Neocartographer Geogame Design Document
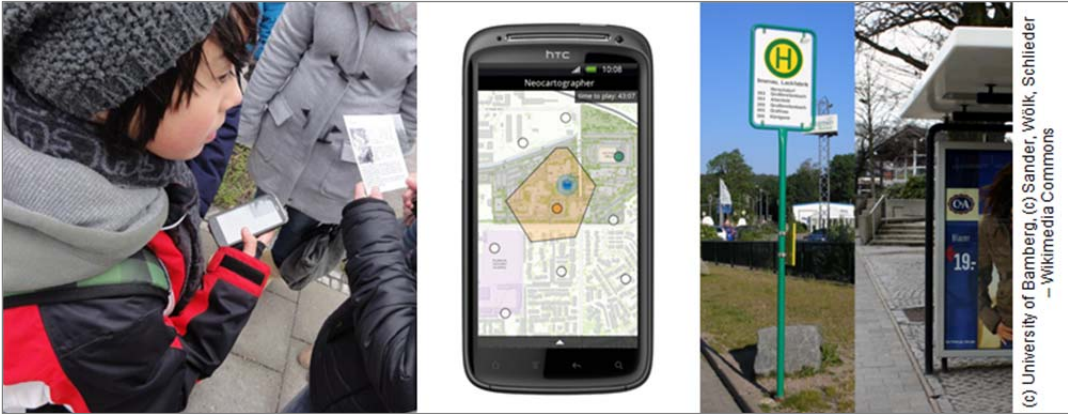
Content

NOTE: *To assist first-time readers of a Geogame design document, each section starts with a brief comment drawn from Schlieder (2013), Guideline for Geogame Designers. Experienced readers just skip the paragraphs printed in italic.*

1. Version

v 1.4 of January 20, 2013
The design was known under the working title MapMaker until v 1.1

2. Creators

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3. Game design summary

The game design summary informs those who intend to use your Geogame in a particular application context, for instance, in an educational or a touristic activity. Provide sufficient information to let the reader understand how well the design aligns with the goals of his or her context activity. Focus on the game playing experience because this is central for comparing designs. Do not try to explain the rules of the game at this point! The summary should (1) describe the main elements of the playing experience, (2) explain in what way the game connects to other location-based games, (3) highlight what is unique about the playing experience of your game.

In Neocartographer, two players or teams of players compete, each trying to outperform the opponent in a mapping contest where a player gains an advantage by being the first to contribute a piece of information about a geographic location. The game belongs to the genre of allocation games, where players occupy spatial regions until they reach a winning configuration. In contrast to most of these games, Neocartographer challenges its players by requiring them to reason about spatial distances. The game has been designed as a playful introduction to geospatial analysis, more specifically, to the concept of Voronoi neighborhood. However, there is also a game variant in which the players do not need to familiarize themselves with that concept. Neocartographer balances reasoning and action in an intricate way and is generally played as a pedestrian game. It takes only a few minutes to get acquainted with the rules and the smartphone interface. With the game itself lasting about half an hour, Neocartographer is an ideal choice for applications where temporal constraints are tight such as a tech demo in the context of a scientific conference.

4. Players and organizers

Geogames may support a variety of context activities or they may draw on specific cognitive or motor skills of their players. Knowing that your game design targets players who know how to ride a bicycle is an important piece of information for those who decide on whether or not to use the game. Describe the players in terms of their motivations and skills. At this point, do not focus on their equipment! Most Geogames require one or more organizers or game masters for preparing the game with geo-content, for choosing, inviting and briefing the players, then for starting, monitoring, ending the game, and debriefing the players. The organizer may be a school teacher for a biology field trip game or a tourist guide in case of a city exploration game. Some game designs require additional assistants,

for instance, supervisors and referees. Be precise about the human resources needed for staging your Geogame. In describing the organizers, again, focus on their motivations and skills.

Neocartographer addresses anybody who likes to spend 30 min outdoors competing with others in a game that requires tactical thinking as well as spatial reasoning. The players do not need any prior knowledge of spatial analysis. They should, however, be able to use a web mapping client on a smartphone. One game variant involves some geometric reasoning about points and lines. In that case, familiarity with these basic geometric concepts, as it can be expected from students of grade 8 and higher, is helpful. Neocartographer is a two-player game. If you want to involve more people, you need to team them up. Team sizes of 3 to 5 are ideal. In other words, each instance of the game occupies up to 10 players.

The game is designed as a playful introduction at the beginning of a curriculum on spatial thinking. Since it is centered on the concept of Voronoi cell, it is an ideal supportive activity for a course which covers that topic. Neocartographer could, for instance, be played at the end of a 90-min-class on the geometrical foundations of Voronoi tessellations and their algorithmic construction. Alternatively, with learning objectives focused on applications, the game helps to gain an intuition about the notion of Voronoi cell before discussing in class geographic problems in which the concept appears. In the default game variant, the players only reason visually about regions shown to them on a map without having to know that these are Voronoi cells. This is the variant for playing the game as a self-contained activity, say, as a software demo.

Staging a Neocartographer game is straightforward. Basically, the organizer of the game needs sufficient knowledge about the geographic environment to be able to choose between 9 and 16 points of interest which are accessible to players moving by foot. The game offers the option to integrate location-specific quiz questions. Obviously, local knowledge is required to formulate such questions. The technical skills of the organizer regarding the interaction with the smartphone and background knowledge about spatial analysis should at least match those of the players.
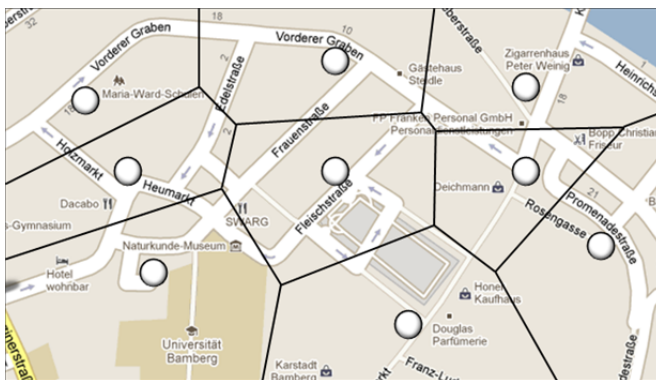

Fig. 1.
Game board design study showing
9 points of interest with associated regions

5. Geo-narrative and mode of locomotion

Games connect their players socially; Geogames also connect them with the geographic environment. It is the environmental experience and the active form of locomotion which makes them unique. The narrative captures this experiential aspect of the game in form of a fictional context, a story. In contrast to classical video game narratives, what matters most in a Geogame, is the way in which players connect to the geographic spaces they move in. It makes, for instance, a difference whether your

game is about flowers (immobile objects in a natural environment) or about cars (moving objects in a man-made environment). The geo-narrative presents the main lines of the story that is communicated to the players. Focus on describing the interaction with the environment. Asking the players to pick flowers is certainly different from asking them to take photographs of flowers. Describe locomotion as a specific form of interaction. Make explicit which mode of locomotion the game is designed for and which others it supports. Can some players move as pedestrians while others use bicycles? Be clear about whether or not it is possible to combine different forms of locomotion. Finally, do not try to argue that your design could support many narratives. Make a choice and spell out a single narrative.

Neocartographer is based on a narrative focusing on collaborative mapping and the competitive aspects which this sometimes involves. The geo-narrative runs as follows.

"Although satellite imagery provides detailed data about our environment, making maps generally also involves a lot of field work. Some features of the environment are best understood by direct inspection which means that the map maker has to actually visit the place. Think of identifying building types in collaborative mapping projects such as Open Street Map. The fact that everybody collaborates in producing the map does not exclude fierce competition. Collaborative map makers are proud of being the first to contribute or update a piece of information. Often, they try to map several contiguous regions such that large parts of the resulting map are attributed to them.

This pretty much describes your task in the Neocartographer game. You are a collaborative map maker, as is your opponent. There are places that need verification on the ground, for instance, a bus stop from which it is not known whether it provides a shelter. You would then simply visit the place and document what you see: a shelter vs. no shelter. Whoever first reaches a place and provides the information gets the credit. Actually, not just the point but a region surrounding the point is attributed to the first contributor. In the course of the game, the map fills with regions attributed to you or to your opponent. Each attributed region increases your status as a map maker according to a set of rules which depends on the mode in which the game is played. Try to win by obtaining a higher status than your opponent."

Neocartographer is conceived as a pedestrian game but there is nothing inherent in the game design that prevents the players from moving with, say, a wheelchair, a bicycle or a Segway. Since speed matters in some game situations, it is strongly recommended that all players use the same mode of locomotion.

Fig. 2.
Verification task: The green player visists a point of interest, a bus stop. After documenting the presence of a shelter by taking a photograph, the point and the associated region are attributed to the player.

6. Geo-content and game relocation

Geogames exploit knowledge about the geographic environment in order to enrich the game playing experience. In the simplest case, the geo-content consists just of a selection of points of interest at which the players perform some task such as taking a photograph. Location-specific quiz questions involve more elaborate geo-content. Some Geogames are specifically designed to exploit the unique features of a single place on earth. Most Geogames, however, can be relocated to different geographic regions. Describe your design decisions: is your game relocatable? What spatial constraints, if any, apply? Does the game provide support for creating geo-content?

Neocartographer is a relocatable Geogame. The organizer of the game specifies 9 to 16 geographic locations taking care that all locations can be reached by pedestrians. It is also necessary to check that a sufficiently strong GPS signal is received at all locations. Especially locations in urban canyons, could require an analysis of satellite visibility during different times of the day.

Since the first visitor of a location gets all the credit, players will only go to locations which have not been visited before. In a game with 10 locations, each player is going to visit 5 locations on average. Assuming that the verification task takes 2 min = 120 s to complete, 600 s are spent on verification. With a playing time of 30 min = 1800 s, this leaves 1200 s for moving between the locations. At a speed of 1.5 m/s the total path will be around 1800 m. In other words, on average, there should not be much more than 350 m distance between one location and the next and even a layout of 16 locations will easily fit into a 1.5 km x 1.5 km square. It is up to the organizer to take these considerations into account. The game software assists the organizer to specify the locations on a map but it does not check whether her or his choices are based on plausible spatio-temporal assumptions.

Support is provided for specifying the verification tasks. A task consists of a descriptive text shown to the player when arriving at the location. Three types of answers are possible: answering by ticking a check box, by entering free text, and by taking a picture. The organizer of the game has to provide one task description per location. For check box answers, it is also possible to specify which answers are correct.

7. Temporal balance and duration of the game

The temporal balance of the game flow is the core of every Geogame, as Schlieder, Kiefer & Matyas (2006) have shown by a formal analysis of the state space. However, it is also true in a more intuitive sense. A real-time game differs from a turn-based game. Temporal balance in Geogames is mediated by the site-specific tasks which delay the game flow with the effect of combining real-time and turn-based game elements. Whatever design choices you have taken on the issue of temporal balance, make them explicit. In addition, the design document needs to provide information about the temporal requirements for setting up and playing the game. During the design phase of the game you will probably only have time estimates. Nevertheless, write them down. Game design is an iterative improvement process in which the design document is worked over again and again based on experience gained with the design. Your design skills will improve by analyzing which temporal requirements where underestimated, which overestimated.

Neocartographer is played as a real-time game which means that the players act at any time and independently of each other without having to wait for their turn to come. The temporal balancing of the game flow follows the Geogames principle: the verification tasks consume time with the simple consequence that it becomes impossible to win the game by just being faster than your opponent. Under reasonable assumptions (see section 5) about 1/3 of the playing time is spend on verification, the remaining 2/3 on locomotion.

A game organizer who knows the geographic environment sufficiently well to select the locations and verification tasks without having to actually visit the places on the ground should take no longer than 3 min per location for entering the geographic position and generating a task description. In other words, plan roughly 30 min preparation time for a typical game with 10 locations.

The Neocartographer game itself consists of a briefing phase, a playing phase, and a debriefing phase. Introducing the game narrative, explaining the verification task and the rules of the simplest variant of the game takes about 5 min. It may, however, take longer for more complex variants or if background information relating to the verification task needs to be communicated to the players.

When the locations are chosen appropriately, the playing phase lasts about 30 minutes. By default, the game ends when every location has been visited by one player. Alternatively, the game can be played in a time-out mode where it is automatically stopped after a preset time. It is recommended to use this mode, when staging the game under tight temporal constraints. Several instances of the game using the same locations can be played at the same time. A class of 20 students could be grouped in 10 teams of 2 students playing 5 matches of Neocartographer.

At least 5 min should be spent on debriefing. As the game software already establishes the winner, this is needs not be handled by the game organizer. Debriefing time is instead used to let the players present to each other the results of their inspections of the different locations. This is important since by design a player will have only seen about half of the places, those that the opponent has not seen. The game software supports the debriefing phase by generating a list showing the locations together with the results of the verification task and the contributor. Alternatively, debriefing can concentrate on the game flow letting the players describe to each other their tactical decisions in the game. There is no specific support in this case.

8. Technology and other equipment

Design abstracts from technological constraints. Nevertheless, it may already be clear at design time that you are going to use certain technologies, for instance, a specific mobile operating system. What matters are not the details but the choices which have implications for who will and who will not be able to use the game. Disclose these technological constraints as early as possible because they are needed for the cost-benefit analysis that the potential organizer of the game is likely to make. Do not try to estimate the costs of hardware or licenses yourself. It should just become clear what technology is needed for running the game. For instance, knowing that you need Android smartphones to run the game is an important piece of information for anyone considering organizing it. Equipment which is not IT should be mentioned too. If it is necessary to provide a Segway for each player that adds to the costs of staging the game.

In a Neocartographer game, two players face each other or two teams of players who act as if they were single players. The game mechanics does not distinguish between the two cases. Location-sensing, communication and game flow are handled by the game software which consists of a game

client on each of the two player's smartphone and a game server. The Neocartographer game client is a smartphone application designed to communicate with the Geogames game engine server, both developed and distributed by the Geogames team of the University of Bamberg (www.geogames-team.org).

To play the game, two Android smartphones are needed with either GPS localization switched on. The accuracy of localization methods such as WiFi-only or cell-ID-only varies between geographic regions and may not be sufficiently accurate for the game to work. For that reason, they are not supported by the game software. Of course, WiFi and cell ID may be used in assisted GPS to improve the accuracy.

No further equipment is needed.

9. Geogame mechanics and rules of the game

Describing the game mechanics amounts to describe how the game works from the player's perspective. For a competitive game, for instance, you start with explaining what the player needs to do for winning. This is the point where it comes to the rules of the game. Aim for simplicity. The simpler the set of rules, the less time it will take to learn the game. Restrict rule set variants to an absolute minimum. A beginner and an expert variant are fine, as well as a variant for a short game and a longer game. Describe the implications of the game mechanics for the user interface. Note that the section on game mechanics constitutes the least interesting part of the design document for readers who want to decide whether or not to use your Geogame in a particular application context. If the preceding parts of the document are written properly, such readers will only need to glance through the description. On the other hand, it is the part of the design document that provides the most valuable information to the software developers of the game.

In Neocartographer each player tries to be the first to solving the verification task for a map region, causing that region to be attributed to her or him. At the beginning of the game no region is attributed to a player, after 30 minutes of play, many will. The game mechanics iterates navigation phases in which the players move to a location (e.g. a bus stop) and task phases in which they solve a verification task at that location (e.g. does the bus stop have a shelter?). Because of the simplicity of its game flow, Neocartographer works fine with an interface with just two modes: a navigation mode and a task mode.

In the navigation mode, the players see the same pieces of game status information throughout the game without needing to switch between different modes of textual or visual information presentation. Note, that the mode of presentation is identical for the two players.

Each player sees a map of the geographic environment with the locations for the verification tasks. The locations are color coded: orange for locations attributed to the first player, green for those attributed to the second player and white for locations still waiting to be attributed to one of them.

The player is also shown the map regions corresponding to the locations which she or he has won. In some game variants (see below) also the regions of the opponent are shown in addition to the locations. Fig. 1 shows a typical game status for which all regions are shown.

To help the player navigate through the environment, her or his current position – but not that of the opponent – is displayed on the map. By not showing the opponent's position, Neocartographer re-

quires the player to engage in spatial reasoning: Which was the last location taken by the opponent? Which locations could he possibly move at? Which is most valuable? Which is closest?

The player is warned if she or he leaves the game board's bounding box. However, no additional navigation assistance (e.g. routing) is provided. Since the game board covers less than 1.5 km^2 of urban space, panning and zooming operations on the map are rare, if necessary at all. The interface also informs about the temporal boundaries of the game: the remaining time to play.
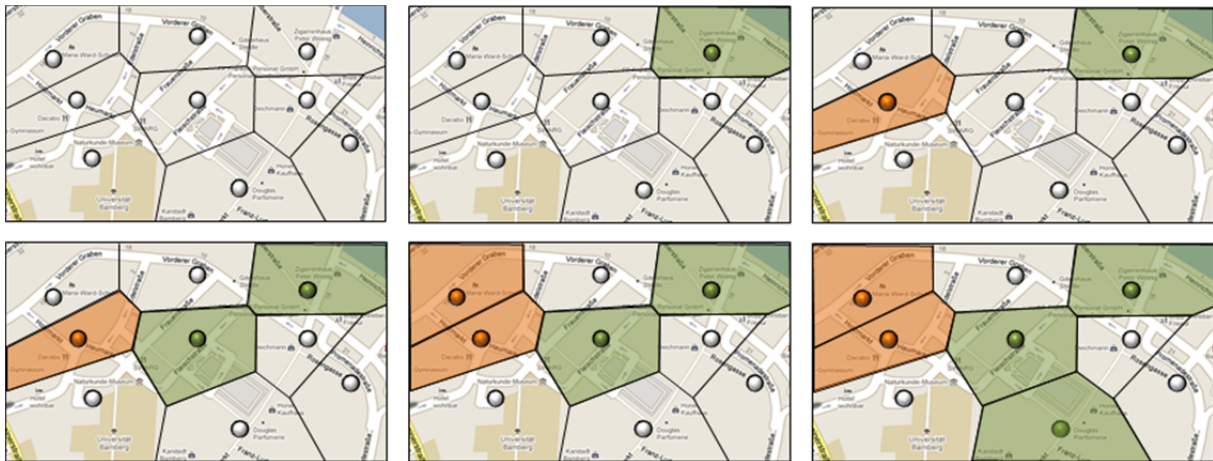

Fig. 3. Typical Neocartographer game sequence

Neocartographer offers 4 = 2 x 2 game variants. There are two winnings conditions and two forms of visualization to choose from. It is the game organizer who makes these choices before the start of the game. The two winning conditions refer to the regions that are attributed to either of the two players.

- AREA: The player whose regions cover the largest area wins.
- BRIDGE: The first player to reach a "bridge" configuration wins.

The regions need not be connected in the AREA variant of the game. In the BRIDGE variant, a winning configuration consists of three regions, exactly two of which are pairwise connected. To put it differently, among the regions of the winning player, there are regions A, B, and C with A connected to B, B connected to C, but A not connected to C. In Fig. 1 both players could obtain a bridge configuration with the region in the bottom left of the map.

With respect to the visualization of regions on the game board there are two options.

- ALL REGIONS: All point locations are shown together with their Voronoi regions
- MY REGIONS: All point locations are shown but only the player's Voronoi regions

Note that the MY REGIONS variant is more challenging. The player only sees the locations attributed to the opponent but not the corresponding regions. Figuring out the opponent's Voronoi regions and how they connect to each other helps the player to anticipate the moves of the opponent.

The default variant of the game combines the AREA winning condition with the ALL REGIONS visualization. This set of simple rules requires the least explanations and shortens briefing time considerably. Note that in the default variant, the game organizer neither has to introduce the concept of Voronoi region nor the game-specific concept of bridge configuration.

In the task mode, the interface shows of a descriptive text describing the task. The game software checks whether the player actually is at the location when solving the task. It requires the player to stay for a certain period of time (default 1 min) within a preset radius (default 20 m) of the geographic coordinates specifying the location. Three types of answers are possible: answering by ticking a check box, by entering free text, and by taking a picture. In case of a check box answer, it is possible to make the attribution of the location dependent on the correctness of the answer. All these choices (default values, correctness check) can be modified by the organizer of the game.