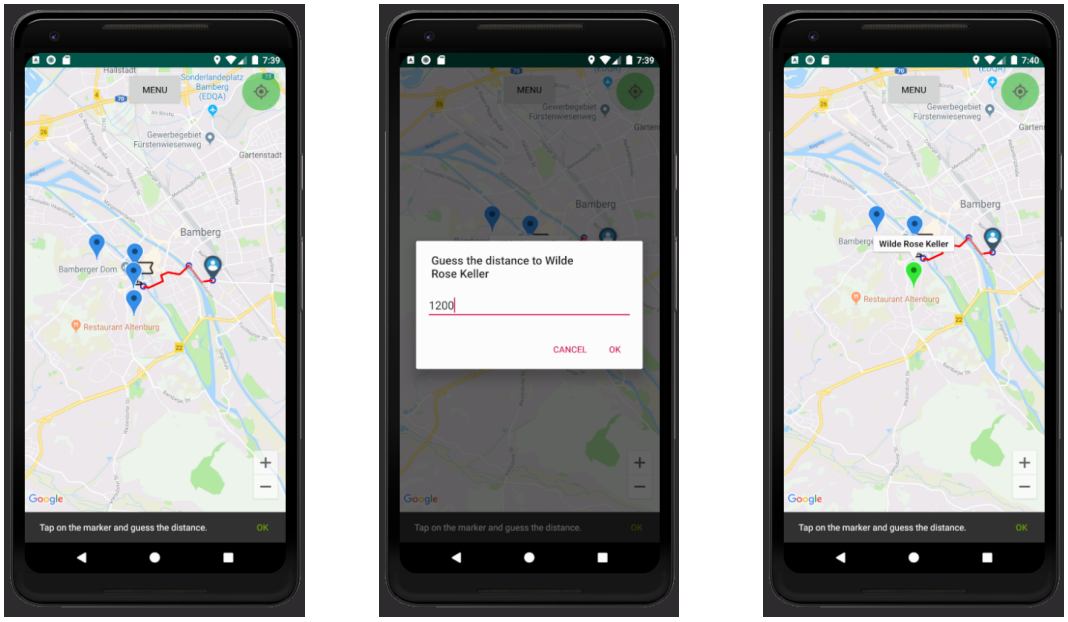



Figure 1: Player's position

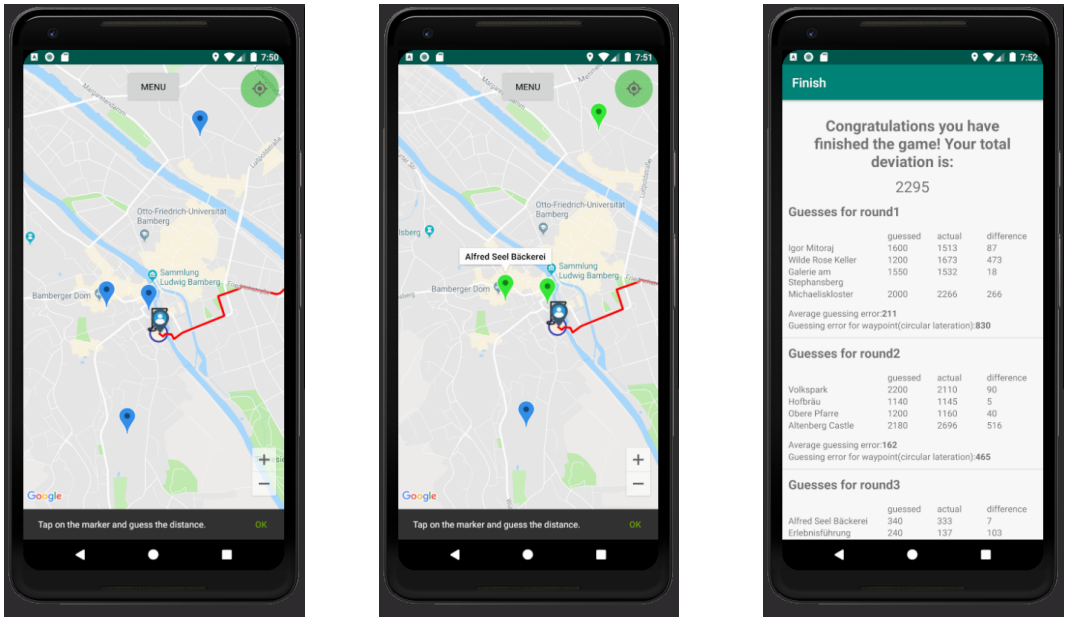
The waypoints (marked with blue circles) appear on the route. The number of the blue circles corresponds to the number of rounds you have selected. As soon as you start walking towards your destination and into the blue circles the landmarks will appear. Once clicked, the player is prompted to enter an estimation of the distance between the landmark and the waypoint.
In order to win, you have to minimize your guessing error which will result in a lower deviation from the reference waypoint to the calculated position. This is important since the sum of these deviations will be your score. The lower, the better. These landmarks used are inside the area of interest of the city of Bamberg. They are picked at random according to the selection route towards your destination. Once you have provided guesses for each of the four landmarks, you proceed the next waypoint and repeat this until you reach your destination. This procedure can be inspected in Figure 2.




(a) 2a (b) 2b (c) 2c

Figure 2: waypoints and guess screens

The calculation of the Cartesian coordinate is done with the help of Universal Transverse Mercator Coordinate UTM, which converts the longitudes and latitudes into Northings and Eastings. These values are given in meters for a 6° zone. Since we focus on just the city of Bamberg, we can neglect the case of doing calculations with locations in different zones. Given four landmarks and distances (in the form of player guesses) to an unknown position, we can approximate iteratively the most likely position under these parameters. Comparing it to the actual waypoint that the player used as a reference point gives us a deviation score. Once you finish the last waypoint,the score board comes up, displaying your scores and total difference of each rounds played. In addition to the sum of the deviations, there is a detailed view showing the guessed and actual distance to each point of interest. The last round and the finish screen can be inspected in Figure 3.
The finish screen shows the summary of the game. Besides every single guess, there is for each round the average of the guessing error and the guessing error for the circular lateration (from the waypoint to the actual calculated position). The total 'score' is the 'total deviation' at the top of the screen. This is the sum of every lateral calculation error and should be as small as possible. This score can be compared to other players who started at the same position and time.




(a) 3a (b) 3b (c) 3c

Figure 3: Last round and finish screen

The game supports multiple players playing from the same start points at the same time. When the desired destination is selected at the same minute, it is guaranteed that the same landmarks will be prompted.
*There is also a quick-start guide in the readme-file of the git repository with an included manual to import the KML-file to test the app with the Android emulator.*

# 10 Appendix

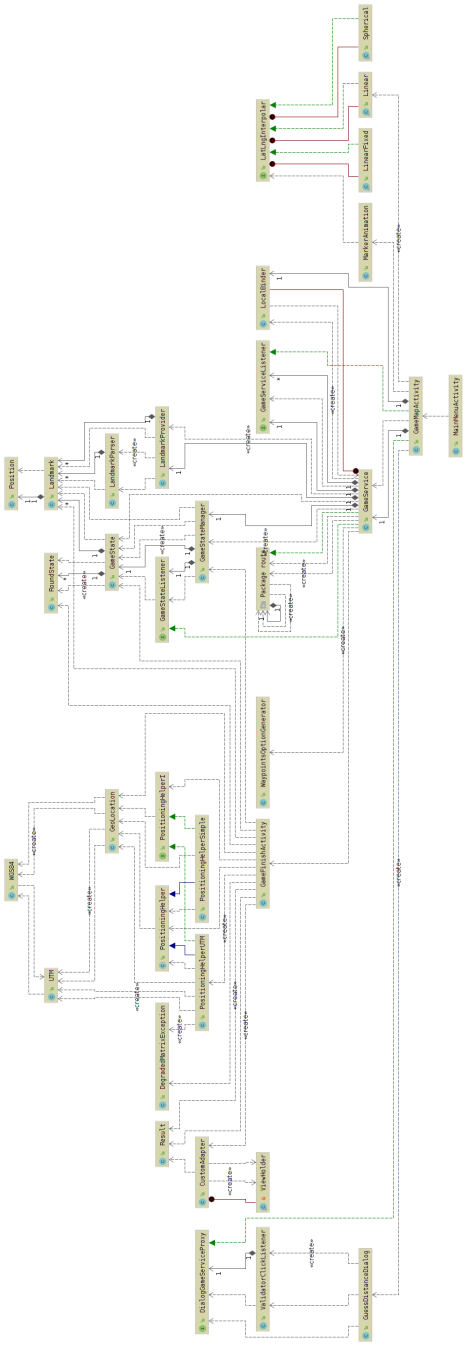


Figure 4: An overview of all classes of the GeoRacer application showcasing its modularity