

Cell Spell-Casting: Designing a Locative and Gesture Recognition Multiplayer Smartphone Game for Tourists

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Abstract. In this work-in-progress paper, we present REXplorer, a mobile, location and gesture recognition based spell-casting multiplayer game for tourists. Launching in late summer 2006, this serious game will be installed as a permanent pervasive entertainment service on site the medieval city core of Germany's best preserved historic city, Regensburg. In REXplorer, visitors roleplay volunteering scientific assistants who partake in a self-guided field trip to explore odd, magical incidents occurring all across the former capital of the German Empire. Whilst it is the player's goal to become the day's most successful assistant (and thus, the most notable mage) by gesturing proper location-based spells with a rental smartphone, as game design researchers, it is our goal to bring to light legend and history of Regensburg by the way of novel gameplay.

1 Introduction

Unlike practically all other German cities, Regensburg's urban heart was spared from WWII bombings. The mostly romanesque and gothic city core - see Figure 1 - is if not the best preserved medieval city core in Germany: More than 1'400 buildings within the city center are under historical preservation protection [1] [2].

Formally, the medieval cityscape suits well as a physical game board for a serious pervasive entertainment service concerned with historical sightseeing. Aspects to be considered include density of points of interest; walking distances and touristic workload per sight; sight accessibility; spatial interrelationships, that is: the architectural connectedness of buildings spread out across the city, e.g. churches; climate; and seasonal peaks. Dramaturgically, the history of the city offers a manifold of starting points for immersive and engaging narrative architecture, for example concerning premise, stories, and characters [3]; legends, myths, and fairy tales [4]; and historical trivia [5].



Fig. 1. Regensburg city core including the Old Stone Bridge and St. Peter's Cathedral.

REXplorer, the project we present in this work-in-progress paper, takes advantage of the city core's functional and dramaturgical setup in that we try to design "aus dem Wohnen und für das Denken" - *engl.* "from dwelling and for thinking" [6] - by translating facts and legends into pervasive gameplay for visiting tourists. The game thus can be classified as a "serious pervasive game" serving an end beyond Huizinga's demarcation of games' "magic circle" [7]. In this, REXplorer can be compared to other, yet smaller scale and prototypical serious pervasive game projects such as a location based collaborative learning game [8], or a live action role playing tourist game designed for the UNESCO world heritage protected city core of Split, Croatia [9].

2 Game Design Cornerstones

2.1 The Regensburg Experience

Launching in late summer 2006, REXplorer is a crucial part of the „Regensburg Experience“ (REX), a high tech visitor centre and experience space where history shakes hands with the future, fusing Offline / Online and in house / urban space multimedia offerings. The Regensburg Experience aims at promoting Regensburg as Germany's most beautiful and historical city. The project will be implemented in three spaces, (i) in the renovated 1620 salt storehouse „Salzstadel“; (ii) in the virtual space of the WWW; (iii) in the urban space of the city taking on the form of REXplorer, cf. <http://www.rex-regensburg.de>. It is planned to intertwine these spaces scenographically where appropriate.

REXplorer is a joint project between RWTH Aachen University, Germany; the ETH Zurich, Switzerland; non-profit company Regensburg Experience GmbH; the city of Regensburg; and Regensburg sightseeing guides. Out of the 1.6 million national and international visitors to the city per year, REXplorer targets mainly young

adult day trippers, local and regional school groups, as well as a portion of the increased number of expected tourists with Regensburg becoming a UNESCO world heritage in 2006. The number of expected REXplorer players totals to > 15'000 per year, who we believe will rent a „wand“ at the Salzstadel museum location. We design REXplorer on the assumption of a maximum of 30 simultaneous players, with an average gameplay session ranging from 1-2 hours.

2.2 Game Premise

The basic premise of REXplorer is that in our “light fantasy”-meets-science experiment setting, particular landmark buildings have locked magical - factual as well as fictional - spirits, secrets, and treasures inside of them, all of which can be unleashed and interacted with by the way of the proper spell gesture. REXplorer equips players with a rental „scientific apparatus” which turns out to be a magic wand. This wand is a gesture sensing and location tracking smartphone running custom software and data necessary for the game. As if taking a positionable, Nintendo Revolution controller with built-in loudspeaker outdoors, players may not only interact with site specific game services including large public displays, but also “tickle” one another’s wand to paralyze it for a while, or fulfill cooperative quests. REXplorer can be thought of as a situated, advanced, and handheld platform based „Waving Hands” [10], although we are not using the Waving Hands / Spellcast rules. For our game, we are not laying out an explicit magical setting, but we are being inspired by popular themes such as the „Harry Potter” series, Magic the Gathering[®] trading cards, and the GURPS fantasy campaigning manual [11]. In addition, we are taking into account (mobile) game design patterns [12], as well as research about techno-surveillance [13], and situated or computer mediated interaction in the public sphere [14] [15].

3 Core Interactions

3.1 Status Quo

At present, the game is in its early implementation phase, taking advantage of existing technologies and research, as well as prior design experiences.

2.2 Gesture Vocabulary

At its technological core, REXplorer builds on top of existing interaction techniques that have been developed by the Media Computing Group at RWTH Aachen University, Germany. The Sweep technique, for example, allows a Nokia Series 60 phonecam to be used like an optical mouse [16]. Using optical flow image processing, the phonecam samples successive images and then sequentially compares them to determine relative motion in the (x, y, theta) dimensions, thus allowing the camera to be used as a three degrees of freedom input device.

With Sweep as a starting point, we are currently developing SweepSpell, the basic gesture vocabulary including device feedback (audio, screen animation), as well as gameplay feedback (e.g. player hears disgruntled voice of building spirit after a spell cast incorrectly). The gesture vocabulary we are implementing follows both functional, technological, and city historical demands, allowing for four basic gestures, see Figure 2.

Functionally and technologically, these gestures are simple enough to be performable and processable. We are planning to allow players to, theoretically, sequence up to four gestures, so that the combination set results into an interaction permutation matrix. However, we are aware that we will need to limit interactions to a manageable and sufficient quantity.

Historically, our vocabulary refers to a secret argot used on an infant's stone grave in the cloister of St. Peter's Cathedral, dating back to 1583, cf. <http://www.geschichte.uni-muenchen.de/ghw/geheimschriften/g9.shtml>. It is one of the many secret languages that were invented in the city due to the plenty diplomats and legations that stayed in Regensburg during the "Immerwährender Reichstag", a prototype of the EU parliament (*engl.* "Perpetual Imperial Diet").



Fig. 2. Gestures to be performed with REXplorer's magic smartphone.

2.3 Geo-Positioning

The gameplay we are envisioning demands (a) to let players move around the city core seamlessly, (b) to be able to measure their locations, and (c) to measure proximate player-to-player interaction such as spell-casting tickling situations. Thus, we are presently researching and testing appropriate geo-positioning methods such as PlaceLab next to GPS Bluetooth receivers that work with the Nokia N70 phones we are deploying. In addition, we are currently probing operators for forwarding the geo-positions to our game server via their UMTS network.

From the player perspective, we translate retrieved location information into device appropriate clues. The closer two players are to one another, the more intense their wands pulsate, for example.

4 Game Design Issues

4.1 Design Challenges

REXplorer is a public-private endeavour, juggling with research interests, as well as with academic, entertainment, mobile social software [17], and tourist market de-

mands. Beyond balancing stakeholder interests, there are a number of interplaying game design and technological challenges we are dealing with and have to solve for the final product. Examples include:

- **Transforming a Tourist experience into a Game Experience.** Tourists – even younger ones – bring expectations with them what a tourist experience should be like. Usually, these dispositions include (self-)guided sightseeing, or, in seldom cases, maybe even puppetmastered role playing. So, convincing potential players of the added value of participating in REXplorer will be part of the game design already, comparable to package design for off-the-shelf products.
- **Transforming a Game Experience into a Tourist Experience.** From a serious game design standpoint, it is important to leave a sustainable message with the players, to transfer city history across the magic circle. This can be instantiated by interacting with historical facts in a suspenseful fashion so players will want to solve a riddle themselves, rather than have shown to them how to solve it.
- **Spell-Casting Expectations.** The Harry Potter series and brand has made spell-casting a popular theme. We assume that there is a lot of potential for reaching a greater number of players by making it possible to actually spell-cast with a wand-like device wherever a player is. The tradeoff of choosing a magic / medieval scheme lays in player expectations: If the game does not cater to the prevalent entertainment record of players, it may fail to immerse and entertain.
- **Unfamiliarity of Place.** Typically, tourists are unfamiliar with the destination they are visiting. This makes location services, especially navigation and recommendation services, more appealing. However, players will need to trust the service, which can be at odds, or even counter, gameplay elements and actions such as unexpected, or unconsciously triggered events, which – from the perspective of the game design - are supposed to thrill players.
- **Privacy.** The utility of location services in unfamiliar settings may tilt the utility-privacy tradeoff that tourists are willing to give up more personal information in return for a better game. The potential privacy concerns of the players may also be eased by the temporary nature of the visit (and associated privacy invasion). Naturally, minimizing the necessity of privacy invasions should be vigorously pursued. On the other hand, engaging collaborative interaction for joint quests may force the designers to plan for privacy intrusion.
- **Personal Device Suitability.** Focusing on mobile phone technologies, many tourists may be reluctant or unable to use their own mobile phones because of roaming charges or network compatibility issues, or they may simply not have a mobile phone with them on the trip. Additionally, many people may be reluctant to download special third party software to their personal mobile phone, possibly because they don't know how, or because they are aware of potential malware. Thus, REXplorer will be offered along with a rental smartphone.
- **Rental Device / Controller Unfamiliarity.** Specifically in time constrained settings such as the one REXplorer represents, getting to know a new device along with unfamiliar controller functionalities is already quite a task for a player who is very likely not a hardcore gamer. Consequentially, we have to limit the overall in-game functionality to a functionality core, and not overwhelm unaccustomed play-

ers with a „featurama“. This also includes limiting the basic gesture vocabulary to a fixed, easy-to-learn set, as well as feedbacking to a core channel, namely, audio.

- **Player and Playmate Identification.** Many pervasive and mobile games require players to identify, locate, and communicate with other players. These activities can be assisted using „mobile social software“, e.g. indicators such as a proximity radar or a buddy list. The design challenge, however, is to keep design consistency with the overall scheme of the game - spell-casting in a predominantly medieval architectural setting - and not to break it.
- **Publicity Sanitation.** Gestures are a subset of human non-verbal communication. Categories of commonly readable gestural communication include facial expression, clothing cues, postures, and body movements. Because the public and sudden hand-arm movement we instantiate is not easily interpretable for what it symbolizes within the game, the smartphone „wand“ gestures will cause confusion for non-players. Specifically around the launch of REXplorer, spell-casting could be associated with non-contextual interactions, e.g. waving about a real weapon. We try to compensate this by associating wand interaction with typical and loud game-like sounds.
- **Is this part of the game?** Location-based services have the added benefit of assisting participants in understanding the games physical boundaries, and helping them locate elements and landmarks relevant to the game in the real world.
- **Is this part of the game, too?** Previous pervasive games have shown that uncertainty about whether a certain event or encounter is part of the game can add excitement to the experience. We will apply this design pattern for REXplorer.
- **Tutorial.** How do we mobilize a player once she has decided to participate in REXplorer? After renting their wand, players have to pass a “gesture license test”, which involves learning core mechanics and functionalities in a playful fashion and, potentially, with the help of Salzstadel museum staff.
- **Content Accuracy vs. Suspension of Disbelief.** Along with the spell-casting expectations we have mentioned earlier in this section, we also need to keep up historical accuracy (a requirement of the Regensburg Experience operating company) whilst immersing players in an exciting hybrid reality fantasy setting that is coherent with the game’s premise. For this purpose, we are researching the city core’s landmark buildings, filtering interwoven stories that altogether help the player to puzzle together the “everlasting magic” of the city.
- **Geo-Building Accuracy.** The city of Regensburg is currently implementing a web map service based on UMN MapServer, with Mapbender as a frontend. The city’s Department for Measurement and Cartography has provided us with their UMN landmark database containing over 1’400 entries, including addresses, short descriptions of the building history and usages, as well as their geopositions. These geopositions base on the metric Gauss Krüger (GK) geosystem, which has been used in Germany-speaking countries and Eastern Europe for decades. The Universal Transverse Mercator (UTM) system can be thought of as a version of GK. We transformed the entire database into GPS data, preparing for GPS functionality on the smartphones. In addition, we are carrying out extensive on-site inspections with different GPS Bluetooth receivers in order to verify or correct the geo-data.

- **Gameplay Scenario Design.** We are using storyboards for designing scenarios and board game models to explore and solve design problems and solutions.
- **Testing.** Two months prior to the commercial launch of REXplorer, we are planning a series of playability tests under real life conditions, meaning a maximum of 30 simultaneous players / session. In addition, we are presenting the game to our target group, e.g. school classes, collecting feedback to optimize the game.
- **Research.** Throughout the implementation and iteration phases of REXplorer, we are carrying out game design evaluation and playability research. Aspects include cell phone gesture recognition player testing; determination of player strategies in spatial situations; usability and balancing of pervasive games etc..

5 Conclusion: Design Success of a Rhetorical Landscape

Of course, we hope that our game will be successful in the opinions of the REXplorer players. However, we also understand REXplorer as an academic and serious pervasive game design experiment that should have the right to partially fail, so there is a reason for REXplorer patches. In order to measure whether we have been successful with our design decisions, we plan to examine and analyse not only our design, and progress, but also the gameplay sessions once REXplorer has been launched.

Beyond pervasive game design, serious pervasive games (SPGs) represent not only mighty empowerment vehicles, but also surveillance tools. On the one hand, SPGs posit players into exciting playgrounds never seen before – the computerised world itself becomes the game board. On the other hand (and in order to assure a seamless experience), SPGs need to bring upon the player a quasi surveillant IT infrastructure to ensure gameplay, goal fulfilment, and closure. We can think of this dilemma as the dialectics of SPGs. These dialectics point out a future of situated drafting, implementation, and operation where, on the one hand, the ongoing intrinsic motivation of a “player” to interact with a built environment becomes an important planning goal. On the other hand, a planner must consider that SPGs install a form of Benthamian monitoring [13] that can be misused to steer and control the reward-seeking player. It is no wonder, then, that serious games in general are widely used for military purposes.

With the omnipresence of pervasive computing based services that appeal to us and make us “behave”, we assume that our conceptions of place, presence, and everyday gratification will alter drastically; we would like to kick off a discussion about the future of these „rhetorical landscapes“ [9].

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