

Catch&Run

Semester project for A4M39NUR

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1 Introduction

Catch&Run is an outdoor GPS game played with GPS-enabled cell phones. People are chasing each other to gain virtual money. Full description of the game is in my bachelor's thesis (<http://edux2.felk.cvut.cz/car/>). In this project I will focus on changing existing simple user interface for Java phones to advanced touch-oriented interface for Android phones.

2 User Research

I have performed an user research with 5 people who were selected using screener.

2.1 Screener

2.1.1 Target group

My target group are people who like to be outdoor, have some experience with outdoor games and have positive attitude to mobile technologies.

I have asked potential candidates these questions:

- Are you more indoor or outdoor person?
- Have you attended summer camps or similar activities?
- Have you heard about geocaching?
- What's your attitude to running?
- Have you ever used GPS?
- What kind of phone do you have?

- Do you use internet in your phone?

Candidates had to answer correctly or semi-correctly all the questions in order to be selected for a interview.

2.1.2 Public part

1. Are you more indoor or outdoor person?
 - I like to spend most of my time outside
 - I would like to spend more time outside, but I don't have time
 - I mostly keep myself indoors and I'm comfortable with it
2. Have you attended summer camps or similar activities?
 - Yes I have been to many summer camps in the nature
 - I was at some summer camp when I was young, I don't remember it much
 - Summer camps were never my thing
3. Have you heard about geocaching?
 - Of course, I have already found some caches
 - I have heard about it, but never had opportunity to try it
 - What is that?
4. What's your attitude to running?
 - I like to run just for the fun of it
 - I don't run when I don't have to, but I don't mind
 - I don't like running and sports where you have to run a lot
5. Have you ever used GPS?
 - Yes it's a great invention, I use it often
 - I used it couple of times for example in car
 - I don't trust GPS, I rely on myself
6. What kind of phone do you have?
 - Android or iPhone
 - Smartphone from Nokia, Samsung, ...
 - I don't know it's just for calls and SMS
7. Do you use internet in your phone?

- Yes I use internet in my phone on daily basis
- I use it few times in month, but I don't want to pay much for it
- I don't need it, internet in my PC is enough

2.2 Interview topics

I have performed behavioral interview. I have prepared topics and some sample questions, but I was not limited by this questions. Sometimes we discussed more aspects and new questions have risen.

Topics and sample questions:

- **outdoor games experience** - What outdoor games have you tried and liked? What element of these games did you like most?
- **technical matters** - what kind of phone do you have? How often you use internet in your phone? For what? Do you have GPS in your phone? How often do you use it? Do you like touch-screen interface or keyboard interface?
- **principles of Catch&Run** - Do you like running? Do you like games when you need to catch somebody or run from somebody? How do you orientate in the nature or city?
- **Catch&Run itself (after explanation of the rules)** - Would you try this game? What role you found most appealing (Idler, Catcher, Runner)? Can you imagine yourself playing it on regular basis? When you have time or planned events? With random people or friends? Do you have any suggestions how to improve the game? What extension you think will make the game more appealing - virtual treasures in the area or possibility to buy upgrades like guns for game money?

2.3 Interview transcript summaries

I have tried to pick up people who comply with my requirements but also represent different social groups. I have one working young men, one university-studying female, one working middle-aged men with family, another university student and one child. I have interviewed following 5 people:

2.3.1 Male, 23, software development team leader

- He does geocaching every week and likes that he can get outside because of it
- He attended lot of summer camps, he liked most the outdoor game "Smugglers" (one group smuggles something, other group is trying to catch them) and "Castles" (groups are trying to capture and hold castles in the forest)

- He has Android Phone - Nexus One. He uses internet in phone every day for many apps - Twitter, Calendar, Maps, Web, ...
- He is not afraid of unstable versions of software when he can see new features quickly, he experiments with custom ROMs
- He doesn't like to run very much, but when it's part of the game it's ok
- He is able to orientate in the nature, he combines paper map and GPS
- He would like to try Catch&Run very much, maybe even on regular basis
- His favorite role would be Catcher
- He likes the idea that he can meet new people in the game
- He would welcome notifications for nearby games, he is bad at planning things
- From two extensions he would pick upgrades for game money

2.3.2 Female, 20, pharmacy student

- She does geocaching occasionally with her boyfriend
- She has been to some summer camps, she liked orienteering runs
- She owns Nokia 6110 Navigator and is comfortable, but she could buy a touch-screen device in the future
- She uses internet in her phone few times in a month, but she pays for the data, so she is cautious. She uses public transportation queries, email and Google search there.
- She uses GPS mostly in car, in geocaching her boyfriend operates GPS
- She likes to run and running-based games, she likes to be chased rather than chase someone.
- She is good in orientation, uses local landmarks and paper maps
- She would like to try Catch&Run, maximally once a month
- Her favorite role would be Runner
- She would prefer non-planned game sessions, both with random people and friends
- She suggested that temporary invisibility could be a cool feature
- From two extensions she would pick the virtual treasure

2.3.3 Male, 30, project manager

- He does geocaching about twice a month
- He attended many summer camps, he liked most the game "Smugglers". The most appealing element of this game is sneaking quietly.
- He owns Android phone HTC Desire, he uses internet every day for news and e-mail
- He uses GPS in phone every day in car
- He loves touch-screen, but he would prefer hardware keyboard for text input
- He doesn't mind running, likes action games like airsoft or paintball
- He is good at orientation in the nature, but bad in the city. He uses paper map and GPS just as backup.
- He is interested in Catch&Run but he doubts he could find a time for it regularly
- His favorite role would be Catcher
- Only way he can attend is when the event is planned and it's with friends
- He suggested variation of the game when one group of players are sneaking inside area and others have to stop them
- From two extensions he would pick a virtual treasure, he thinks it would give players a purpose

2.3.4 Male, 23, economics student

- He does geocaching often, he also does orienteering. He is competitive.
- He attended some summer camps, he liked the game "Castles", because there was lot of strategy involved
- He owns Nokia 6110 Navigator, but he strongly considers buying an Android phone - he like touch-screen devices
- He uses phone internet every day - for e-mails, news, geocaching
- He uses GPS in his phone minimal once a week
- He like to run, because he does many sports
- In running games, he likes to be the one who chases others

- For orientation he uses both paper and electronic maps, he compares them to real landmarks
- He was excited about Catch&Run, he thinks he could play it once a month
- His favorite role would be Runner, because he thinks it's easier for the runner
- He would like games to be spontaneous and non-organized
- He thinks guns will just complicate the game, but virtual treasure is a good idea

2.3.5 Male, 11, pupil of elementary school

- He likes to be in the nature - he does airsoft and sometimes geocaching
- He likes to sneak, that's why his favorite summer camp game is "Smugglers"
- He owns Nokia 5530 with touch-screen, he loves touch-screens
- He uses internet in his phone, but just over Wifi, He downloads games from Ovi store, uses Facebook
- He doesn't have GPS in his phone and use just mum's GPS in car
- He likes to run as he likes sports
- Orientation is not a problem, but he needs to know the neighborhood a little
- For navigation he prefers straight arrow in GPS rather than map
- He would try Catch&Run, he doesn't know how often
- His favorite role would be Runner, because he thinks it's too easy for the runner - he would decrease chase starting distance from 200 m to 50 m
- He would like to be notified about nearby games, no planning
- He prefers virtual treasure over upgrades

2.4 Summary of knowledge gained

- All participants found at least some geocaches
- Most participants liked the summer camp game "Smugglers", where major element is sneaking. Some liked game "Castles" where major element is strategy.
- All participants already have Android phone or plan to get it and they like touch-screen interface.

- All participants use phone internet, some of them every day
- All participants are familiar with GPS, most of them with GPS in phone
- All participants have no problem running, some of them love it
- Orientation is not a problem for participants
- All of participants found Catch&Run interesting and they would try it, most of them thinks they can do it on regular basis
- 3 of participants would like to be Runner, 2 of them Catcher, there might be some advantages for the runner
- 4 of participants would like the game to be spontaneous and be notified about nearby game, just one would like it to be planned and with friends
- 4 of participants would like virtual treasure rather than upgrades for game money, some say upgrades would just complicate the game

2.5 Recommendation

- Technological barriers for the game like good phone, phone internet and GPS are getting smaller, there will be enough people to play the game.
- Running and orientation should not be a problem for most people.
- It seems that game concept is appealing, easy to understand and people will like it.
- I should introduce sneaking which can be represented by "invisibility" in the game. It can combined with possible technical problems resolution - player will have limited time of "invisible" time. He can choose to be invisible or he is invisible due to technical problems. Both Runner and Catcher can go invisible, which also brings more strategy in the game.
- I should work not only on planned games management but also on spontaneous games and notification of players about nearby games.
- I should implement virtual treasure extension rather than upgrades for game money.

3 Requirements and analysis

Based on information I gained from user research, I have created use-cases described by scenarios. Based on this, I have designed a system using HTA method.

3.1 Use-cases

Use-cases created from user research are shown in **Figure 1** and described by scenarios later.

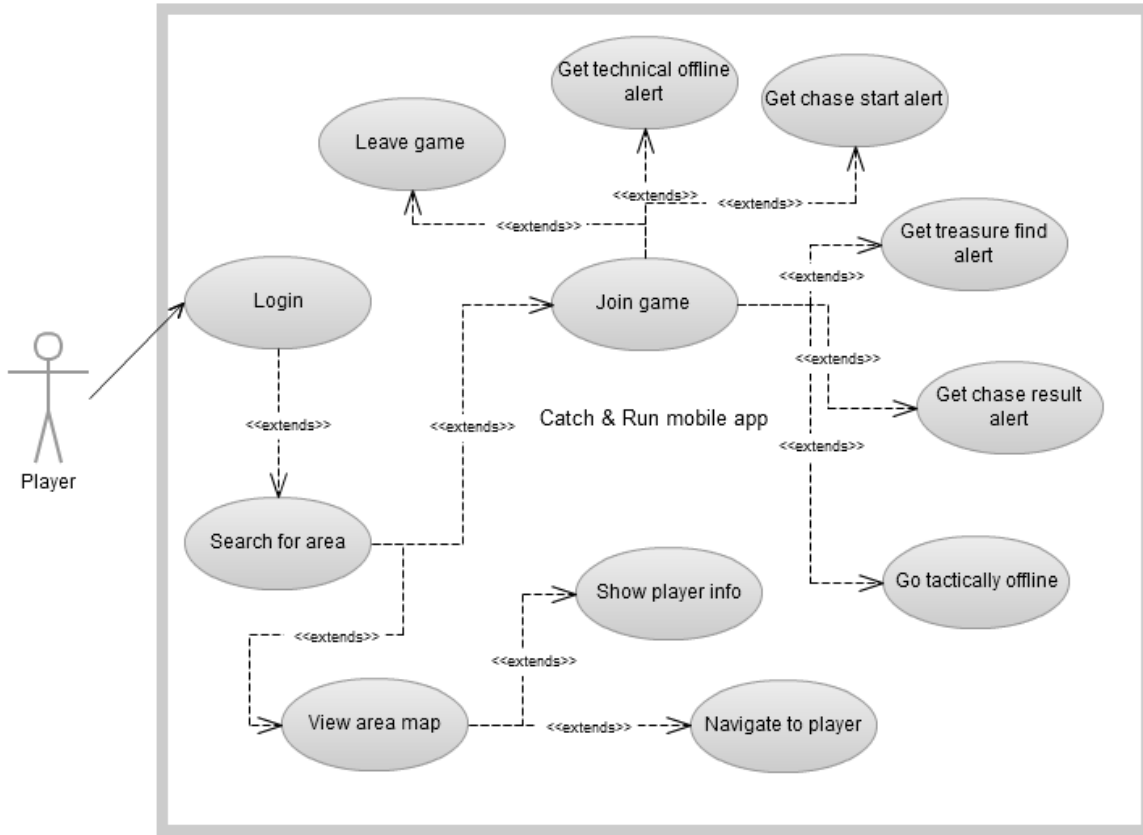


Figure 1: Use cases for mobile part of Catch&Run

3.2 Scenarios

3.2.1 Login

User fills in username and password which was previously acquired on project's website. When the credentials are valid, whole functionality of the application is enabled.

3.2.2 Search for area

Right after successful login, area search is initiated. Phone automatically detects it's location and user see list of areas which are closest to him. User can see name of the area, distance from his location and how many players are currently playing.

3.2.3 View area map

When player clicks at some area in area list, map of the area is loaded.

Map is the most important component of the application. It shows following information:

- Google maps street or satellite as background
- Border of the area
- Player's current location
- Icons of the other players (different icons for the roles)
- Player's status (role, distance to target, money)
- Icon of the treasure

User can zoom in, zoom out and pan with the map.

3.2.4 Show player info

While browsing the map, user can tap on icons of the players. A bubble of information opens above the map displaying player's:

- Nick
- Role
- Distance
- Money

3.2.5 Navigate to player

After tapping on icon of some player on map, user can launch navigation towards this player. In case chase is started with some player, navigation is started automatically. Navigation looks like dotted line from current location to the player.

3.2.6 Join game

When player browses the map and is physically inside the game, he automatically joins the game. After joining the game, his role is idler and he can become chaser or runner.

3.2.7 Leave game

User can choose to leave game when he has previously joined the game and is in idler state. If he leaves the game as runner or chaser, he automatically loses current chase.

3.2.8 Get technical offline alert

When player loses GPS signal or internet connection, he is notified that he is currently offline for technical reasons. Player can see how much offline time has he left before leaving the game and losing any current chases.

3.2.9 Get chase start alert

When player is in idler state and approaches another idler, chase starts and both of the players are notified. One becomes runner and the other one chaser. Navigation to the target is started automatically.

3.2.10 Get treasure find alert

When player is in idler state and approaches the treasure, player is notified about finding the treasure and how much money it contained.

3.2.11 Get chase result alert

When chase ends for any reason, both runner and chaser are notified about the result. Both see who won and how much money was won/lost. Navigation to the target is disabled.

3.2.12 Go tactically offline

When player is in the game, he can decide to go tactically offline. While offline, he is invisible to others on the map (only last known location is visible). Each player has limited amount of offline time. Idler doesn't earn any money in offline mode. In case of running out of offline time, player leaves the game and loses any current chases.

3.3 Hierarchical Task Analysis

Hierarchical Task Analysis (HTA) is a method for formally describe tasks user can do in the future system. HTA diagram is displayed in [Figure 2](#).

3.3.1 Plans

Plans describes the order of the tasks from HTA for achieving certain goal. Here are plans for most common goals:

Login and see nearby areas

- 1.1 Type username
- 1.2 Type password
- 1.3 Login

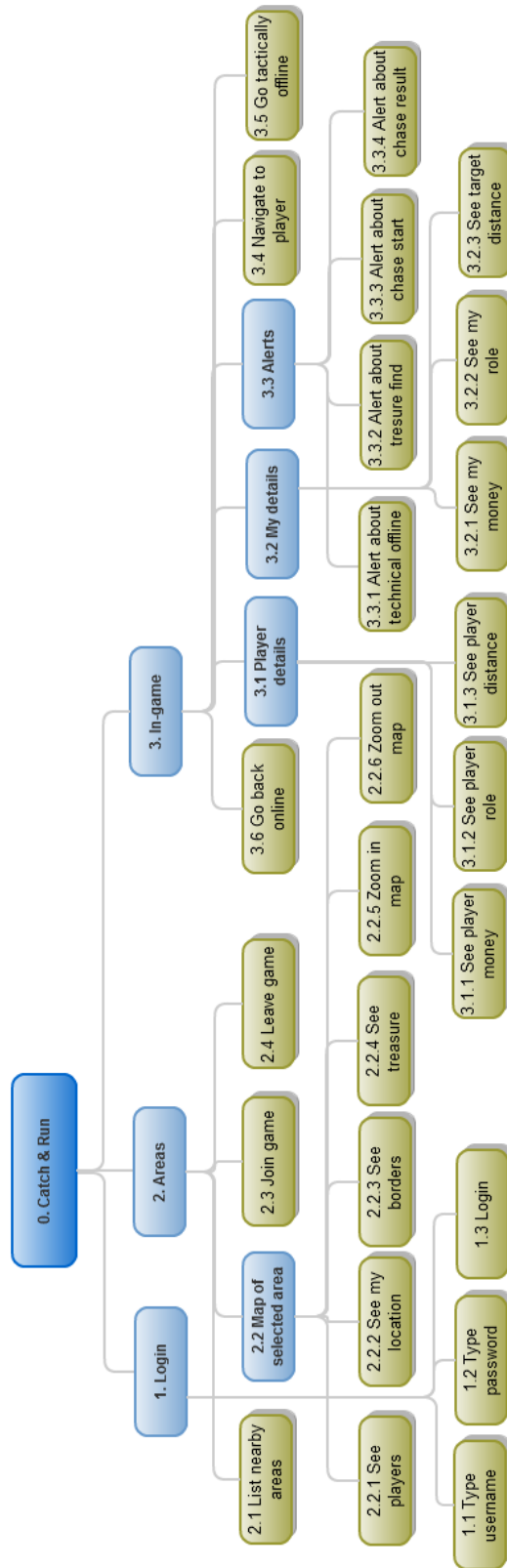


Figure 2: HTA for Catch&Run mobile application

- 2.1 List nearby areas

See area map and walk into area to join the game

- 2.1 List nearby areas
- 2.2.2 See my location
- 2.2.3 See borders
- 2.2.1 See players
- 2.2.4 See treasure
- 2.3 Join game

Try to find treasure as idler and avoid others

- 2.3 Join game
- 3.2.1 See my money
- 3.2.2 See my role
- 2.2.1 See players
- 3.3.2 Alert about treasure find

Engage in a chase and try to use tactical offline as advantage

- 2.3 Join game
- 3.1.1 See player money
- 3.1.2 See player role
- 3.1.3 See player distance
- 3.3.3 Alert about chase start
- 3.4 Navigate to player
- 3.2.2 See my role
- 3.2.3 See target distance
- 3.5 Go tactically offline
- 3.6 Go back online
- 3.3.4 Alert about chase result
- 3.2.1 See my money

4 Low-fidelity prototype

I have created a paper prototype based on previous analysis. I have tested the prototype with 7 users and discovered some problems in user interface.

4.1 Covered scenarios

I have decided that prototype should cover following tasks for the user:

1. Launch application and discover nearest area
2. Find out information (money for example) about a player inside the area
3. Go inside area and become idler
4. Engage in chase as catcher and catch player Honza123
5. Engage in chase as runner and during running, use the hiding function as strategic advantage
6. Find a treasure as idler
7. Leave current game
8. Exit application

4.2 Prototype creation

I have used a tool Balsamiq Mockup (<http://balsamiq.com>) to create the prototype. I have also used Android Controls for Balsamiq from <http://mockupstogo.net/android-controls>. Result can be seen in [Figure 3](#) and [Figure 4](#).

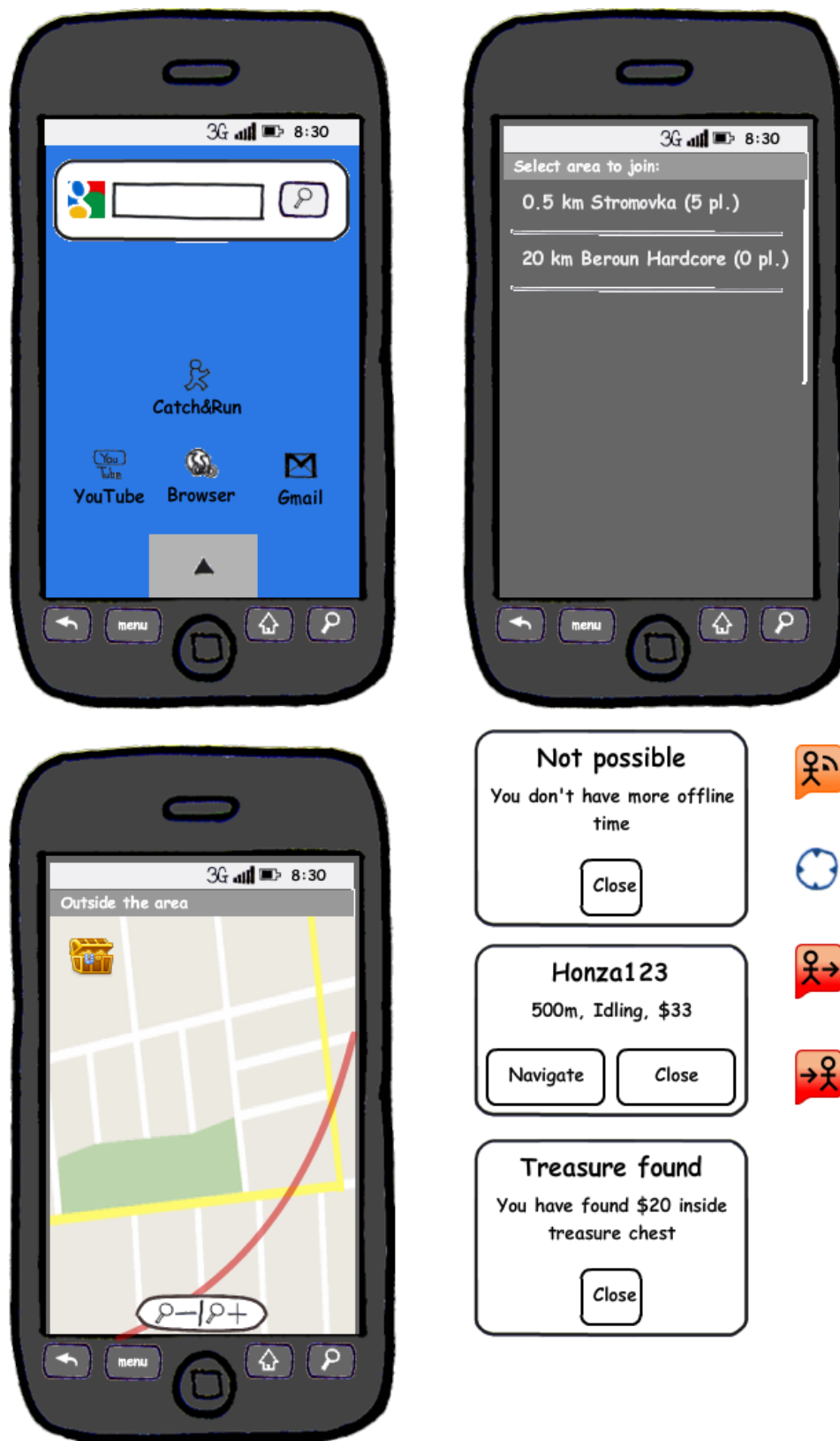


Figure 3: First part of paper prototype created using Balsamiq Mockup

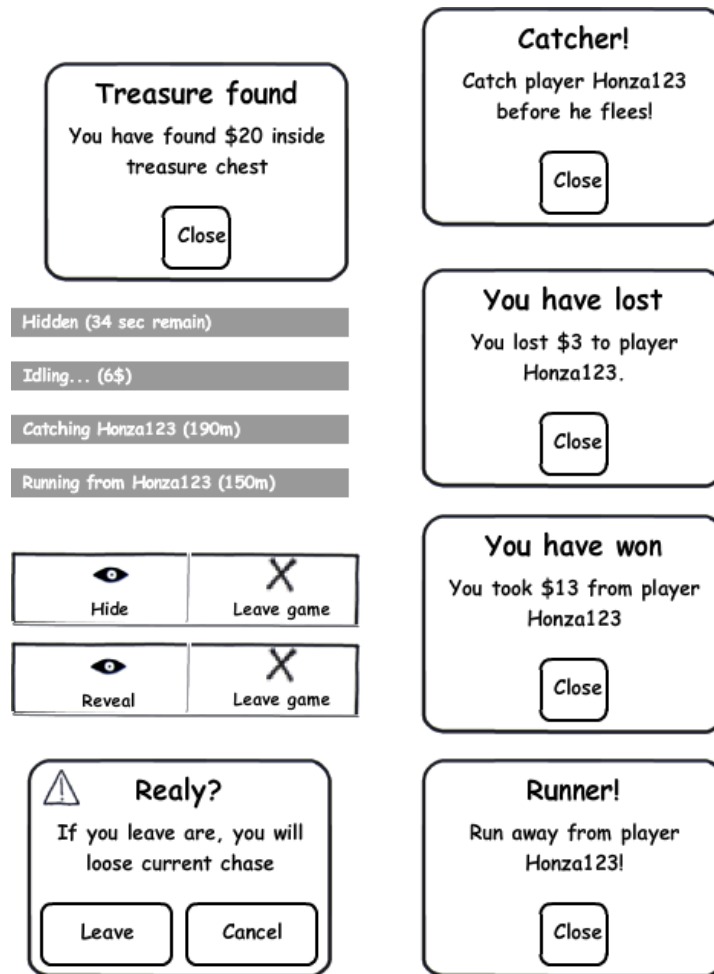


Figure 4: Second part of paper prototype created using Balsamiq Mockup

4.3 Goal of evaluation

I wanted to discover following:

1. Can users apply explained game rules?
2. Is the screen flow appropriate and matches what are Android users used to?
3. Is the map layout clear? Can users identify area border and treasure?
4. Can users identify icons of my location, idler, runner and catcher?
5. Do users read top title bar?
6. Should the Hide button be on the screen all the time or in menu?
7. Are there some other problems I didn't think of?

4.4 Test setup

I have printed all the materials from Balsamiq and cropped it with scissors. I faced one big issue - how to emulate movement of the player and opponents during the test. I have created what I call "board game setup". I have glued icons of player and opponents to pieces from one actual board game. This way it's easy to move players on the board (the screen with map). Whole setup is displayed in [Figure 5](#).

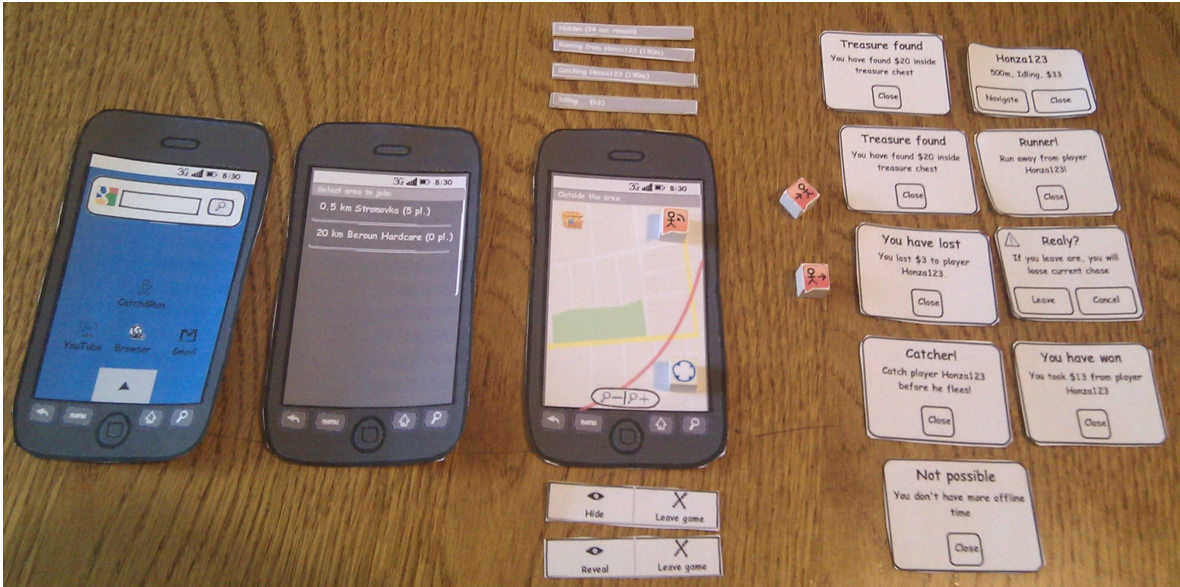


Figure 5: "Board game" setup for the test - icons glued to pieces from actual board game

4.5 Test execution

I have tested the prototype with 7 people. For each participant, I have:

- Explained rules of the game and focused on new features (treasure and hiding)
- Reminded Android UI specifics - what buttons BACK, HOME and MENU do.
- Explained "board game" method for simulating player movement
 - Participant could move with piece marking his position
 - All pieces could move only along the streets (on the map). Maximum distance of one move is to nearest intersection. In the park (green area), they could move how they wanted
 - I was controlling movement of opponent, following same rules
 - We played in turns - player moved, opponent moved and so on

- We followed scenarios from subsection 4.1
- I was taking notes on participant's progress and encountered problems
- At the end I have asked participant what would he change in user interface

Photos from the test can be seen in Figure 6 and Figure 7.

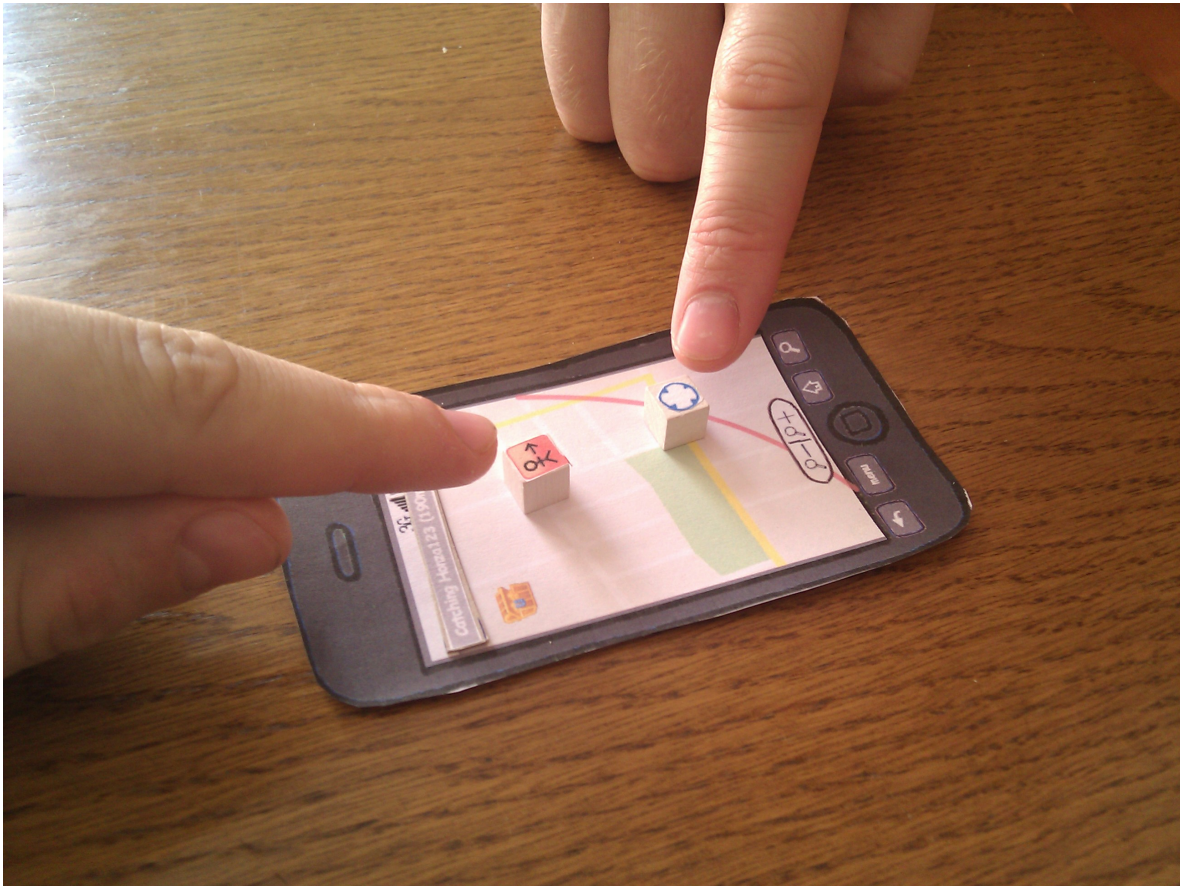


Figure 6: In the middle of test execution - we are using "boardgame method" for simulated movement. In this picture player is trying to catch runner.

4.6 Test findings

All 7 test participants successfully completed all scenarios from subsection 4.1. Some of them lost in simulated chases, but chases were completed. Here are most interesting findings from each test:

4.6.1 Male, 23, software development team leader

- In scenario 5 he started hiding even when he wasn't in chase yet

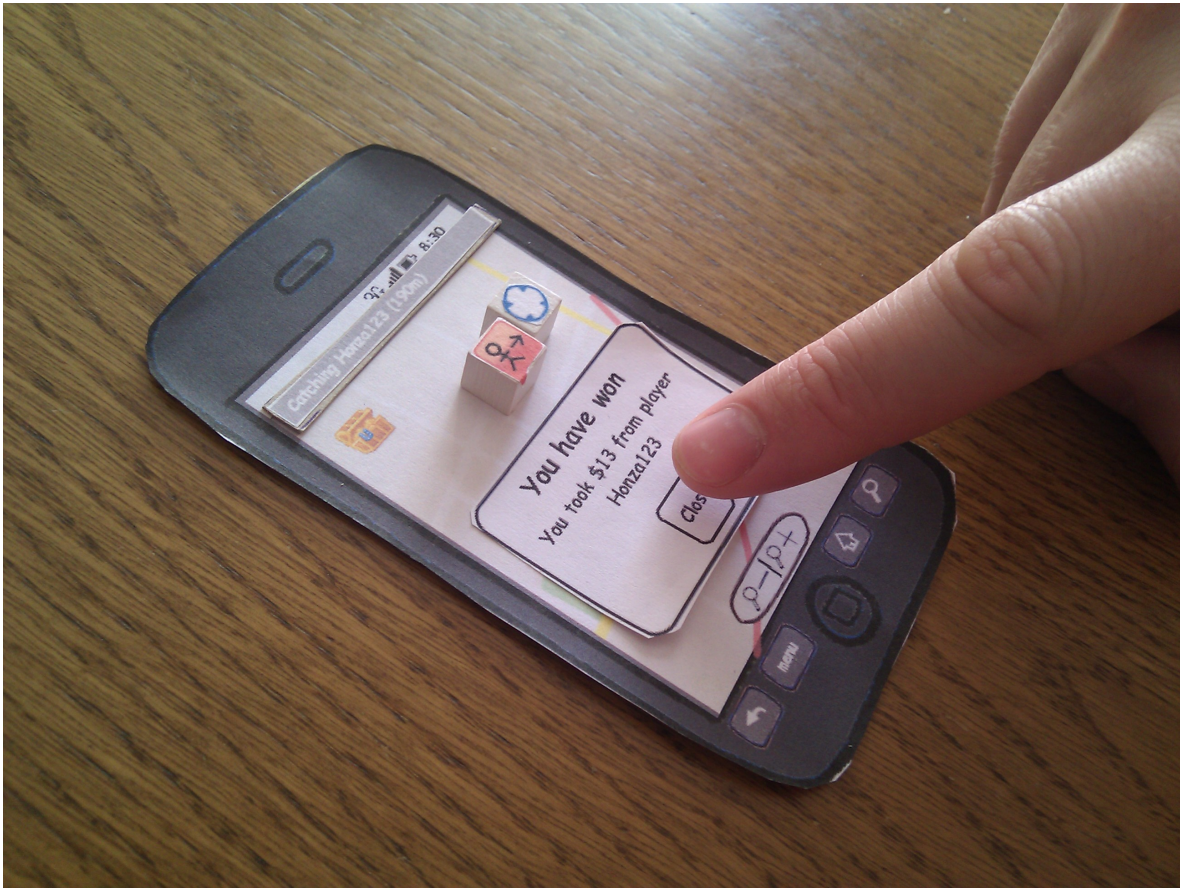


Figure 7: In the middle of test execution - we are using "boardgame method" for simulated movement. In this picture player caught runner and won.

- He wasn't sure about the rules - he thought rules should be in application somewhere
- He suggested circle around each opponent if idling - it will display distance where chase will start
- He would put Hide button in the top right corner instead of menu

4.6.2 Male, 23, programmer

- It wasn't clear to him that he can reveal himself when hidden and therefore use hiding more times
- He suggests to put both Hide and Reveal actions into menu - one will be always dimmed
- He also suggests when player reveals himself, he should be notified of remaining offline time

- He didn't like "Leave Game" action. He would rename it to "Leave area" or something else.

4.6.3 Male, 23, student of HCI

- He thought that border line is yellow (main road) not red line
- He would rename "offline time" to something else
- He suggests putting remaining offline time in title bar
- He would change My Location icon when idling

4.6.4 Male, 23, economics student

- It took him lot of time to find Hide under MENU
- He kept tapping My Location icon and expected to find Hide there
- He suggests putting information about current player and possible actions after tapping on My Location
- He deliberately lost chase in catcher role to become idler near treasure - interesting strategy

4.6.5 Female, 20, pharmacy student

- She wasn't sure which of the icons is her location
- She suggests to change My Location icon
- She kept tapping My Location icon and expected to find Hide there

4.6.6 Male, 11, pupil of elementary school

- He suggests to change My Location icon
- He kept tapping My Location icon and expected to find Hide there
- He deliberately lost chase in catcher role to become idler near treasure

4.6.7 Male, 30, project manager

- He thought that clicking on Navigate will start the chase
- He wasn't sure about Idler's icon
- He kept tapping My Location icon and expected to find Hide there
- He lost a chase because he appeared (after hiding) outside the area
- He suggests to leave Hide in menu but also put it after tapping My Location icon

4.7 Recommendation

Based on performed tests, I answer questions from [subsection 4.3](#):

1. Users can easily apply game rules. But summary of rules should be accessible from menu during the game in case of some confusion.
2. Screen flow is appropriate and matches Android users' expectations.
3. No more icons should be added to the map. Border line should be more distinctive from underlaying map. Treasure icon is ok.
4. Icon of My Location should be changed. Icons of idler, runner and catcher are fine.
5. Users read top title bar. It could also contain information of remaining offline time.
6. In Menu, both Hide and Reveal actions should be visible. But just one of them active, other dimmed.
7. After tapping My Location, dialog with information about current player and possible actions (like Hide) should appear. Also hidden player shouldn't loose chase when he doesn't reveal himself (like I thought). This should happen only when hiding because of technical reasons. In tactical hiding user should automatically reveal when he has no more offline time.

5 High-fidelity prototype

I have created an Android prototype based on previous testing. I have tested the prototype with 5 end users and discovered some issues in user interface.

5.1 Prototype creation

The prototype is a standard Android application running on Nexus One phone. It is limited by lack of server-side. Everything is running locally. Player doesn't control his own location - both player's and opponent's movements are emulated. Prototype covers all scenarios from low-fidelity prototype - see [subsection 4.1](#).

5.1.1 State-transition diagram

[Figure 8](#) shows high-level overview about states in the game and transitions between them.

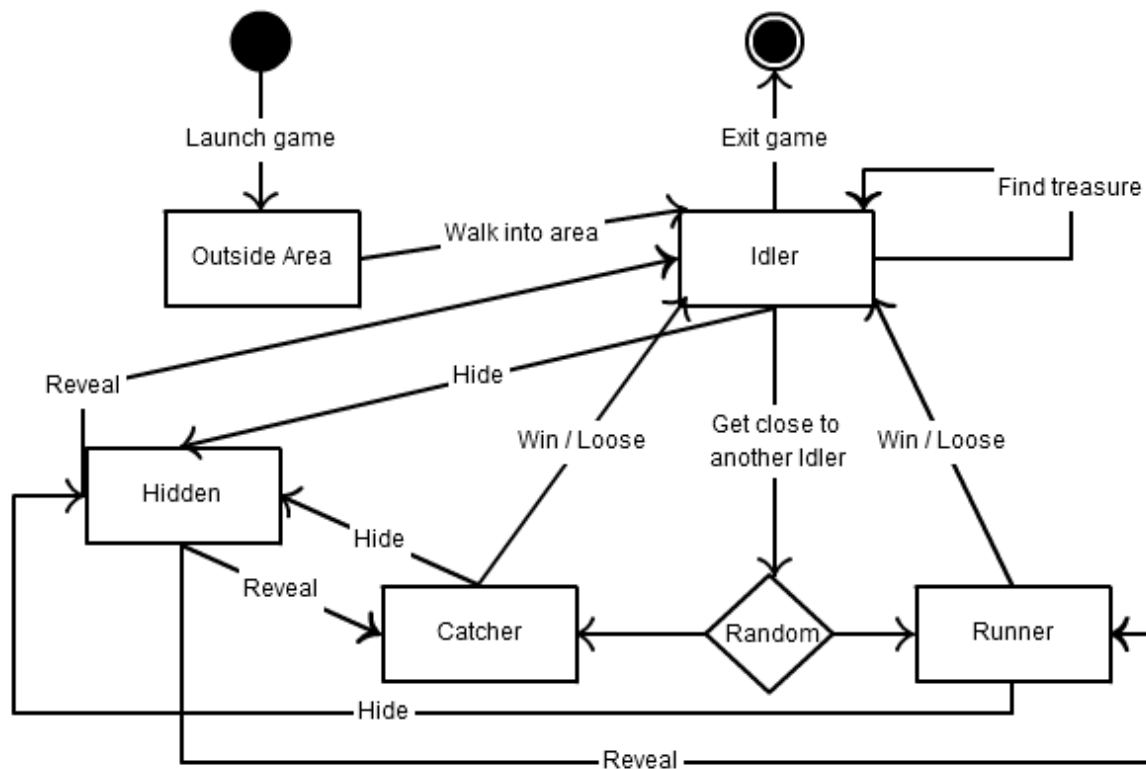


Figure 8: High-level state diagram of the game. Player can be in states: Outside area, Idler, Catcher, Runner and Hidden

5.1.2 Technologies

I have used standard tools for creating Android applications:

- Android 2.2 SDK + Emulator (<http://developer.android.com/sdk/index.html>)
- ADT Plugin for Eclipse (Java) (<http://developer.android.com/sdk/eclipse-adt.html>)
- Android Developer Documentation (<http://developer.android.com/guide/index.html>)
- StackOverflow discussions (<http://stackoverflow.com/questions/tagged/android>)

5.1.3 Improvements since low-fidelity prototype

I have improved user interface based on low-fidelity prototype testing. Some changes can be seen on screenshots in [Figure 9](#). Here are most important changes:

- First screen with areas contains logo
- Information about areas on the first screen are organized in a two-line list
- Game menu contains more options for working with map - Satellite Map and My Location (center of the map snaps to current location)
- Game menu contains option to view simplified rules of the game
- My location icon has changed (now same as in Google Maps)
- Navigation line has changed - now shows direction and color (Idler - forward direction, blue color, Catcher - forward direction, green color, Runner - backward direction, red color)
- Border line color is changed to purple
- It's possible to view information about current player and hide/reveal after clicking to My Location icon

5.1.4 Implementation tips and problems

- I have separated server-side and client side logic - all server side logic is in class *Scenario*. When I develop server-side, I can replace this class and client-side logic will be intact.

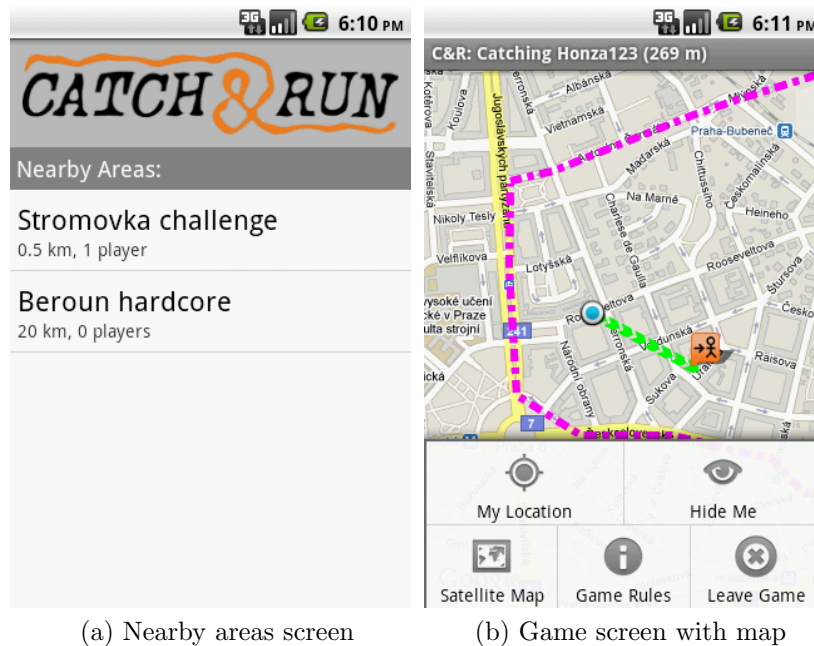


Figure 9: Screenshots from prototype (see more in video: [subsubsection 5.1.5](#))

- Google provides nice component for working with map - *MapView*. But it's not a part of official open-source API. You need to specify target "Google APIs", which contains SDK+Google Addons. You also need to get API key from Google (for free).
- For My Location icon, component *MyLocationOverlay* can be used. It saves lot of coding - my location icon and it's animation, communication with GPS, moving map with the location. But I needed to use fake location, not from GPS. I have created fake location provider called 'mockupgps', overridden method *onLocation-Changed* and here I accept just new locations from my fake location provider.
- For menu icons, I have used platform's menu icons located at `/android-sdk/platforms/android-9/data/res`. First I had icons from Android Froyo (API Level 8), but they look ugly in Gingerbread (API Level 9). Icons from Gingerbread looks great on all Android platforms.
- For navigation line and border line I have used low-level drawing on *Canvas* with *Path*. I have discovered that SDK includes nice set of path effects which can be used to make paths much nicer. There is a [sample code how to do that](#).
- I needed to listen for an event when user moves with a map. There is no direct support in SDK for that. I have found a workaround - you can add *MapGesture-DetectorOverlay* into map overlays and use it for detecting various map gestures - [sample code](#).

- It's better to use *ItemizedOverlay* instead of *Overlay* for icons on map even if you are displaying just one icon. You get shadow for the icon with no work. You also get *onTap* method, which is triggered when user taps the icon. But be sure to set image bounds properly where the image shows the location (usually bottom-left or bottom-center).
- I had problems with playing sound in WAV format. I had to convert it to MP3 format.
- First I had vibrating and sound at the same time. But vibrating also creates sound so first half of the sound wasn't clear. So I have scheduled sound after vibration. Quick note here: When you are starting sound in another thread, you need to keep thread alive until playback is complete. Otherwise playback stops on actual device (not in emulator).

5.1.5 Prototype functionality

I have created a video of the prototype. Video format is best for this purpose, because it shows both visual and interaction design. Here it is:

<http://www.youtube.com/watch?v=5oLlmNbxap4>

5.2 Evaluation

5.2.1 Goal of evaluation

I wanted to discover following:

1. Can users play the game even when disturbed by walking?
2. Can users work with map and don't get lost?
3. Do users understand new coloured navigational lines for Idler, Catcher and Runner?
4. Can users identify icons of my location, idler, runner and catcher?
5. Do users read top title bar?
6. Can users use Hide function properly? Will they win or loose second chase because of hiding?
7. Are there some other problems I didn't think of?

5.2.2 Test setup

I wanted to emulate distraction by walking or running which is present in actual game. So when player was moving in game, I asked participants to walk back and forth in the hallway. They were walking slowly, but the test scenario was much faster than actual game (whole scenario takes about 3 minutes). Contents of the scenario is described in [subsection 4.1](#).

First I explained participants the tasks they should expect. When they selected nearest area, game scenario started. I repeated task instructions as they came in the scenario. When there was a moment of waiting, I asked them additional tasks ("Zoom in/zoom out", "How much money you have right now?", ...). After scenario was complete, I interviewed them about any suggestions, problems etc.

I had to record participant's progress for later analysis. I used video camera for that purpose. I was walking with them and trying to film the phone screen with their hands. I filmed also the additional interview after the scenario. Videos are too chaotic for publishing, but they helped me remember and analyse each of the tests.

5.2.3 Test execution

I have performed the test with following 5 people:

Male, 11, pupil of elementary school, Symbian user

- Closed alert dialog with Navigate instead of Close
- Was using My Location function to quickly see his location
- Used hiding correctly and won second chase
- Icons were clear to him
- Title was also clear to him (even if he doesn't speak English much)
- Thinks that application is easy to use
- Suggests putting MENU button on screen

Male, 23, student of Informatics, Windows Mobile user

- Expected map to center when pressing Navigate
- Title was clear to him
- Was looking for hiding button after clicking to opponent
- Didn't find hiding in time and lost the second chase

- Suggests putting Hide on screen when in chase
- Thinks that game is interesting and easy to understand

Female, 23, student of Architecture, Android user

- Tried to use application in landscape mode
- Couldn't find My Location function
- Couldn't find hide function
- Lost second chase because she didn't hide
- Was confused with icons - thought about them other way around, but corrected herself quickly
- Couldn't tap on current location icon even if she tried - icon too small
- She would appreciate reading manual first
- Suggested bigger font for money
- Suggested that user should select own color and my location icon will have that color
- Another option for player icons - photos from Facebook

Female, 21, student of Mathematics, Android user

- Didn't see distances for nearest areas
- Icons were clear to her
- Used multi-touch to zoom
- Found MENU easily
- Used hiding properly and won the second chase
- Title was clear to her
- Pointed out that she doesn't have internet connection except wi-fi
- Found application intuitive and easy to use

Male, 23, student of Economics, Symbian user

- Confused player icons - thinks that it's other way around
- Title was clear to him

- Used hiding by clicking to current location icon
- Won the second chase
- Suggested that remaining time for a chase should be in title
- Would change current location icon - preferably by avatar picture

5.2.4 Recommendation

Based on performed tests, I answer questions from [subsubsection 5.2.1](#):

1. Users can play the game even with disturbance of walking. They don't need to stop walking for interaction during chase.
2. Users can work with map without further explanation. One of them even used multi-touch gesture for zooming. They weren't lost in map. They mostly couldn't find "My Location" feature, but this feature isn't essential.
3. New coloured navigational lines helped. Some users appreciated that they also show direction. Users used navigation feature quite often.
4. Player icons were causing most troubles. Some users completely misunderstood them. I have received nice suggestion that player icons should display player's avatar or picture. It will be more personal and clear who is who. Player's role could be displayed as a border color of the picture.
5. Users have no problem with the title bar. But information about remaining minutes to the end of the chase should be added. Also information about money should be bold, because money are important for the player.
6. Three of the users have found the Hide function and two of them didn't. This two users have lost the second chase because of that. The problems were caused mostly because my phone has different icon for MENU than other Android phones. But still I think Hide button should be visible on-screen, but not all the time - only if player is in chase and hiding is possible.
7. In general there was no big issue with user experience. People found the prototype easy to use. Except issues mentioned above, this prototype can be used as a solid base for implementation.

6 Documentation for developers

This section contains a summary of the whole document. It is intended for developers who will turn prototypes into actual product.

6.1 Functional requirements

Here are functional requirements for mobile client of Catch & Run. I'm not considering server-side here, which is also crucial part of the whole application. It is just a quick summary, please refer to detailed use-cases in [Figure 1](#) and related scenarios in [subsection 3.2](#).

I have divided requirements by three priorities:

6.1.1 Must have

- Login
- Search for nearby areas
- Map view of the game with borders, current location, location of other players (with information about players after tapping them)
- Map control tools - panning, zooming, satellite map
- Status line about state of current player and money
- Alerts about game events - begin chase, win chase, loose chase
- GPS and network management - limited off-line time
- Leave game and application

6.1.2 Should have

- Information about nearby areas
- Navigation to other players on map
- "My Location" feature - center of the map snaps to current location
- Target's name and distance in the status line
- Treasure on the map and treasure found alert
- Hiding function with countdown of remaining hidden time
- Alerts accompanied with sound and vibration

6.1.3 Nice to have

- Navigation to other players with compass
- Game rules summary in the menu
- Sending messages to the other players

6.2 Specification of interaction design

Interaction with the application should be minimal. I suggest just two screens in the prototypes - areas screen and game screen. In final version, there should be one additional screen for login. Most of the interaction will happen in the game screen. Game screen should be a map, because users know how to work with the map. All game events should be displayed as dialogs, not new screens - user will not lose context with ongoing game.

It's also important to notify the user about major events in the game by sound and vibration, because users can have their screen turn off. See implementation issues with that in [subsection 5.1.4](#).

Game-specific interaction on the map is well designed in high-fidelity prototype. See a video in [subsection 5.1.5](#). From perspective of interaction, no major changes should be made.

6.3 Specification of visual design

Visual design of the areas screen is pretty final. It shows the game logo and game colors - orange, black and grey. Similar look and feel should be used for login screen and also for the website. See the areas screen screenshot in [Figure 9](#).

Visual design of the game screen is also pretty solid in high-fidelity prototype (see video in [subsection 5.1.5](#)). Menu structure and icons are good enough. Also title bar is clear. But some changes should be made with map overlays. Most importantly player icons should be changed - read carefully recommendations from prototype testing in [subsection 5.2.4](#).

6.4 Specification of user experience design

User experience should be seamless and intuitive - no help, tips etc. should be needed. This can be achieved by combination of interaction and visual design described above. It is important that user will be mostly working with the map - component s/he already knows. All complex use-cases like creating areas, inviting others, organizing events or analysing game results should be on the game's website, not in the mobile application.