

City Sleuth

location-based
mobile game

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See the video of the app:

https://youtu.be/a2YQinnKJ_4

Access app development at GitHub:

<https://github.com/KasperGam/CitySleuth>

Special thanks to: Jörn Messeter

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Introduction

Locative media combines the ubiquity of mobile data accessibility and physical locations to add cultural layers to our surroundings. Though locative media applications can range from the thought-provoking to the entertaining, all follow a narrative and can change the user's impression of the world around them. In this report we, as a group studying locative media, aim to explore the theoretical framework of the field and argue for the design choices of our own locative media app: "City Sleuth." By coupling the popularity of the detective genre with the theory of embodiment and real life locations, we seek to empower the user to explore their surroundings while solving fictional crimes, and gain a deeper understanding of their physical location in the process.

1. Description of Design Case & Domain

City Sleuth is a game that uses navigation by the player to progress. It encourages the user to interact with the places they visit in ways that may seem atypical for those places, all while rewarding the user for doing so. In addition, it places the user in a fictional space within the real world.

1.1 Domain

At its core, our concept is a locative game. Players are given a location at which their case will begin and must deduce where to go next, with the help of clues and media found at each site. Upon reaching the correct location, they are alerted and allowed to take location-specific actions, after which they will be rewarded with clues.

The domain of the locative game is one that has captured the attention of millions of people worldwide. Points of interest (POI) on a map give players opportunities to interact with the space around them in a manner unlike they usually would. Pokémon GO, for example, rewards users for exploring their surroundings with virtual characters and items. The app

also promotes user interaction by designating real world locations as "gyms" where users can compete. Our design can also be likened to that of live-action roleplay (LARP), in which players travel to various locations, interacting with other players and non-player characters, some of which masquerade as everyday people. Not only do activities like LARP and Pokémon GO bring about new forms of interaction with a physical space, they generate a separate fictional space.

It also acts as a mystery story, sending the player on a scavenger hunt to find clues at specific locations. The key point, however, is to allow players to use their own wit to figure out where to go next or how to solve the case. Users could potentially be misled by the information they gather to find that they need to go somewhere else instead, eventually arriving at the correct location.

1.2 Setting

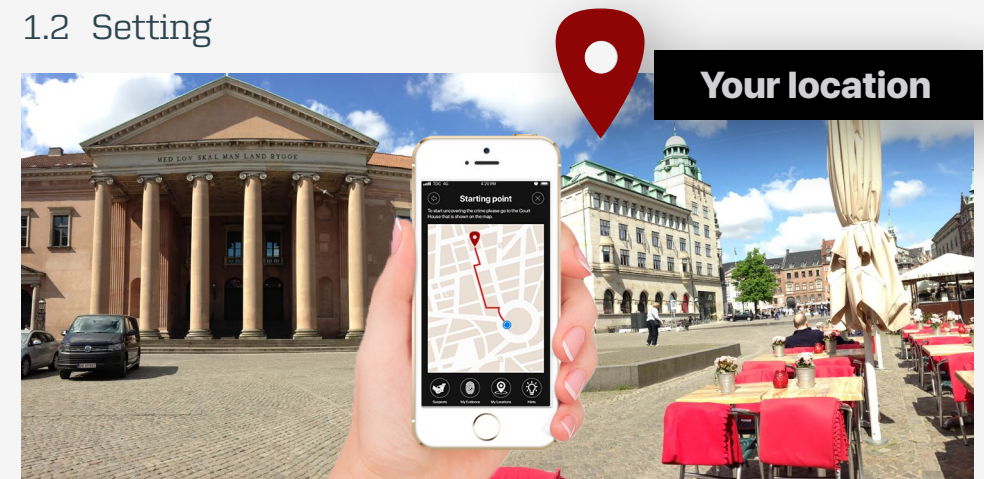


FIGURE 1: POI 1 - the starting point of the game.

The story takes place in the area surrounding Nytorv, a public square near the center of Copenhagen. The square itself boasts a handful of outdoor cafes, food vendors, and the occasional public event. In addition, most streets near it are used predominantly by pedestrians and cyclists. There are many similar businesses located around the square,

mostly coffee shops, bars, restaurants, and clubs. While similar in function, each business is distinct in style and features. The modern, sleek Espresso Huset, for instance, contrasts from the cozy, secluded Thomas Sandwiches cafe. Because of this similarity, the area also provides opportunities to mislead players into going to locations that may not advance the plot of the story.

Whether shopping, eating out, or commuting, Nytorv has a large number of people passing through it every day. Because of the large number of people moving through the area on a regular basis, this concept design provides vast array of potential users with opportunities to alter their usual or intended routes through or within the Nytorv area. A person using the app while shopping might be directed to go to a previously unknown coffee shop, or discover someplace new along the way.

1.3 Context

To get to a location, a user must identify nearby landmarks or a distinct feature on the outside of the location. For example, there may be loaves of bread mounted in the windows of a cafe or a restaurant down the street from a bar the victim's friend visits. Some locations could also require the user to look for details around the location, or even go inside, to solve a puzzle associated with the place. As a mystery game, the intent is to give the user enough guidance to point in the right direction without eliminating the possibility of user error. The game can thus be played in many ways, while relying on subtle clues, misleading or otherwise, to provide a challenge and keep the user engaged.

As can be seen on the figure 2, all of the locations utilized in the design are within a few minutes' walking distance of each other, some of which in our testing were roughly five minutes' distance at most. However, each case would not need to be completed all at once either, meaning that the player would not need to traverse the entire path in one day if not desired. Users could instead visit the points of interest on their own terms, perhaps by incorporating the locations into a new routine or setting aside some time to explore the area after starting the case.



FIGURE 2: Point of interest in the City Sleuth

1.4 Target Audience

The primary focus of our game is to attract people who are at least somewhat familiar with the area in which the mystery is located. This decision is due to the everyday nature of the locations in question, bars and coffee shops rather than statues and castles. Such landmarks may make cases that the players try to solve too obvious and force them to move around the city too much for them to be interested about the story.

With locals are the main focus of the target audience, tourists are not included in that as much. The way the locations are presented in the app requires some level of familiarity with the area in which the game takes place. If a tourist were looking for a coffee shop that is distinct from others while still trying to stay within the area in question, then the tourist would likely get lost. The locations are also not necessarily those that would draw tourists to begin with, as they are not of significance as attractions or monuments. While some cases could be made with more tourist-oriented points of interest, such stories may be too easy and not allow users to feel like they solved the case on their own.

2. Locative Media Theory

In this section, we aim to address the theories and concepts we found fitting and relevant for our design work in all its aspects. First, we draw from the course literature about locative media and outline the domain in which our work is grounded, exploring how the user, the application, and the world interacts and adds onto each other. This is done by first outlining the theoretical concepts, then applying them to the context of our concept. While introducing these concepts on a theoretical level, the motivation for choosing these will be briefly discussed, weighing the strengths and weaknesses of them, while also noting towards how it will inform our analysis and discussion.

2.1 Theoretical Context

2.1.1 Farman

Farman dedicates a whole chapter of his book *Mobile Interface Theory* to developing the theory of the sensory inscribed body through an investigation of both phenomenology and post-structuralism (Farman, 2012). He argues there is no single working theory able to give the full picture of embodiment in a situation where the digital and the material world intersect. Thus multiple viewpoints must be considered to form a more holistic view of the body's relationship with space.

We chose to work from Farman's definitions because he does an excellent job outlining basic locative media concepts like embodiment and space while weighing the strengths and weaknesses against each other. His theory encompasses the complex compositions of space, bodies, and objects in a world where digital technology is intertwined into the very fabric of the everyday. We believe we can use his framework to unravel our digital product and discuss it in detail.

The term **sensory inscribed body** is used to describe several aspects of "being" in the

world. Farman builds on the phenomenological theory of Maurice Merleau-Ponty, saying that one can never truly inhabit space because it would imply the body and the space are two separate entities and the space is a pre-existing field for our bodies to occupy. The central argument of Ponty's 'being in the world' is this lack of separation between the body and space, that space is co-constructed with our sense of **embodiment**. Building on this notion, Farman cites the work of Lefebvre saying "Embodiment is always a spatial practice and, conversely, space is always an embodied practice" This notion describes an intricate relationship between the mind, the body and the world. The world is not seen as an object in itself, but as the setting of which you experience the world. The way we perceive the world is very much defined by the structures of the material world and constraints of the sensory apparatus of the body. Our body serves as a medium through which we observe the world, and only through being in the world does man know himself.

Cognitive unconscious - If the world is a setting, Farman (2012) argues, the senses of the body are the tools that inscribe meaning to that setting. However, while being aware of our surroundings through our senses is vital for embodying space, being able to filter the information our senses give us, is equally important. The ability to intentionally place specific sensory information in the foreground, while relegating other information to the background is vital to the creation of space. We are not always consciously aware of all the sensory input we receive. Our brain relegates the mundane and expected to the background so we can focus our attention towards the unexpected. This internal cataloguing process frees us to dedicate our cognitive load towards deconstructing new information we receive.

This relation between cognitive awareness and unconsciousness relates to Heidegger's theory of technology use, which focuses primarily on tools. He uses the expression **ready-to-hand**, in which a tool is experienced purely through its function. The tool itself does not take up any cognitive awareness, our brain disregards it, and it disappears into the background. If the tool stops working as expected, it draws attention towards itself as the user of the tool begins to deduct what is wrong with it (Farman, 2012). As Heidegger notes that as users we become scientists the moment a tool breaks down. With our concept in

mind, the idea of ready-to-hand meant we would focus on creating an interface that would work with the user's expectations of the game. This will be discussed when we detail how our concept's functionality was designed with usability in mind.

Farman goes on to borrow from post-structuralism, specifically Jacques Derrida's work, arguing that the way we perceive the world is through a reading process, where the world is represented as semiotic sign-systems. As he quotes "There is nothing outside of the text" (Farman 2012). This includes our bodies which are inscribed with these signs. Our bodies are inscribed culturally, since it is both shaped and perceived in a culture (one cannot understand this as an outsider of a culture), it is also sensory inscribed, as our embodied presence is shaped by how we perceive the world.

Farman blends these different paradigms toward an understanding of bodies as simultaneously conceived through site-specific sensory engagement and a reading of bodies as always culturally inscribed. (Farman 2012, p.31)

Bridging the gap between the body as a sensory apparatus and the body as sign systems. Negotiating these various modes of embodiment is to understand the sensory-inscribed. (Farman 2012, p.34)

2.1.2 Cresswell

While Farman's focus is centered on the interaction between the body and place, Cresswell (2004) focuses primarily on the definition of place itself. The excerpt used to develop our concept, "The Genealogy of Place," is primarily focused on introducing different definitions of "place" from several authors and theorists. Cresswell plays the role of mediator or curator, without backing any approach. However, his systematic approach of exploring what it means to be a "place" made it easy for us to understand and come to our own conclusions.

Cresswell breaks down the different trains of thought in regards to place into three categories (2004). The first of these is a descriptive or "idiographic" approach. This approach asks: What, fundamentally, makes this specific geographic location special

or interesting? The second approach is a sort of "social constructivist" approach, which is primarily concerned with understanding underlying cultural and societal motivations surrounding a location. The third and final approach is a "phenomenological" approach, which is focused more exclusively on how humans inhabit a place rather than unique aspects of that place. Going a step further, Cresswell suggests that place may exist independently of location as well.

Despite building up this multifaceted understanding of what a "place" is, Cresswell also highlights theories that point to a possible end of place, citing theorist Nigel Thrift. When Cresswell's *Place* was published, "big box" stores and chains had already been gradually replacing independent stores and the ascent of online retailers have continued through today. With some even considering locations like theme parks or transportation stations as "placeless," the future of place could seem grim. Cresswell does suggest, however, that the end of "place" can be circumvented when viewed more through the "phenomenological" approach mentioned previously. Understanding places beyond what simply makes a specific location unique allows a user to find new meaning in already discovered places.

2.2 Theory in Practice

2.2.1 Game Theory

City Sleuth is a location-based mobile game that uses geo-technology to facilitate a relationship between people, places, and objects in the real world. When considering game theory, it is important to decide which platform the game should take place on. According to The Most Important Gaming Platforms in 2017 survey (Richer, 2017), 38% of developers are working on games for the Smartphone platforms, making them the second largest group after PC developers. Additionally, the number of mobile gamers has more than doubled from 2010 to 2017, cementing them as the dominant gaming audience compared to casual online gamers and social gamers (eMarketer, 2014). Suits (as cited in McGonigal, 2011, p. 22) states that "Playing a game is the voluntary attempt to overcome unnecessary obstacles". Overcoming unnecessary obstacles proposes an idea of challenge and an

opportunity of engagement. According to McGonigal (2011, pp. 21-26), all games share four characteristics: goals, rules, a feedback system, and voluntary participation. A goal is an outcome that the player should accomplish. Goals give the players a sense of purpose. Rules put constraints on how the player can achieve that goal, making the player think strategically. The feedback system informs the player how close he is to achieve the goal, such as providing the player with real-time points, levels and scores- bringing motivation to the gameplay. Finally, the player has to willingly accept the goals, rules and feedback system. Voluntary participation gives a free choice to enter or quit the game, which ensures that the challenging work is an enjoyable experience. Thus, in City Sleuth, the goal of the game is to solve the crime or mystery. The rules of the game include solving the puzzles and finding the locations by using logical-mathematical and spatial intelligence (Koster, 2013, ch. 6). The feedback system in City Sleuth consists of levels, which in our case take shape of the different points of interest. As they progress, players are rewarded with discovering new locations and virtual goods in form of new evidences. These characteristics should test the player's ability to solve the game and thus keep the player engaged and satisfied with the gameplay. Refer to figure 3.



FIGURE 3: Game characteristics

2.2.2 True Crime and the Detective Genre

City Sleuth is an adventure game, which is typified by the player assuming the role of the central figure of an often fictional interactive narrative guided by exploration, discovery and mystery-solving (Ju & Wagner, 1997). According to McCarthy (2015), adventure games are the fifth most popular genre of game, making up 6% of the most favourite games. Adventure games are usually driven by both the story and the context, and have an imaginary environment, with new episodes and various contexts to create an engaging experience. City Sleuth is set apart in that our story is fictional while utilizing a real locative setting. Thus, when the user is taken to the Coffee Shop point of interest, the player is asked to navigate in a real environment and interact with the real objects in that environment. This locative aspect gives a new dimension to the classic adventure game. As the game is driven by storytelling, the user benefits from intrinsic rewards for solving challenges and progression in the game rather than extrinsic or altruistic accolades.

2.2.3 Embodiment

According to Farman (2012) mobile technology is always embodied spatial technology and as an extension, argues that bodies and spaces are inseparable. Embodiment is therefore about constructing the space through use where the digital world combines with the physical world. Space exists when we interact with it, with space also informing the body, leading to a state of co-production. City Sleuth fosters a sense of embodied connection across space through the game's interface and the need to interact with the real world and objects to solve the mystery. As embodiment is a spatial practice, when playing the game, a space is created through the player's movement in the physical world and their relationship to the locations and objects they interact with. This construction of a new space for the user enhances the story and provides a context that would otherwise not exist in the user's setting. As a gateway to this manufactured place, the application serves as an embodied spatial media, giving new form to the player and the place simultaneously on a real and virtual level. In City Sleuth, the digital space informs the users how to navigate in the physical space around them, while simultaneously creating an embodied connection to those locations through the mobile interface. Our goal is to create a smooth relationship

between the digital and the physical space. For example, finding the physical evidence in a coffee shop and solving the puzzle to get a new digital evidence, mixes the spaces together with the bodily experience.

2.2.4 Immersion

An often-cited metric for measuring the success of a game is its “immersion” of the user. In traditional gaming, this is achieved via a successful narrative, interesting mechanics, or the use of immersive platforms, like VR headsets. When researchers attempt to quantify immersion, they often do so in experiments like those conducted by Jennet, et al. These experiments quantified eye movement and also qualified subject reactions to various stimuli and distractions (2008). This definition of immersion rests on the user losing touch with the “real” as a result of the game.

However, the integration of “real” locations into “virtual” games complicates a screen-focused understanding of immersion. Farman (2011) stresses the blurred line between the virtual and the real that occurs when the user’s experience expands from a digital interface into the user’s “real” surroundings. With all digital interactions increasingly being urged into the realm of pervasive computing, Farman argues that the actual and virtual should no longer be considered as opposites. Rather, we should see these two worlds as complementary elements forming individual realities. Farman’s words resonated with us, and we wanted our users to understand the physical and virtual as complementary. Our user is presented with a mediated version of their surroundings, not closed off from them. Though the user may still be mentally separated from others they may encounter during their use of the app, they are aware of the people, inhabiting the same places as they. Thus, for our purposes, “immersion” is understood as this ability to successfully overlay a virtual narrative on a real location in a way that enhances the user’s understanding and use of a physical location.

2.2.5 Place

Farman (2011) describes the interplay between the user and their surroundings as a cycle,

with “embodied actors” creating “culture” creating “embodied actors” and so on. Cresswell, on the other hand, views this interplay in layers of meaning added or subtracted according to time, context, or approach (Cresswell, 2004). However, both Cresswell and Farman do agree: place informs the user as the user informs the place. Described in section 1.3, the user of our app physically travels to locations to unlock clues and uncover more context regarding the crime they must solve. These guided interactions can alter the way the users view their setting, even when they are not directly interacting with our app. Such altered locations may include a building the user may have previously passed on the street many times gaining the label of “crime scene” in the user’s mind after interacting with the app. Even common sights like a 7-Eleven become integral to the understanding of our narrative. One of our concept’s goals was to create places out of both inherently interesting locations and placeless locations.

3 Research method

In order to produce the City Sleuth game, we created a plan that would allow us to achieve our desired outcome in a short period of time. We divided our development into stages: concept ideation, design, implementation, and testing.

3.1 Planning

In the concept ideation stage we developed the storyline for the crime mystery. The story was written as a narrative with all the details concerning the events that take place from the time of the crime to the final resolution. Refer to appendix 1 for the story and testimonies.

Next, we conducted research on the location, first looking at Google maps of the central area of Copenhagen, where the story takes place. When we decided on the area in which we wanted to limit user interaction with the environment, we went on-location to make decisions regarding the number of POIs, nearby physical objects that should be used to solve the puzzles, and deciding on what evidence should be collected at different locations.

The latter was difficult, as we wished to use evidence that could be useful but at the same time only taking a digital form. For example, at one location the player finds a video still from the coffee shop, so the user receives a notification that the new evidence is unlocked while physically present at that location. After we had the points of interest, evidence, locations and suspects in place, we could proceed to the design stage. As it is a location-based mobile game where the user is always moving, we had to take the user interface and user experience aspects seriously. The user interface is designed so the user can easily get access to the main sections of the app when moving to various locations. Refer to appendix 2 for early sketches and mock-up. The aim with the information architecture was to structure the app to allow the user to intuitively navigate around it. For example, the size and contrasting colors of the app allow the user to navigate the app easily while on the go, and the user can access other apps such as Google Maps without quitting the game. The ideation phase is the longest phase of this project since the core elements of the game were created here and most important decisions took place.

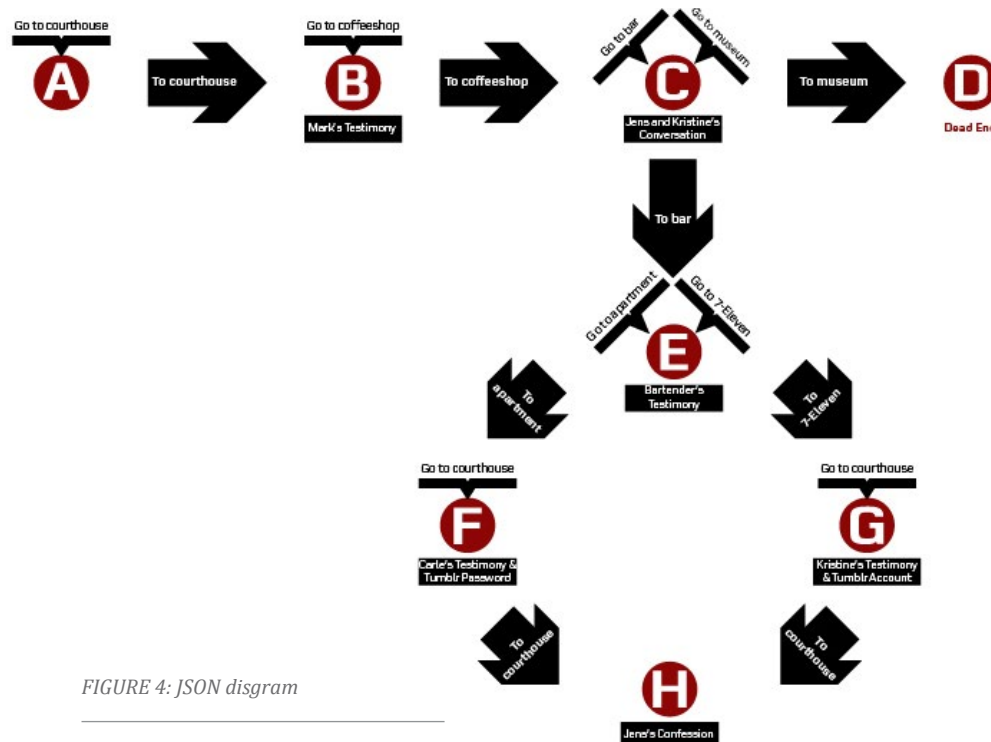


FIGURE 4: JSON diagram

3.2 Implementation

We first looked at several options for simulating with existing tools the experience we would like the user to have, including Tidsmaskinen. However, many did not offer the functionality that allowed for nonlinear decision making, and several other features we found necessary for testing our product with real users. We decided instead of utilizing an existing app, to make our own primitive iOS application to showcase the potential of our concept.

The first step was to logically map out the route and create a state diagram based on the user location. With this in mind, we converted the state diagram into logical JavaScript Object Notation, or JSON (shown in Figure 4), with the top level elements being cases. To demonstrate the future possibility of user-created content and expansion with the app, the prototype was built to load all data from a local JSON file (that would be fetched from a server in the future) to populate the case data. On this foundation we implemented screens, one at a time, and later tested with real users.

1. POI 1 Court house

Hint: to find Coffee shop.

Unlocks: Mark.

Evidence: Mark's testimony from the police station

2. POI 2 Coffee shop

Hint: to find Bar.

Unlocks: Jens.

Evidence: Jens's and Kristine's audio recording from the videotape in the coffee shop

3. POI 3 Bar

Hint: to find 7/11 and apartment.

Evidence collected: Police recording of the bartender's statement

4. POI 4 7-eleven

Hint: to find the Apartment.

Unlocks: Kristine.
Evidence: mysterious Tumblr account

5. POI 5 Apartment

Hint: to find the 7/11.

Unlocks: Carle.

Evidence: the Tumblr account's password

FIGURE 5: The hints, items and evidence unlocked connected to locations

3.3 User Testing

We conducted a user test in order to evaluate the app, which analyzed the usability of the app and assessed whether the user can find the information and complete the tasks as intended in the app. The aim of the test was to narrow the gap between the developers, being us, and the user. We used Gregersen & Poulsen's (2013) usability test methodology to conduct the tests that consist of developing user test objectives, test tasks and usability focus. The evaluation of the test is based on whether the user completed the desired tasks successfully and correlation between the expectation and the final result as well as reasons behind it.

User test objectives: A user test is used to understand where the user experience issues when using the app and to confirm where the problem areas are.

Test Task: The core functionality of the app is to solve the murder case by finding all of the POI's in the game and the final clue that points out the murderer (See Figure 5).

Usability focus

- Navigation/finding the POI's/Locations
- Information architecture/Contents and hints/satisfaction



FIGURE 6: User testing process

The average amount of:

Time spent: 1h 20m	Expected: 40 minutes
Wrong directions made: 2	Expected: 3
POI's passed: 4	Expected: 5

FIGURE 7: The average amount of time spent on completing the tasks and our expectation.

Task description:

Play the game and try to solve the murder case. See figure 6 for test process.

Task steps:

1. We expect the user to find the starting point POI No.1. Evidence unlocked: Coffee Shop clue
2. We expect the user to find the POI No.2 and solve the quiz that will give a clue to the POI No.3. Evidence unlocked: National Museum and bar clues
3. If the user goes to National Museum first, he will find out that there is nothing
4. We expect the user to find No.3 and be guided to the POI No.4 and POI No.5. Evidence unlocked: 7/11 and apartment clues
5. We expect the user to find POI No.4. Evidence unlocked: Password to the Tumblr
6. We expect the user to find POI No.5. Evidence unlocked: Access to the Tumblr account

Please note, that the step 6 and 7 can be taken in any sequence. Also, the step 3 is only to make it more difficult for the user to find the locations, so it is not that obvious where to go from the coffee shop. The user has two options in both POI No.2 and POI No.3.

The timeframe:

The time a user who knows the area well would spend completing the game: Minimum 5 steps / max 40 minutes (see Figure 7).

Documentation

The average amount of time spent completing the game by the test participant is 1 hour 10 minutes. Please see the figure for the average amount of time spent on completing the task. Please note that we were not able to complete the last two steps in the test because the game got reset, due to the user quit the game by mistake. Though he has completed most of the steps successfully and we have continued the session by walking him imaginatively through the next step and giving access to the final evidence (Tumblr account that should resolve the case) via computer. The list of all the observations taken during the test can be found in appendix 3.

User test feedback

The feedback from user focused on two main facets: navigational guidance and the pacing of the app. The user often found himself confused as to where to go and felt he was traveling too far. Additionally, though the user thought the audio contributed to the experience, he felt the segments were too long. Possible solutions for these issues are discussed in section 5.2. For full details, see appendix 4.

Technical Errors

The user is not sure if he is on the right screen. The user should not be able to exit the game without a warning. The user pressed on back button and quit the game. So when he entered it again, the game reset. A possible solution is to have an exit button that would ask the user if he wants to quit the game or not.

Comments worth noting:

- The user is worried of getting too absorbed into the screen and bump into people.
- The user thinks it would be great to play together with other people to for example complete and see who can win the game first.
- The user thinks that the game is much more interesting when it is social and that the user does not have to find the locations alone.
- The user likes that the POI's are in the centre with many interesting places around.



FIGURE 8: Fictional suspects in the City Sleuth

Positive Feedback:

- The user loves the hints and makes a good use of them.
- The user makes a good use of the internal map to find the directions.
- The user loves solving the quiz by looking at the physical clues at the location and interacting with the physical world.

4. Concept

4.1 Description

City Sleuth is a fictional mystery game app. The user's goal is to deduce the perpetrator by piecing together evidence gathered along the way. Our example case begins at the courthouse in Nytorv with a description of the victim and crime scene, as well as the first

suspect, the victim's boyfriend. From there, the user is guided to various real-world locations and learns of others related to the victim, such as her employer, her best friend, and her neighbor, learning of their alibis and feelings about the suspect (see Figure 8). The user also collects evidence in the form of audio clips, images, and videos including, for our example case, an anonymous Tumblr account for which they must find the password (See Figure 9). By making decisions along the way, the user alters the course of the game. By the end, the user is rewarded with correctly determining who the killer is, affirming the user's problem-solving skills and creating an aura of fantasy around an often-frequented location.

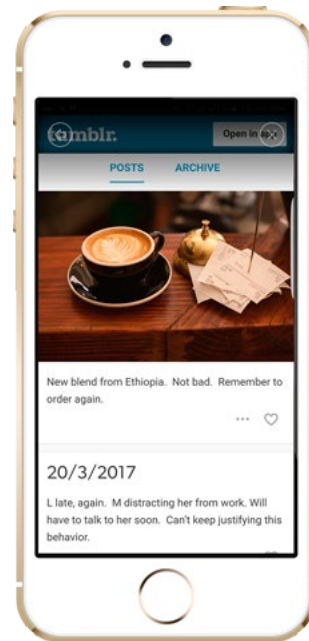


FIGURE 9: Perpetrator's Tumblr account

4.2 Categorization

Our concept could fall into many categories, depending on the perspective with which it is viewed. While the strongest elements are of mystery and exploration games, hints of horror, comedy, and fantasy could be incorporated into the storylines. User generated content could allow for any number of different creative channels. Despite these possible variations, our concept is held together with two common themes vital to the intended experience. The first is the locative experience, the need to base each story on physical locations. This requirement adds physical elements to each story, allowing the application to create new embodied experiences through the story. Our use of location to create a "pervasive game" is a key use of locative media according to De Lange (De Lange, 2010). The second theme is that of genre, of the detective-based game that engages the user in the task of solving mysteries. The platform we provide allows new authors and creations, focusing on how location can be incorporated into the story. We created a story to best demonstrate this with a classic whodunit story climaxing in an unexpected ending.

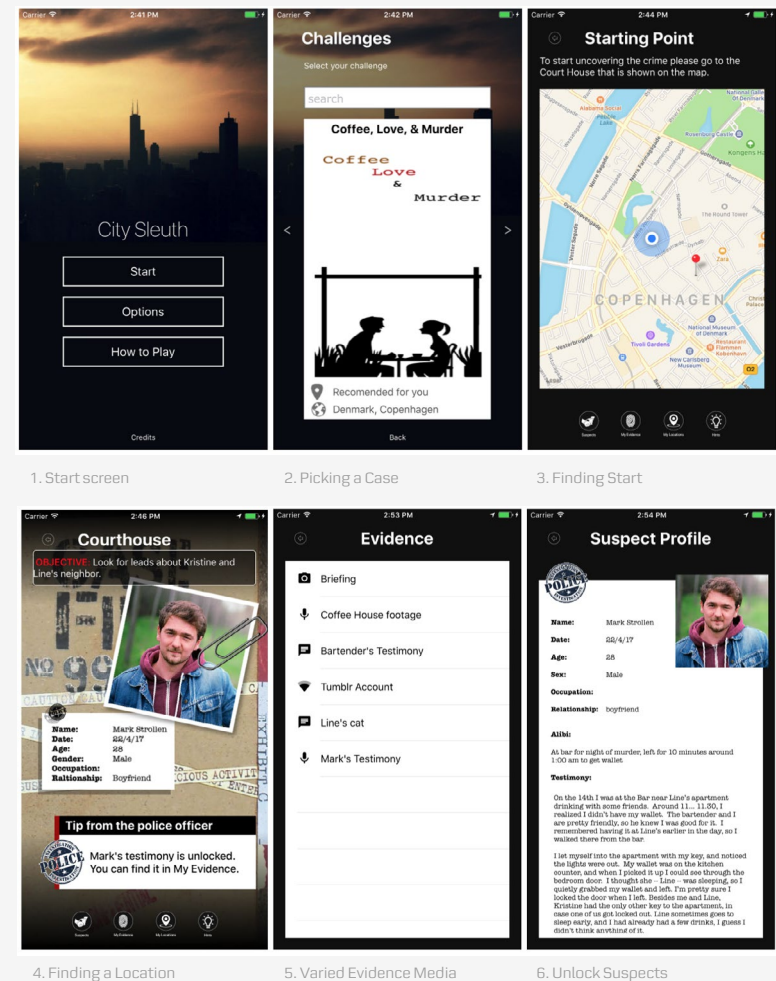


FIGURE 10: City Sleuth functioning prototype

4.3 Functionality

The prototype application was built with simplicity and good design principles in mind. The user is able to choose the case they want, with recommendations based on location (See Figure 10). These features are theoretical right now, as there is only one case we have

created so far. Afterward, a case briefing is presented, hoping to hook the user and provide an introduction into the storyline. The user is directed to the 'jumping off point' for the plot, a location that triggers the first evidence or direction. Once there, the rest of the discovery process within the application follows a similar pattern. The user is provided with an audio file and photo to learn necessary information and indicate their arrival at the correct destination. There are optional hints that can be provided, but more importantly the location can unlock suspect profiles, hints, evidence, and new destinations. The evidence can be any form of media from video and audio to text or web pages. Finally, the experience is set to conclude with a final destination, at which the user must use the evidence they've gathered to solve the mystery. In our case, the mystery to solve is the identity of the murderer.

4.4 Value for User

4.4.1 Motivation

Using the gamer motivation model (Orland, 2015), there are four elements that motivate the player in City Sleuth: immersion, achievement, mastery and creativity. Immersion let the user become someone else in a fictional world. Achievement presents a sense of completion when the user progresses to the new locations. Mastery challenges the user to think strategically. Finally, creativity urges the user to explore the physical world and search for digital evidence.

To reinforce these theoretical concepts, we have two primary feedback mechanisms in our concept. Evidential feedback, provides the player with a feeling of achievement and satisfaction when evidence is unlocked, such as audio and visuals. It is the reward at the end of the challenge that encourages the user onward. The other mechanic is qualitative feedback in the form of an adaptive narrative that responds to the user's choices as the user progresses. Our feedback mechanics guide the user towards the goal by indicating, for example, if the user is going into a wrong direction, or by presenting the user with new evidence as a reward for finding a new location. This feedback system creates a strong motivational base for our game, deliberately rewarding the user. If our feedback is

motivating enough, the player will continue playing, in order to receive more rewards, and continue discovering more components of the narrative.

4.4.2 Intended Experience

As previously stated, our primary desire for the user is their gaining a more varied view of the world around them. By introducing a level of mystery and intrigue into otherwise conventional areas we hope our users will foster a sense of enjoyment associated with places with which they may have had no previous emotional associations whatsoever. Part of this journey is encouraging the user to discover incidental places not explicitly mentioned or used on a case. We want the journey to be just as important as the destination. Finally, we want the user to find a personal sense of pride and achievement in solving the cases, affirming their faith in their problem-solving abilities and deduction skills.

5. Analysis and Discussion

5.1 Defense of Idea

5.1.1 Genre Popularity

One of the reasons our concept brainstorming took the form of a detective/thriller/mystery is the continued growth in popularity of crime and mystery-based media. The popularity of Netflix's documentary series Making a Murderer, which gained an unofficially-tallied 19 million views within a month of its release, is just one example of widely popular true crime entertainment, particularly heinous crimes like murder and rape, is being embraced by a large portion of modern society (Lynch, 2016). Some, like criminology professor Scott Bonn (2016), credit this dark interest in death and destruction to brain chemistry: the adrenaline our system receives when we come into contact with objects or events that frighten us. While this adrenaline release is not limited to true crime or horror media (rollercoasters and kissing are two non-mystery examples), unraveling a mystery or secret also provides a sustained and intellectually rewarding journey other activities may lack.

Outside of the true crime realm, fictional crime media has maintained a steady audience for the last century and a half. In particular, the detective story has been a cultural institution since its introduction in the 19th century by literary greats like Edgar Allen Poe (Thill, 2010). Arthur Conan Doyle's Sherlock Holmes, for example, has maintained such a high degree of popularity for over a century that his infamous intellect currently sustains not one, but two television adaptations of Conan Doyle's work (Elementary and BBC's Sherlock).

There are many popular games in the detective genre. L.A. Noire, for example, was hailed for attempting, and at least partially achieving, a "cinematic" experience that allowed the user to feel the lead character in their own thrilling crime movie (Goldstein, 2011). Even low tech games like Clue can capture the imagination of our inner detectives. Simply put, many people find enjoyment in playing the detective. Putting together evidence and skirting danger is a rewarding experience that, we believe, provides the perfect basis for a compelling media narrative. By combining this foundation with locative media, we wanted to create a way for this investigative desire to be funnelled into the user's figurative backyard.

5.1.2 Ethics of Narrative

The narrative of our concept is not based on any specific crime. This decision does have some logistical benefits. For example, being able to decide the location of our points of interest allows us, and theoretically future creators, the freedom to be more creative in choosing where a "case" can take place. However, as important as the logistical reasoning in developing our concept were ethical considerations as well.

Incorporating real life tragedies into a narrative meant to entertain can easily turn exploitative. True crime media such as documentaries and podcasts walk a thin line. In our group's opinion, a gamified version of a real crime could too easily cross this line. Our narrative follows this precedent of fictional detective storytelling for one primary reason: true crime, as is obvious by the name, is made up of real events involving real people. Using

real-life tragedy to create a game felt ethically dishonest in a way other true crime media did not.

Though our narrative is not based on a real crime, the narrative does contain realistic elements and parallels to real crime trends. A study conducted on FBI homicide statistics over a span of about 10 years showed that women are more likely than men to be murdered by "spouses and intimate acquaintances" (Kellermann, 1992). In more recent data from 2010, the FBI also reported that over several thousand homicides, the perpetrators were overwhelmingly male (Expanded Homicide Data Table 3, 2010). We incorporated these data trends by developing a male murderer (Jens) who was a relatively close acquaintance of his female victim (Lina). We felt by basing our narrative on statistically accurate information, we could more closely emulate a "true crime" atmosphere without utilizing actual crimes.

5.1.3 Ethics of Locative Media

Just as using real events and people in a narrative can raise ethical concerns, so too does utilizing a "real" location. Both users and bystanders have differing comfort levels, which could hamper mediated interactions within unfamiliar places. As Farman (2012) explains, gamers must understand the existing culture of a location in order to effectively navigate it and mask their presence as players. This natural use of a place can be difficult to achieve when the goal of the game is to challenge the user. Users can be confused and not sure where they must go next. Interactions in these social contexts could be awkward for both users and observers.

Another ethical issue arises when the game asks users to go against defined social behaviors in order to progress. In one instance, our story asks the user to participate in a quiz when they arrive at the coffee shop. To complete the quiz, however, the user must go into the coffee shop- an action indicative of wanting to buy something. The café worker might be upset at gamers entering the shop and not buying anything. When asking the owner of the shop about its inclusion in our story, he had no problem with our testing, but mentioned "it would be nice if [users] would buy something." The users who tested the prototype also

indicated a level of awkwardness in the cafe and thought it may be more appropriate to have such interactions in a more neutral location, such as a convenience store, where users can loiter without buying anything immediately.

The other, perhaps most pervasive issue in locative media, is one of safety. If a user is too immersed within the game, they may lose touch with real world dangers. Walking from one place to the next, entranced with the narrative, users may walk into traffic or other pedestrians. Malicious or dangerous routes could be submitted when the app is opened to user-generated content. Thus we face the problem of balancing creative freedom and user immersion with social and ethical concerns– all of which poke holes in the porous “magic circle’ in which games reside” (Farman, 2012, p. 76).

Certain measures must be taken in order to address these issues. Points of interest will have to be approved by those who own them, while, similar to Pokémon GO, we will have to warn users to be alert and careful to potential dangers. User submitted routes will need approval before being available to play. However, while safety of our users must be a priority, it must be balanced with the sense of “real” adventure, without which a game could feel flat, constrained, and boring. One of the reasons Pokémon GO is so engaging is, safety warnings aside, the user has the freedom to make their own decisions and go where they please. There is a certain level of excitement felt when the user is unsure, adding positive tension and intrigue to the storyline, and when properly balanced with reasonable safety protocols, it can make the experience much more enjoyable.

5.2 Testing Results and Future Development

As discussed earlier, two key flaws were presented when testing our prototype in the field: the distance between points of interest and effectively relaying the story at each point. Users seemed to find the locations too far apart, noting that the appeal of exploring was finding the locations and solving the puzzles, not walking several blocks when trying to do so. Therefore, saving time and energy only makes sense when looking at where points of interest should be located relative to each other. The second flaw in our story, that the

length of each audio segment was around two to three minutes, was one we had, in part, considered before testing. Users complained about having to listen to two or three minute segments needing only a few key details mentioned. It does add to the difficulty to have to pick out the important details, but providing the text seems a logical solution. Users did not find the story or length of the audio inherently irritating, but instead wanted a summary or text to refer back to after listening (skipping altogether) the audio clips.

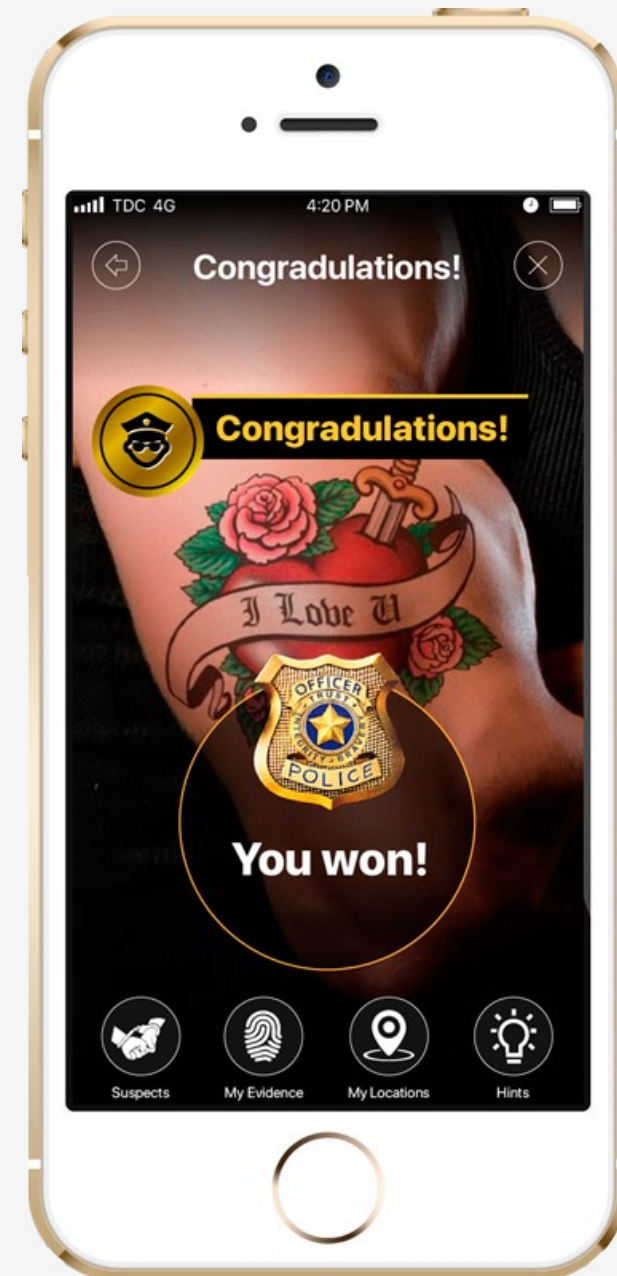
The application had several small implementation flaws as well, which is not surprising after initial user testing and feedback. Future iterations of the product would include simple fixes and features such as improved app navigation, notifications, vibrations and sounds, and indicators when the user is too far off the intended path. Testers did appreciate the map built into the application, but it did not have the features commonly associated with a complete map application, causing some frustration. Adding a bearing and navigation feature to the map could significantly improve the experience of utilizing the map. When arriving at locations, we found the user did not notice they had arrived, as the only indication was a change in background and the the playing of the audio. Our test subjects decided not to use headphones, and the audio was drowned out by city noise most of the time. To better account for this, notifications with some accompanying sounds and vibrations could be utilized to “wake” the user and get their attention. According to the findings of Ma, Mirzamohammadi, and Sani (2017), vibration notifications are the most successful when trying to grab user attention to time sensitive sensory information, such as when they arrive at a point of interest. Users could thus use other apps, text, or listen to music while looking for points of interest and recognize the vibration as indication they have arrived, liberating the user as a participant so they can better use the application how they see fit, without detracting from the game.

However, these smaller issues did not prevent our testers from finding the potential enjoyment and utility from the application. We find that the platform, the storytelling, and the interactive design all bring transformative benefits to the theme of puzzle solving and mystery games. We believe this app has the potential to provide locative content to all

who seek the genre. Users could treasure hunt at the Louvre, catch Jack the Ripper in 19th century London, or solve a haunting in New Orleans– there are endless possibilities for user-generated content. Our initial prototype shows how location can be used to not only enrich storytelling and puzzle games, but add new conceptual layers that would not exist otherwise.

6. Conclusion

City Sleuth adds an additional cultural layer to everyday experience, creating a mysterious, fictional space that exists within the real locations visited by the user. Utilizing Farman's theory of embodiment, the interaction with the fictional narrative and real space creates an experience that places the user front and center in an exploratory game and directly involves them in the decision-making process of solving a crime. Unlike traditional mobile games, the user is not isolated within the story while in real locations but rather utilizes observations and interactions within the real world that break barriers between reality and fiction to advance the mystery. While our initial testing showed us ways to improve our concept via better directing the user and troubleshooting the technical aspects of the app, we are confident that this concept could not only be viable in the larger game industry, but also expand to encompass a large group of content creators and mystery-lovers ready to explore cities and crack cases.



7. References

Bonn, S. (2016). Why We are Drawn to True Crime Shows. [online] Time. Available at: <http://time.com/4172673/true-crime-allure/> [Accessed 20 May 2017].

Cresswell, T. (2004). The Genealogy of Place. Place: A Short Introduction, 1st ed. Hoboken, Wiley-Blackwell, pp. 15-51

de Lange, M. (2010). Moving Circles: mobile media and playful identities. Erasmus University Rotterdam.

eMarketer (2016), Growing Number of Smartphone Users Is Driving Mobile Gaming Consumption, viewed 20 May 2017, <<https://www.emarketer.com/Article/Growing-Number-of-Smartphone-Users-Driving-Mobile-Gaming-Consumption/1013686>>.

Farman, J. (2011). Mobile Interface Theory: Embodied Space and Locative Media, New York: Routledge.

FBI: UCR, (2010). Expanded Homicide Data Table 3. [online] Available at: <https://ucr.fbi.gov/crime-in-the-u.s/2010/crime-in-the-u.s.-2010/tables/10shrtbl03.xls> [Accessed 20 May 2017]

Goldstein, H. (2011). L.A. Noire Review. [online] IGN. Available at <http://www.ign.com/articles/2011/05/16/la-noire-review> [Accessed 20 May 2017]

Gregersen, O. & Poulsen, I.W. (2013). Usability. Copenhagen: Grafisk Litteratur.

Ju, E., & Wagner, C. (1997). 'Personal computer adventure games: their structure, principles, and applicability for training', Newsletter, vol. 28, no. 2, Spring 1997, pp. 78-92.

Jennet, C., Cox, A., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., Walton, A. (2008). Measuring and defining the experience of immersion in games.

Kellermann, A., Mercy, J. (1992). Men, women, and murder: gender-specific differences in rates of fatal violence and victimization.

Koster, R. (2013), Theory of fun for game design, Paraglyph Press, Arizona, pp. 48-79.

Lecture with Fredrik Pålsson, March 22, 2017

Lynch, J. (2016). Over 19 Million Viewers in the U.S. Watched Making a Murderer in its First 25 Days. [online] Adweek. Available at: <http://www.adweek.com/tv-video/over-8-million-viewers-us-watched-making-murderer-its-first-35-days-169602/> [Accessed 20 May 2017].

Ma, Z., Mirzamohammadi, S., Sani, AA. (2017). Understanding Sensor Notifications on Mobile Devices. University of California, Irvine.

McCarthy, N. (2015), America's Favorite Video Game Genres, Statista, viewed on 25 May 2017 < <https://www.statista.com/chart/3599/americas-favorite-video-game-genres/> >

McGonigal, J. (2011), Reality is broken: why games make us better and how they can change the world, Penguin Press, New York, pp. 19-34.

Orland, K. (2015), We took gaming's version of the Myers-Briggs test—and you can, too, arsTECHNICA, Viewed on 27 May, <<https://arstechnica.com/gaming/2015/07/we-took-gamings-version-of-the-myers-briggs-test-and-you-can-too/> >

Richer, F. (2017), The Most Important Gaming Platforms 2017, Statista, viewed 25 May 2017, < <https://www.statista.com/chart/8525/most-important-gaming-platforms/> >

Thill, S. (2010). April 20, 1841: 'Rue Morgue' Paves Way for Detective Genre. [online] Wired. Available at <https://www.wired.com/2010/04/april-20-1841-rue-morgue-paves-way-for-detective-genre/> [Accessed 20 May 2017].

8. Appendix

Appendix 1 - Story and testimonies

Story

The victim is a 25 year old female. College graduate, currently working at a small business (let's just say a coffee shop). Strangled in her home, found in bed, placed under sheets/blankets in what appears to be a posed manner. As there were no similar murders in the area, it's assumed the manner in which the victim was posed was more out of some sort of twisted affection rather than a ritualistic thing that a serial killer might be. Also, no sign of forced entry, so either someone that had a key or that the victim knew. Last people to see her were her coworkers, specifically her one best friend (whom she later texted) and the owner, who was also a friend. Her neighbor also saw her coming home later at night (let's say 11). Time of death around 12.30-1am. She texted best friend beforehand, best friend railing against victim's on again, off again boyfriend. Victim lives in a converted apartment, for which the victim, the boyfriend, and her best friend has a key.

The semi-boyfriend doesn't have a steady job, and the two have had domestic disputes in the past when police have been called, but neither has ever been arrested for assault. The two were together (meaning "on") when the murder happened, and he spent the majority of the evening in a bar very close to the victim's apartment, which can be validated. However, he did leave for 10 minutes when he realized he didn't have his wallet around 1 am to go the apartment to retrieve it. He says he went to the apartment, grabbed the wallet off the kitchen counter, and left immediately, not realizing the victim was dead in the bedroom. This is obviously suspicious. However, the bartender, as well as patrons of the bar do confirm he was only gone for 10 minutes, and with the walk to and from the apartment, it is doubtful he could've committed the crime in the window given. Still, he has a criminal record and, added with the past domestic disturbances, lots of people assume he did it.

However, it is obvious via texts that the best friend (who also had a key to the apartment) that the two had a fair amount of arguments as well, mostly about said boyfriend. More compelling, best friend doesn't have a strong alibi for the time of the murder time as she had no roommate (just staying in watching Netflix). BFF did make a call that pinged a tower a ways away from the victim's apartment, which supports her alibi, but it would've been easy enough to have someone else call from the location while she committed the murder, though admittedly unlikely. Interestingly, though, she said she'd lost her key a few days previously. Victim had complained that she thought Neighbor that saw her come home on night of murder was stalking her, but had no proof. This turned out to be accurate, however,

and the neighbor acknowledged being obsessed with her, though denies ever wanting to harm her. His is the one or two of the four suspects whose fingerprints aren't found in the apartment (in addition to the boss), though he could have easily worn gloves. He has no alibi, but had a medical condition (I'll figure out a specific one, lol, but for now, just assume he has a weak grip) that would have made it very difficult for him to strangle someone.

The boss/owner of the place where the victim worked was a good friend with the victim. He and she talked often, but never really hung out outside of work. They also texted, fairly rarely, and while she never flirted with him, he would occasionally try to flirt with her. The night of the murder, they were the last two at the coffee place. According to him, she left first, after finishing cleaning, and he left shortly after (say, 9 pm) after locking up. His alibi is going to a concert that started at 10 pm and lasted til 2. He posted geo-tagged posters on Instagram that back this up, and different people at the venue recognized him as being there. However, he's lying. He's the murderer. He thinks the Victim deserves better than her boyfriend... namely, him. Like the neighbor, he's become obsessed with the victim, though not by stalking her, etc. However, after the victim's continued rebuffs (as confirmed by text messages and the BFF's testimony) he decided that if he couldn't have her no one could. The night of the murder, he actually left before her, saying he had an emergency, and left her to clean up. This is the clue that breaks the case, and I think it could be shown by CCTV footage or something that shows her still in the cafe after his car is gone or something. He stole the key from the best friend. He first went to the concert venue, where he took the first picture he posted on social media and then went to the victim's house. When the victim let him in, he attacked her in the bedroom, and strangled her with his hands (obviously gloved), and, feeling at least some semblance of shame or whatever, covered her with the blankets before turning off all the lights, and locking the door behind him with the stolen key. He then went back to the concert venue until the end of the evening, dropping somewhere on the best friend's route from her house to the coffee shop, ensuring it could be played off if it was found by the police.

Testimonies

Name: Mark Strollen

Date: 22/4/17

Age: 28

Gender: Male

Occupation:

Relationship to Victim: Boyfriend

Alibi: At bar for night of murder, left for 10 minutes around 1:00 am to get wallet

Testimony: On the night in question (Friday, April 14, 2017), I was at the ___ Bar near the apartment having some drinks. I left around 8:00 pm, and did not see the victim arrive back. I spent several hours there, but when the time came to pay my tab, I realized I did not have my wallet with me and must have left it at the apartment. I went back to get it, noticing the victim was asleep (so I presumed) and quietly retrieved it and returned to the bar. Afterwards, I had one too many drinks and was helped by a friend back to his place where I crashed on the couch. The next day, I returned to the apartment to find the horrific scene. I pulled back the pillow and comforter to find her dead. I called the police immediately and they arrived around 10:45 am. The victim and I have been dating on and off for several years. We often get into heated arguments that end pretty badly. But I would never hurt her or do anything like this. In fact, I know the guy across the street is always looking over her into this apartment, with a weird face that is hard to read.

Name: Kristine Flyne

Date: 19/4/17

Age: 24

Gender: Female

Occupation: Waitress/ Barista

Relationship to Victim: Best Friend, coworker

Alibi: At home watching Netflix

Testimony: On the night in question (Friday, April 14, 2017), I was at home, having taken an early shift at the coffee shop and getting off around 4:00 pm. The victim was still working there with our boss, having to close up. I was tired from a long week of work, and after making myself dinner, was relaxing and watching a movie on netflix. I called my friend to see if she wanted to catch up tomorrow. I made that call at around 9:30 pm. Afterward, I was on facebook for a while and had an uneventful evening until I fell asleep around 11:30 pm. I woke up the next day around 11:00 am and was about to go to the shop when I heard from Mark what had happened. I couldn't move afterward, it seemed impossible..

I have always been close to the victim, and even have a key to her apartment in case she needs me to get something or for various other reasons. We have been best friends since we were kids, and started working at the same coffee house two years ago. After I had heard what happened, I noticed my key to her apartment was missing. I'm not sure when I last used it, or when it was lost.

Name: Jens Brohler

Date: 20/4/17

Age: 34

Gender: Male

Occupation: Coffee Shop Owner

Relationship to Victim: Boss

Alibi: At rock concert

Testimony: I have known the victim for several years, ever since she started working for me four years ago. She is a good employee, always thorough, good with customers, and a delight to have in the shop. On the night in question (Friday, April 14, 2017), we were the last two finishing up for the night and getting ready for the weekend. I was going to a concert later that night, but told her to go ahead as she had put in a good day's work and the concert was close to the shop. She left around 8:45 pm and I closed up and left shortly after, around 9:00 pm. I then attended the concert, and took pictures that I uploaded to my tumblr page when there. After the concert ended, around 2:00 am, I headed home, arriving there around 2:30 am. I did not hear what happened until I opened the shop at our saturday opening of 12:00 pm and the victim and her best friend did not come in for their shifts. I called, and upon hearing what happened, was appalled and understood Kristine's grief. It is a tragedy. She had heard from Mark, who I have never liked. If he ended up doing this I will never forgive him. He didn't deserve her.

Name: Carle Nisine

Age: 32

Gender: Male

Occupation: Web moderator and developer

Relationship to victim: Neighbor

Alibi: At home, on the internet

Testimony: The victim has been my neighbor for several years. We have only talked face to face twice, and she was always very nice. On the night in question (Friday, April 14, 2017), I was at home, not up to much. I spend a lot of free time online, as I am not the most social person. However, I would never do anything like this. I admit to having romantic affections towards the victim, but I am a pacifist and would never hurt anyone. She was a great neighbor and I hope you find whoever did this! I never really trusted that boyfriend of hers, he seemed to have a hot head and I know the police have been to that apartment before.

Scripts

1 - Mark's testimony

On the 14th I was at the Bar near Line's apartment drinking with some friends. Around 11... 11.30, I realized I didn't have my wallet. The bartender and I are pretty friendly, so he knew I was good for it. I remembered having it at Line's earlier in the day, so I walked there from the bar.

I let myself into the apartment with my key, and noticed the lights were out. My wallet was on the kitchen counter, and when I picked it up I could see through the bedroom door. I thought she -- Line -- was sleeping, so I quietly grabbed my wallet and left. I'm pretty sure I locked the door when I left. Besides me and Line, Kristine had the only other key to the apartment, in case one of us got locked out. Line sometimes goes to sleep early, and I had already had a few drinks, I guess I didn't think anything of it.

I got back to the bar, it couldn't have taken more than 15 minutes. Afterwards, I had one too many drinks and my friends helped me back to one of their apartments. I crashed on the couch. The next morning, I returned to Line's apartment... I was worried she'd overslept her alarm, so I tried to wake her up... and... she was just like lying there. I called the police immediately and they arrived twenty minutes later.

Line and I had been dating on and off for several years. We argued sometimes, pretty intensely. But I would never kill her! I was just worried about her. She was really independent, and I was always worried something would happen to her. The city's pretty peaceful, but there are always bad guys looking for vulnerable people. Line would stay late at that coffee place she worked at... you know, the one on Kompagnistraede... with the bread in the window? She insisted on walking home alone and I was worried she would get attacked. People noticed her. People like that weird neighbor of hers. Have you talked to him yet? I'm pretty sure he was stalking her. I could see him looking over at her windows from his apartment. She tried to get a restraining order and everything. You should be talking to him... not me.

I would never hurt Line.

2 - Coffee Shop

JENS

Kristine, can I talk to you for a second?

KRISTINE

Um, yeah, sure. What's going on?

JENS

Sigh, should I assume Line isn't coming in today?

KRISTINE

Oh, well, she'll probably be in? She and Mark had a fight last night, she probably just overslept her alarm.

JENS

That'll be the third or fourth time this month. Line is a great employee, but I can't keep letting her get away with missing so many shifts. You're her best friend right? Could you talk to her? This never happened before... him.

KRISTINE

Don't you think I've tried, Jens? Mark is bad news, I get it.

JENS

I guess it's not enough that he's in here almost every day talking to her when she should be working.

KRISTINE

Yeah, he's a scumbag. (sighs) I think it would have been better if she'd never met him. It's always been a lot, but recently he's gotten even more controlling. I haven't hung out with her, on her own, in a month. You know, when she leaves work early on Friday? It's so she can go to the National Museum and get at least a couple hours to herself.

JENS

Oh, that's where she goes on Fridays?

KRISTINE

Yeah, Mark's always at that awful bar on Fridays, the one with the tacky black paint job near Fresh Bagel, so it's the only time he isn't monitoring her every move.

JENS

You mean the Drunken Flamingo?

KRISTINE

No, no, it's farther up the street from there.

I forget its name.

JENS

So why is she still with him? She should just break it off with him once and for all and find someone more compatible.

KRISTINE

(Sighs)She loves him, I guess. And I guess that doesn't always make sense to people looking from the outside in, like us. And Line does seem happy... most of the time at least. (pause) I still think he's a douchebag. (pause) I'll give Line a call.

JENS

Thanks, Kristine.

3 - Bartender's statement

BARTENDER

Yeah, Mark came in here quite a bit, at least every Friday. He was here the 14th, I'm sure. His team was playing, and he and a few friends were watching the game here. I know he was rough around the edges, but he was always a pretty good guy, at least he was here. Definitely a drinker, but never gave me too much trouble.

It's a shame about Lina, but I can't imagine Mark could've done it. When I say he was only gone for ten minutes that night, I mean he was only gone for ten minutes. He left at 11.30. I have to take a medication at 11.30, and have an alarm set on my phone. When I stepped out back on a break to take it, I saw Mark leaving the bar. My break only lasts 10 minutes, and he was back around the time I went back inside. He'd

mentioned earlier he'd forgotten his wallet, and since Line lived close by, I assumed that's where he'd left it. He definitely had it when he got back; I can show you the receipts for his credit card. His mood didn't seem any different when he came back. He left at closing, which is around 2, with a few of his buddies. He was pretty sloshed. I know he got into some trouble in the past, but he loved Line.

She was a sweetie, I don't know who'd want to hurt her. She'd come in here with Mark occasionally. Always had a smile on. She hung out with that bitch Kristine, but that was only thing I could say was a "fault." (chuckles) The only time I ever had trouble with Mark, here, would be when Kristine or that weird neighbor, Carle, showed up. Kristine'd come in, never when Line was here I don't think, and just start yelling at Mark, who would always yell back. I unofficially banned her from coming in here, but I'd occasionally catch her smoking outside, probably waiting for Mark to leave. She always used the excuse that she was just out buying cigarettes from the 7/11 near here. I mean, I do see her at the 7/11 a lot, but I think she had it in for Mark.

Carle was more annoying than anything else. He'd try to casually sneak into the bar and Mark would always tell him off. I never really asked about it. I didn't want to get more involved.

I really hope you catch who did this. And I really hope it wasn't Mark.

4 - Kristine's Testimony

KRISTINE

Mark and I argued, sure. He was literally scum and treated Line like shit. I am, was, (pauses) her best friend, and thought she deserved the world. And Mark definitely wasn't the world. I always told her she was way out of his league, but I think she just had a thing for bad boys. I mean, every guy she's dated has been in some sort of trouble. Mark was just more long-term than the previous ones. And I mean, she had choices. It wasn't just petty criminals or creepers like Carle, you know, her neighbor? Everyone liked Line.

I can't believe there's even a doubt that Mark did it. I mean, he was in her apartment

on the night of the murder around the time she (stops, she's a little choked up) died!

God, I knew something was going to happen. I mean, Mark had gotten so overprotective as of late, making her check in with him when she went places alone.

Not that I blame him completely, with the messages Line had started getting. The police didn't seem that concerned with them, but they freaked me the hell out. I can send you the screenshots I took if you want.

I think it was probably Carle. I would've already confronted him about it, but with everything that's been going on I just haven't had the energy. You're welcome to talk to him about it. He lives in the brick building across from Line's apartment. Above some wine shop.

My key to Line's apartment went missing around the same time of the messages as well. I looked everywhere for it. Line had scheduled an appointment to get the locks changed... it was, um, supposed to be next week. I actually found the key this morning, outside the cafe. I could've sworn I looked there when I'd initially lost it.

5 - Carle's testimony

CARLE (generally exasperated)

Mark's been talking about me? Of course he is, he thinks by yelling about everyone else the police will forget that he's guilty. It's just sad.

I'll tell you what I told the police. I liked Lina. She was a beautiful, interesting woman.

Maybe I was a little jealous of Mark, but I would never hurt Lina because of that. I know about the restraining order she tried to file. I guess I crossed some Linas, I don't know, I just wanted to be around her. I never threatened her or anything. I can't believe anyone, the police or Mark or whoever, would even suggest that. They might as well be questioning Kristine, you know, she doesn't have an alibi at all for the night of the murder.

The night of Lina's murder, I was here at home alone for most of the night. Lina's lights were on around 10.30. I took a shower a little after that and when I got out, around 11 ish, the lights were out. I saw a man leaving the building, but it was too dark to really make out many details. I think it was probably Mark, but I guess it might've been

someone else.

I miss Lina. She was always so friendly. I'm looking after her cat, Sprinkles, now. I guess Kristine is allergic. She's a sweet cat, but I can't look at her without reminding myself of Lina.

6 - Jens' Confession

JENS

(Sighing) The thing about the police is they always care too late. Mark hurt Line. He hurt her emotionally, and while he may deny it, I saw the bruises. He was a disease. I knew Line before she started dating him. He hurt her, infected her.

Line was the kindest person I've ever met. She could make anyone's day better. She... I... I loved her. But she never saw it. Never saw me. I was like background noise to Line. I didn't matter.

The worst thing is, she went along with Mark's bullshit. Every time they fought, every time he harassed her at work, or texted her, demanding she tell him where she was, she just shrugged and went along. Even when they "split up" it was never for long. She always went back to him. I tried talking to her, had Kristine talk to her. I created that Tumblr account as a last ditch attempt.

I knew she would never change her mind. She was too infatuated with Mark. Mark didn't deserve her, but she would never leave him. So, I... I decided that I would make her leave him, one way or another. I stole Kristine's key. When Line left the cafe early that Friday, I knew she would go to the museum, and I could get to her apartment before she did. I waited for her... When she arrived I tried to reason with her one last time. She refused so... I killed her. Strangled her.

I knew the police would think Mark did it. It was almost too easy.

Mark ruined Line.

I had no choice.

Jens Tumblr account

1/1/2017

New Year, new espresso machine. (pic)

2/4/2017

L looked upset today. Spent most of her shift talking to K. Didn't want to interrupt, but need to discourage in future

2/15/2017

New logo idea?

2/28/2017

Is it too cold for ice coffee? Maybe. Indonesian/Honduras mix perfect when served chilled, though.

20/3/2017

L late, again. M distracting her from work. Will have to talk to her soon. Can't keep justifying this behavior.

3/30/2017

New blend from Ethiopia. Not bad. Remember to order again. (pic)

Location addresses

- Courthouse: Nytorv 25, 1450 København K, Denmark
- Coffee Shop: (Thomas Sandwiches) Kompagnistræde 17, 1208 København K, Denmark
- Bar: (Tørst Bar) Vestergade 17, 1456 København K, Denmark
- 7/11: Frederiksberggade 2, 1459 København K, Denmark
- Carle's/Line's apartments: Teglgårdstræde 4, 1452 København, Denmark (Line's)
- National Museum of Denmark (red herring, ooh lala): Ny Vestergade 10, 1471 København K, Denmark

Plot points

1. Mark's Testimony (starting point) (Court house)
 - Gives clue as to which cafe it is (make a description of the cafe that is obvious to the user)
 - Gives indication and introduces the creepy neighbor - Carle
2. CCTV footage/recording of Kristine & Jens talking (Cafe)
 - Indicates Jens and Kristine as to not liking Lina's dating choices
 - Could also indicate Mark as a 'bad guy' from their perspective
 - Something at the cafe leads to the bar? They might know where Mark likes to grab a drink and gives you a clue
3. Bar, talk to bartender about Mark, he confirms Mark's general timeline. (Bar)
 - Leads to new doubts about Mark
 - Maybe leads to questioning of Kristine and Carle
 - Kristine is a smoker (often steps out to a kiosk near the bar)
4. Connect with Kristine (7/11)
 - She bitches about Mark and Carle
 - Reveals Carle's a creeper
 - Mentions Tumblr account (have to figure out password, password hints help user figure it out)(secret Jens' account)
 - Uncover text messages between the two
 - Ask her about her relationship with Jens (why they were talking)
5. Connect with Carle (Apartment)
 - Tumblr (Jens account)
 - Profile pic is tattoo
 - Similar phrase in DMs
6. Resolution (conclude that Jens killed her)

Appendix 2 - Early sketches and mock-up

Intro

City Sleuth

- Concise outline when magnifying glass
- dark theme

Start settings credits How to play - tutorial

Intro to coffee shop

Briefing


Date: 9/11

The body was found

Accept

Take the case

- Suspects
- Mission Brief an official document with mark.



LINA
BLOG OF THE VICTIM
My favorite places

Start

Select your challenge

Cases

Search

Coffee Shop Murder

@recommended difficulty

DK **** recommended for you

• more cases coming soon

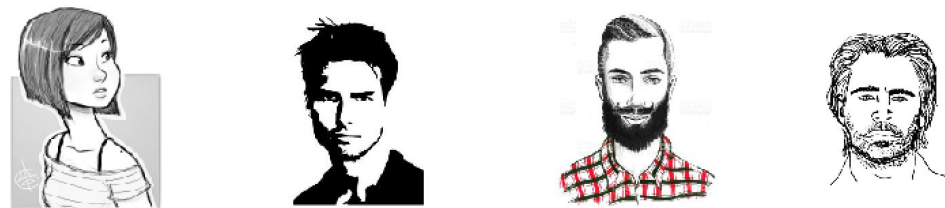
Mark (first avail after video)

Silhouette of person

Locked when clicked

Further investigation

- Name Friend
- =
-
-



KRISTINE MARK JENS CARL

Home screen

Start at the courthouse

- Suspects Testimonies "Current suspects"
- Locations
 - View with map
 - Points you know are viewable
 - Your location
- My Current Evidence
 - initial briefing, murder start here
 - forentics
 - apartment report
 - POI - file cabinet
 - ▲ Coffee shop CCTV 19.04.2017
 - ▲ Apartment Forentics

List / full screen view

- Name
- Picture
- Type of relatie

Detail

Person Footage

Mark's testimony

Photo of Mark

User approaches court house and the

User clicks on play

Unlock: Suspects:

- Mark
- Carl

(Notification to the user as new stuff unlocked)

Hints

"Mark has mentioned a location in his testimony. Do you w Maybe you should check it out"

Home screen

Objective

- "Get testimony of Jens" or
- "Look into Jens"

2 Coffee shop

Objective Investigate the shop

Queuez

Says Coffee Shop found!

Objective "Investigate the shop"

Solve a queuez to get the video tape

Fix "What does painting said about ...? Oh, there is footage!"

Bar (Mark testimony)

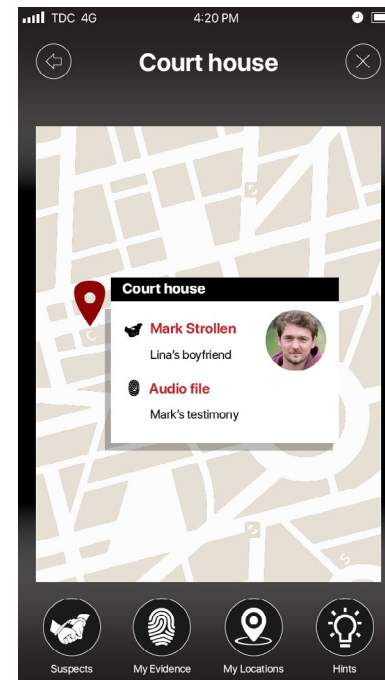
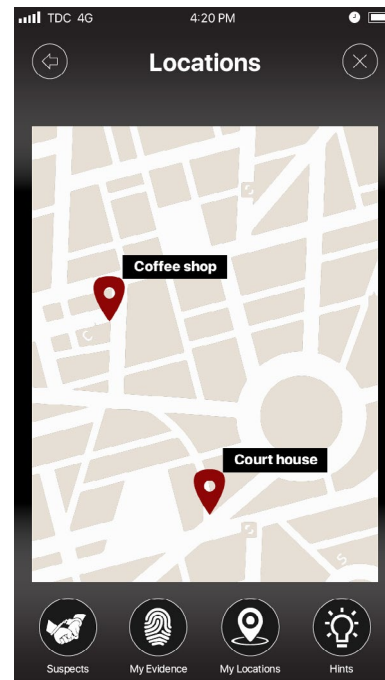
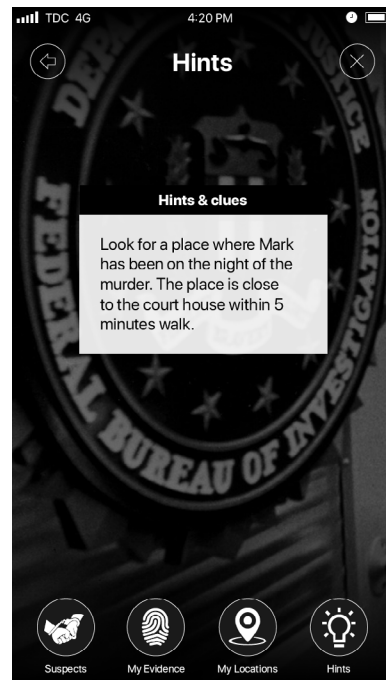
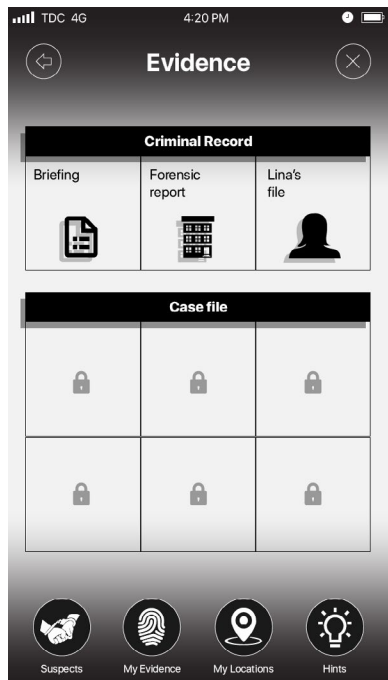
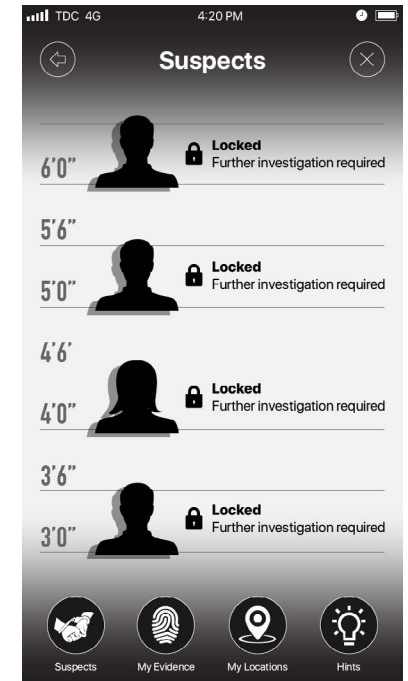
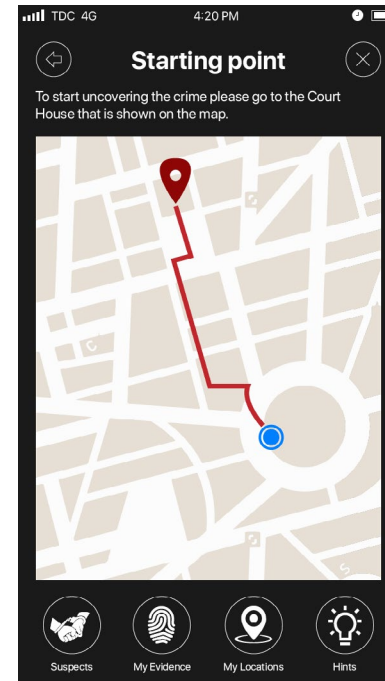
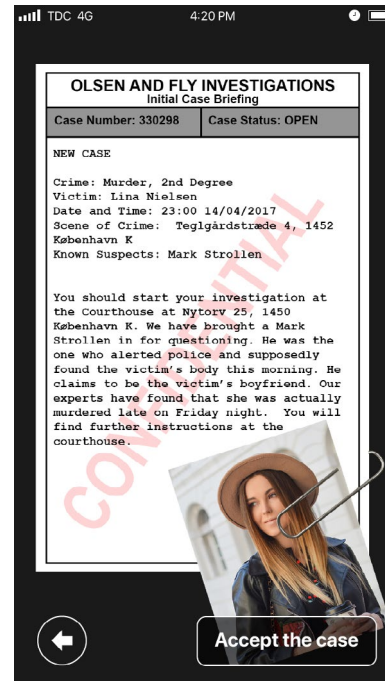
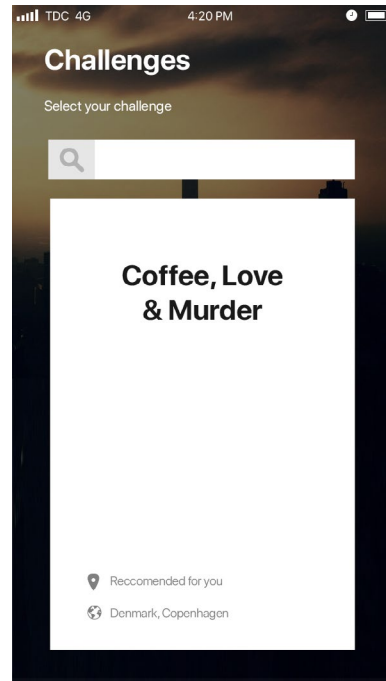
Kristine (Kristine) Laundry (false location) detour

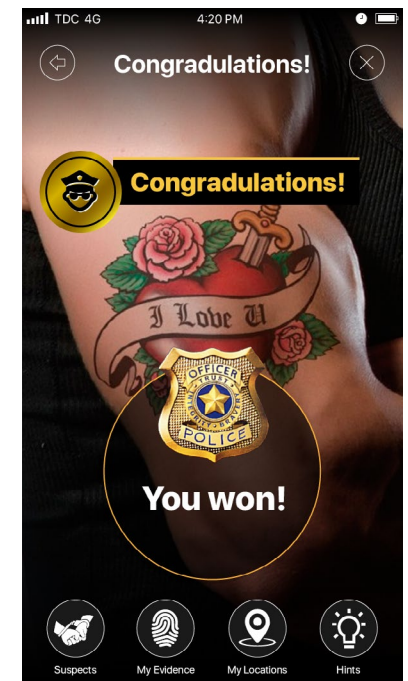
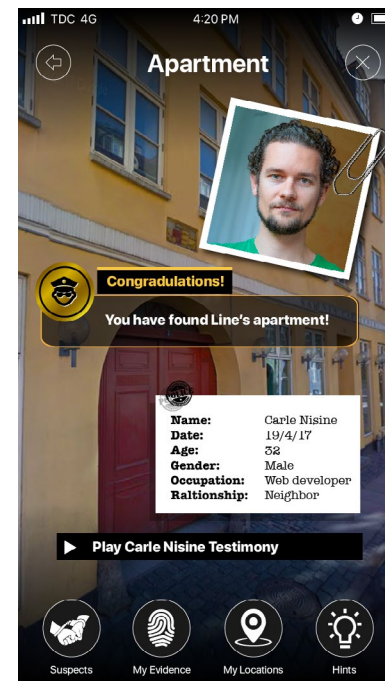
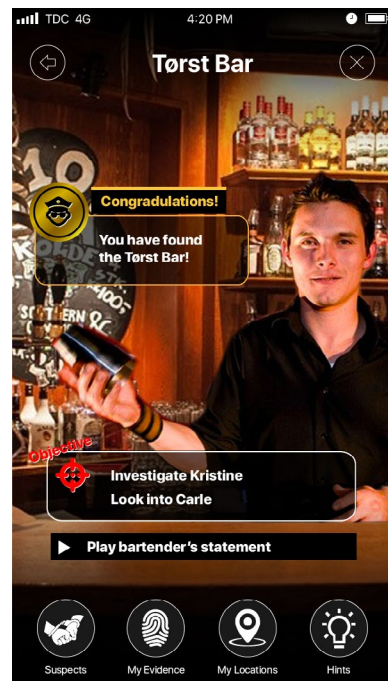
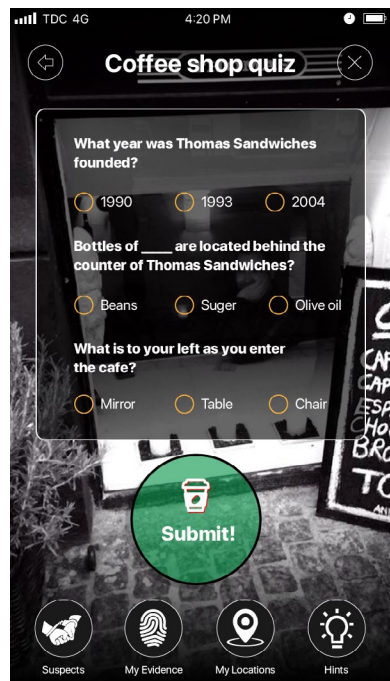
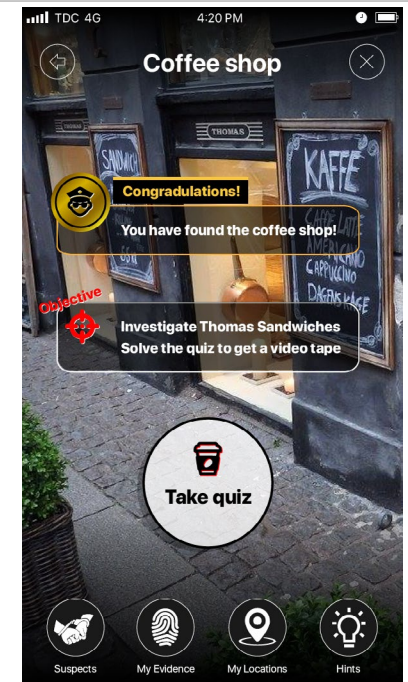
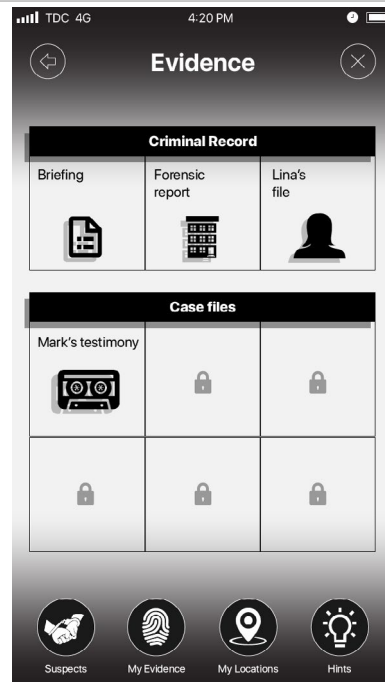
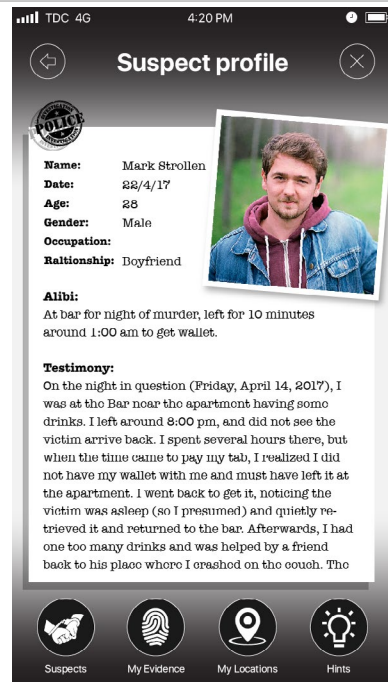
Play footage Evidence: Footage

Hint: Where was Mark at the time of murder?"

2 options for user to go:

- Objective Investigate Kristine and verify Mark's testim!
- Bar
- Laundry - Sorry, nothing here, just dirty underwear





Appendix 3 - User Test observations

- The user doesn't want to listen the whole audio because it is too long.
- The user prefers to have the audio content in a written form because he could not remember everything from the audio file when listening and did not want to replay it.
- Too much text in the case description. The user doesn't want to care about the details. The user is just interested in what to do next.
- The user is confused where to go after POI No.1 (court house). Shortly afterwards, he found out that he had to find a cafe.
- The user expects to find POI No.2 (the coffee shop) just nearby POI No.1 in the area visible from the POI No.1 (court house). So when he walks to the nearest coffee shop, he doesn't understand why nothing happens. He walks back to POI No.1. Now, he uses the hints to get help.
- After he got a hint of the street, he first looked at the internal map, so he finds the street on the map. A little confused without directions.
- The user wishes more visual hints to find the direction.
- The user tries to find the cafe, looking around. He is looking for a clue which says "a bread in the window". He saw bread in a window of a restaurant, but realised it is not the place since it is not a coffee shop
- The user would wish to know if he is on a right track.
- The user wants a hint if he goes too far away. He wants to get a reminder when he found the place. He wants a notification that will tell him he found it. So the phone vibrates and make a sound.
- Now the user is taking the quiz. The user likes the idea of finding the real clues in the physical world.
- The user recognised that there are two options at the coffee shop. He is not sure what to do now. He goes to the hints and see the objective. Now he sees that he should identify Mark's testimony. He doesn't remember who is Mark. Now he is not sure what to do. The user wants more hints and less talking. The user doesn't want to listen again to the dialogue. The user decides to explore both places - the bar and the National Museum.
- The user thinks the poi are too far away from each other. The user proposes to have more hints between poi's. Would be better to have all the POI's on one street.
- The user is worried of getting too absorbed into the screen and bump into people.
- The user expects the pop-up to pop up when he is by the location. The user doesn't understand why the new evidence doesn't pop up.
- The user thinks that it would be cool to play together with others to see who wins.
- The user thinks it is irritating to have an intended fake location when there is nothing there considering the long distance he walked.
- Now the user is thinking of the details about the other location. He is trying to remember what they said about the location. He is googling for the Drunken flamingo location. The user thinks it is too far. He realises that it would have been better to go there first.
- The user would probably drop the app for getting nothing when finding a point and getting nothing there.
- The user suggest to collect points as the form of a reward. Or maybe a form of congratulations that the location is investigate it and marked on the list so the user gets a sense of reward for the job done.
- The user thinks that the game is much more interesting when it is social and that the user does not have to find the locations alone.
- Generally, the user is happy that the POI's are in the centre with many interesting places around.
- The fun in the app is the actual discovery and not the walking, therefore the user prefers to have the place is close to each other to keep rewarded
- The user found the drunken flamingo. The user doesn't want to listen to audio again. Wishes to have a sum up of audio.
- The user complains that there are many places that might have black paint job. The user walks up the street and looking for the bar.
- The clue to the bar was not clear enough. The user only found the location because the poi popped up indicating that he found one.

- The user found out that there is a next clue with 7/11. The user is a little confused with the names. The user assumes that it is 7/11 just nearby. He walks to 7/11. He assumes that it must be the most central 7-Eleven because he thinks it is the main one.
- The user is not sure if he is on the right screen. The user should not be able to exit the game without a warning. What happen is that the user pressed on back button and quit the game. So when he entered it again, the game reset. Solution is to have an exit button that would ask the user if he wants to quit the game or not.
- The user thinks there is not enough clues who killed Lina. He proposes to have a post on Tumblr that he is unhappy that Lina is seeing Mark. The user wants a hint that the Tumblr is connected to Thomas sandwiches. The user proposes to find the final clues by the coffee shop. Also a screenshot of the messages should be shown in the app.
- The user wishes to have more details and clues after listening to the audio. Too much irrelevant.
- Add the text to the audio - a short version of what is important
- Generally, the app works. The user likes the idea with few choices about locations.
- The user proposes to have more GPS things on the map. For example have a little indication is the user is far away or not from the location.

Appendix 4 - User Test Feedback

No.	Concern/problem/issue	Solution
1	The audio files are too long. The user did not want to replay them.	After the evidence is unlocked, to have an audio in a written form.
2	The case description is too long. The user wants to have a short summary of what is important.	Implement a hint option that gives the summary of only relevant information for solving the case.
3	The user is confused with the directions and wants to know if he is on the right track. Often, he starts walking in a complete wrong direction and suggests to have some kind of feedback to indicate that he is on the right track, otherwise he says he will quickly lose the interest. The user proposes to have more GPS things on the map. For example, have a little indication is the user is far away or not from the location.	To implement an indication bar that gives a colour feedback to the user if he is on a wrong path. For example, when the user leaves the POI's radius area of 300 meters, the indication bar will turn red, as he approaches closer it will turn yellow and when he is on the distance less than 50 meters it will turn green.
4	The user doesn't like the fact that he doesn't get some kind of notification when he finds the POIs.	Implement a sound and vibration feature that notifies the user when the location is found, so the user doesn't have to constantly look at the screen or be on the home screen.
5	The user doesn't want to listen to the audio files over and over again in case he doesn't remember something. The user wants more hints and less talking. The user wishes to have more details and clues after listening to the audio. Too much irrelevant.	Implement a summarised version of the audio files that only include the relevant information.
6	He expects to have more hints between POIs.	Have visual hints on the map view.
7	The user thinks that POIs are are too far away from each other. The fun in the app is the actual discovery and not the walking, therefore the user prefers to have the place is close to each other to keep rewarded	Make POIs close to each other. Create more POIs and give more rewards to the user. For example, place them on one street and give more evidence and hints for other locations.
8	The user thinks it is irritating to have a fake POI, if he doesn't get anything there. He would drop the app for getting nothing when finding the POI and not getting any reward there.	Add a reward to the fake location (National Museum), so the user gets a reward for accomplishing something and finding the location. For example, the reward can be in a form of congratulations that the location is investigated and marked on the police list about the locations investigated. So, the user gets a sense of reward for the job done.
9	The clue to the bar was not clear enough. The user only found the location because the poi popped up indicating that he found one.	Make a better clue for the bar. For example, say that it has marquees above the windows with colourful lamps. Also, the pain is not black but grey.
10	The user thinks there is not enough clues who killed Lina. The user wants a hint that the Tumblr is connected to Thomas sandwiches.	To have a post on Tumblr that he is unhappy that Lina is seeing Mark. The user proposes to find the final clues by the coffee shop. Also, a screenshot of the messages should be shown in the app.

User Test

