CE301-6-FY: Individual Capstone Project Challenge

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Android Game Dev.

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**Introduction**

The aim of this project is to create a 2D Android Game that implement various programming techniques, which I have learnt in my previous modules, and to demonstrate my research and development skills. It will show how I manage my work according to my creativity and professionally. Moreover, it will help my cognitive ability in problem-solving and management skills, since this project is only going to worked on by me only, it is my responsibility on how it will turn out, such that it will motivate me to create the best possible work I can.

I have chosen to undertake the challenge of Android Game Development, it is very challenging and new to me, but I will enjoy learning the way to manipulate data through a new language. The best way for me to start this project is by taking courses to develop my skills to produce a project under my expectations, I have high standards for myself such that I must teach myself the language.

The target audience for my project/game I will assume an age geography of 12 – 25 years old, my game will be short and sweet but also somewhat challenging and competitive. My goals and definite objectives is of course a well functional Android game, with multiple ways to complete and compete with friends and others, and to make sure every function is delivered before deadline.

There are courses on [www.developer.android.com/courses/android-basics-kotlin/course](http://www.developer.android.com/courses/android-basics-kotlin/course) which I will go through every single one before starting my own project. This might cost me time to focus on my own project, however, it is for sure worth it.

After I’ve gone through the course, I should have an idea on how to code my project and what features I am able to include. Here are some expectations on my project which I will change after finishing the courses, since I will know what can be implemented and what cannot do.

I will manage this project in an agile approach, meaning I will set all my tasks and objectives in a cycle, but I will override some objectives only if I see them as a priority. By creating sprints in Jira or on my own schedule to keep myself on track, I believe my management is efficient and productive.

Before courses expectations and requirements:

Minimum Requirements:

* Suitable and human-readable GUI with the basics; Buttons to navigate through the game for example: Play Button; Quit Button; High-Scores.
* A character which the user controls by touching the screen.
* A Score system that keeps track of the users score, to be used for comparison with other players.

Not essential requirements:

* Comparing scores to other users, i.e., worldwide high scores.
* Designs, such as: different colour schemes and designs for the character and backgrounds.
* Easy to play, perhaps a tutorial if it isn’t self-explanatory.

I will update these requirements each time, I find something interesting to implement or a must needed requirements so the users can enjoy playing the game. I will update Jira on each interface and state I am at.

After starting some programming, I realise that there will be assumptions, such as all users have a touch screen and that they run Android smoothly. The reason to why I have these assumptions is because they are a minority and would have to edit the input types by allowing non-touch screen mobile phones and obviously would need to have an Android operating system.

**Background**

Project Description

The resources I have used during my Individual Capstone Project, one of the main concepts is the language itself. Such that for me to start the assignment I have set for myself, I took an extensive course in Google about Android Development, and the difference between them. For example, one of the examples is a Java based Development within the android studio, there was also a full Android version which taught how to manipulate data around the page by using the Android Manifest (.xml).

I have chosen to program my project by using both, Java, and android. One of the main reasons why is due to the fact that I want to demonstrate my programming techniques and skills which I have learnt during the 3 years of studying at University of Essex. This required me to learn Android and how it functions with Java and the unique interfaces. Since I knew nothing about Android development, I first researched about it and any courses I can start myself with, and luckily, I found out that Google offer a wide range of Android Development courses from beginner level to intermediate and then advanced level. So, during my university work, I practiced everyday and made it one of my objectives to complete every single course and pass every test, to achieve every badge. Which, I eventually did, and have successfully earned all the badges that can be displayed on my own Google Account. These badges are going to stay with me forever, so whenever I log in to my account, I see these badges and they remind me of my determination during my years of studying in the hardest times recorded, in my point of view getting a degree during a pandemic is harder than without. I kept my head forward and assigned myself a schedule to learn Android before starting my Capstone Project. As referenced above (“[www.developer.android.com/courses/android-basics-kotlin/course](http://www.developer.android.com/courses/android-basics-kotlin/course)”).

Graphical user interface

Description automatically generated with medium confidenceAfter completing the courses, it made me more confident on programming in Android, but I am a perfectionist, I need to produce professional code, so I spent hours and hours watching videos of professors and YouTube tutorials in Android Development so I can expand my skills even further. Displays the exact dates of when they were achieved:

Potential Stakeholders

The target audience might not be the only users who might play the game, whilst researching I found games that cure some conditions or enhance reflexes. The game I produce will increase the users’ reflexes, concentration and to identify multiple objects at the same time which is linked to multi-tasking. Some important conditions, like Alzheimer’s disease but also Parkinson’s disease, after thorough research I have discovered that my game will soothe these diseases. One reason is the constant focus the game requires, and according to this article (<https://www.hopkinsmedicine.org/health/conditions-and-diseases/parkinsons-disease/parkinsons-disease-and-dementia>) it states that people with Parkinson’s disease struggle to concentrate and focus on a specific topic which might cause Dementia, such that my game will force the users to concentrate to every moving object and will open their mind to analyse all the possible outcomes and positions to survive the redness, hence why I chose red as the main colour of the objects that needs to be dodged.

I was also able to find articles that support my hypothesis that concentration and multi-tasking helps with Alzheimer’s, according to this article (<https://www.alzaids.com/mind-games-playing-games-to-help-prevent-alzheimers/#:~:text=Playing%20games%20on%20a%20regular,slowing%20down%20the%20disease's%20progress>.) it states “*Playing games on a regular basis has been shown to help reduce the risk of developing Alzheimer’s by almost 50 percent. For those who already have this condition game-playing can aid in slowing down the disease’s progress*”, the reason to how my game assists in these diseases is because of the concentration needed, it continuously has the mind stimulated, as a result my game will target a niche market of games to help mental health, in conclusion a potential stakeholder is the NHS, there are hundreds of diagnosed and non-diagnoses mental diseases which require 100% focus and concentration.

Possible Outcomes and Designs

There are infinity number of ways to create a game that attracts users and help the people in need, such that there have been multiple drafts which I either dismiss or adapt together to get the best result. An example of an adaptation of two different drafts, for my first game draft it included stick-men and moving backgrounds for a better graphic design but then I decided to create a game to help patients with Dementia and Alzheimer’s, a great motive for me to create a game to help the mentally diagnosed people is because my grandfather is suffering from dementia, such that I asked if he could be one of my beta testers, I chose two possible users to test my game. One of them is my 73-year-old Grandfather called Atef Ataiyah from Egypt and the other is a 22-year-old mobile gamer called Roberta Juskevica, which I will get them to sign at the end of the report. I imagined the best possible combination of the two games and how they could be played, competitively and by using cognitive ability to advance.

Current Market

My idea is not the first, there have been many games which claim they assist in slowing or preventing a mental condition. However, after researching on the most supportive games for Dementia it comes up with games like Jigsaw puzzles, dominos, cards and more. Even-though, these are not technological games I can still use my game as a comparison. Most apps and board games target cognitive abilities by forcing them to focus hard on the puzzles or certain playstyles during any games.

What my game has compared to these board games?

An important brain wave within our minds is the Medial Prefrontal Cortex, now this part of the brain controls how we communicate with what we see, and how fast we react to what we see, also known as reflexes, which helps us by flinching or dodging an incoming object. While these board games have many similarities with my game, they would never need to use their reflexes for it does not matter how fast the brain connects with the eye for them to pick a jigsaw puzzle or placing a domino. This is where my game excels, it requires the user to focus more in order to use their cognitive ability and their reflexes to stay alive, it also starts off really quick to always keep the users on their feet and expect the unexpected.

There are already mobile games applications that has a similar concept, which is by helping the sick. For example, Lumosity, a very clever and thinking game, which requires the user to think and answer a set of questions if it is in English Literature or simple Maths or even Algebra. The way they use quick motion and reflexes in their games is by adding a timer, it gives an incentive to the user to answer the questions as quickly as they can because they get more points, so they can compare with their previous answers or other uses, an important factor because it helps them test themselves according to their past selves, they can compare their progress with their diagnosis, if they are slowing the process down or if it is getting worse. However, the main difference between my game and Lumosity is my game focuses more on reflexes rather than cognitive ability whilst Lumosity focuses on the user’s mind by asking them questions that require thought. (<https://www.lumosity.com/en/science/>)

In conclusion, the aim for my project is to develop a fun and interactive game that also helps with patients with certain diagnosis, which will hopefully prevent them or slow them down, and save a few years of their lives.

**Design**

The Capstone Project I have chosen is a gaming application developed in Android, such that there is one important operating system that is required, it is important to know that my app can only run-on Android systems. The easiest way past this specification is by using an android mobile phone, it is one of my main objectives and responsibility that the system is in Android. Another system requirement is to be able to run and play the game correctly with the touch pad of the device, and according to the EETimes “97% of smartphones have touchscreens” (<https://www.eetimes.com/abi-97-of-smartphones-to-have-touchscreens/>) such that I safely assumed that my users will have a touchscreen to interact with their device, so if their device does not have a touchscreen I advise them to find a different device with a touchscreen. My code contains Java files, XML files and png files, I have tested my game on multiple devices such as the Pixel 3, Samsung Fold 2 for extra space and on a Huawei, they have all the required systems that can run my game easily. My software runs Android APi 30 with Java 11 SDK, these software systems manage the CPU and processors, composed with an operating system and language translators.

Why I chose to program in Android?

One of the main reasons is the compatibility with other devices, all main branded devices (except Apple) run on android, some examples include: Samsung; Huawei, Google; Microsoft; Oppo and more. The massive broad of brands makes it the obvious choice of language, and according this article (<https://www.rishabhsoft.com/blog/5-advantages-of-android-app-development-for-your-business>) the market share is “72.84%” to android, leaving only “28.21%” to Apple, such that it clearly shows how more popular android is compared to any other language.

Another reason is the flexibility and efficient according to the Return on Investment. Since it is cheaper to run an android, it decreases total cost since it is cheaper to run and build. But it also is much faster at developing and testing applications. This links with my decision because I am looking to sell it to the NHS such that being as cheap as possible to help the people in need and the faster the app is developed and sent the sooner, I can save people some more time. The main disadvantage of using android is that it can be more complex than an IOS operating system, however, it can be easily demonstrated by any Android user.

My first implementation and my agile framework, at first, I set a plan to create the main menu with button to play and to read the high scores, after I planned it, I wrote it in Jira and started creating a design whilst exploring on how to develop my idea to exactly how I want it. I then tested it and moved onto the next plan, which was create a moving background, which then starts a new AGILE cycle.

**Implementation**

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In this override function, it interested me the most because of how it runs everything within the whole GameView Class, so I have 2 backgrounds called background1 and background2, so for me to manipulate both in order to run background2 straight after background1 finishes, they are assigned to 200 \* the screen ratio, which is a variable I created so no matter what screen size or tablet it will run the exact same. I then slept the main player so everything runs smoothly at first, the variable starter is a boolean which determines whether the game has started or not if the game has not started it is set to false by default, which will call the function countdown() which will display a count down from 3 for the player to get ready to move. At the end I decided that removing this implementation keeps the user on more edge, no user is supposed to understand what is happening on the first few tries. When starter is set to true, another boolean is then assigned to true which will continuously run the while look until the user dies within the draw() function. The update() function constantly updates the screen to where the user is and where the flying objects are.

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Another example is this for each loop, walls is an array with all the possible red block location so wall2 iterates through each element within walls. In line 2, the wall2 y-axis value is set to the speed of this specific block, since there are 5 blocks in total and each one has a different speed which is selected randomly. Line 3 has an if statement that checks when the block goes off screen, to which it adds another block on the bottom of the screen with more speed than the previous block, so as time goes the level gets harder and harder. The variable level is an integer that keeps count on how many times the red blocks go off screen which then increases the level and makes the blocks go faster and faster. The wall speed is changed randomly, the variable ran is a random integer. The Function levelUp passes wall2 because the speed can individually get changed according to what level it is. The next if statement checks whether the random integer is actually less than 100, since if it is less than 100 the speed will not increase by that much, if the values is lower than 100 it automatically sets it to 100. Changes the position of wall2 y-axis and sets it to the whole screen y-axis. While the wall2 x-axis is changed, this is because the walls come from below so when the x value is randomized the block can be in any position from left to right, which creates more randomness. There is a bug, and it is very unlucky if it occurs but there is a small chance that the blocks create a complete wall where the user can do nothing but accept his death.

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There have been multiple bugs and errors I have come across which has costed me a lot of time, for example, the countdown function does not work to how I want it. The concept is, there is a count down from 3 to Go which runs at the exact same time as the game and does not wait for the function to finish. This is because I am using multiple threads, so the second thread does not wait for the first thread to finish the counting. It took too much of my time to the point I had to retire it and look at it when I have more time, unfortunately I couldn’t finish it before the deadline. I would still love to implement it but it will not be included in the final submission unless the University of Essex accepts my extension form. What is supposed to happen is that it draws each image with the number on it, wait 1 second and then display the next so in theory it should display 3 and then wait 1 second and then display 2 and so on until Go is displayed. I tried using the pause() and resume() function but that also didn’t result in the solution I was looking for.

Text

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I created a bitmap which displays a stickman walking using frame animation, where walks 1 to 7 was a paint display of a man walking frame by frame, and it actually worked. However, I decided to change my concept once I realised, I could focus on people with dementia and the walking stickman with the background would be too much. And I do not want to overwhelm them. Guy was a simpler version of the 7-frame walk, but I did not like how it turned out, it was my first draft, so I left it there to look back at what it first started out like.

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I find this piece of code very interesting, because even though they are somewhat different from each other, they are the same. Since there was only one type of wall I wanted to display on screen, I wanted 5 of them so I created 5 of the same wall and named them all differently because now I am able to change the size of each one according to randomness or my values.

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The first XML file I have worked on in all of my years of studying Computer Science, this interested me the most because of how unique the coding style is compared to any other language, even HTML and CSS is much different than this, it seems like a mixture of both languages. The first line of code opens an application with the following attributes, where backup is set to true which means creating a backup is allowed, the icon is set to the android logo when on the home screen of the mobile phone, I first decided to name the game “Flipper” because at first I had a complete different concept to how it ended in the end, I adapted every time I believe in a different idea, but the original idea was a man backflipping of balconies to other people’s balconies, I thought it being a quite fun concept, but after a long thought I wanted to make some difference so I decided to create a game that has the possibility of helping other people. The fourth line edits the logo on the home screen to the round/circle version of it, so the app no longer looks like a block. The supportsRtL is a Boolean which is set to true only if the game will have Right and Left functions, and such in my project it is included. The overall theme is set to AppTheme which is a default theme style where the application tag is now closed. The function android:name = “…” is where the main class function is called through, so for this example my main function is GameActivity. Screen Orientation is whether I wanted the game landscape or portrait, for this example I want it to be longer than wider.

**A screen shot of a cell phone

Description automatically generated with low confidenceDemonstration**

A picture containing text, first-aid kit, clock

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First window, it displays the menu with the game name, the highest score every scored, and 1 Play button.

After clicking the play button, you’re in control of the white square in the centre and you must click either the left half of the screen or the right half which moves the square either right or left. It starts immediately because I think its’s good to have them expect what they’re tasked to do, instead of waiting for a count down.

|  |  |  |  |
| --- | --- | --- | --- |
| Test | How? | Conclusion | Issue |
| Buttons functionality | Clicked them all multiple times, and check the response time. | Works as planned | None |
| Lives/Hearts | Allowed myself to get hit by a red brick, which should kill me. | Works | None |
| Level changes | As time goes on, the blocks should go faster and faster | Played for a while, and yes they go quite quick. | None |
| After death | Get hit by a red brick, I should see the Game Over background screen. | Shows nothing, just black. | It does not display the game over screen, not sure how. |
| Visual Functionality | Observing every red brick | Most run smoothly and perfectly, how ever some seem to stretch and look like it split in half. | No idea… |

**Future Additions**

If I had more time working on this project, I would like to add multiple features, for example:

|  |  |  |
| --- | --- | --- |
| Additional Features | Function | How? |
| Gold coins/ stars | Increase High-Scores | By adding new object to move around randomly. |
| Additional movement | Up and down function buttons, which will be more challenging and fun. | By splitting the screen by 2 again or by adding a directional circle to move in any direction |
| Power Ups | For example, a shield/ super speed/ smaller cube/ smaller red bricks…and more | A shield, make myself invulnerable for a few seconds/  increase the speed of the white cube when the user clicks/  Decrease the size of the main cube/  Decrease the size of the red bricks/ |
| World wide highscores | Comparison with friends on a new window | Creating a database with users and their scores |

**Conclusion**

The aim of my project is to make a game in and Android Device while using all the features within the Android Development functions. The result is quite simple, but it should be simple, it can not be overwhelming. I have learnt more during this capstone project than the entire 3 years of university, I went out of my way to learn a brand-new language. And for that I am happy with this experience, I can safely say that I am confident with Android and their development system. As clearly shown, if I had more time I could increase the functionalities, but I am happy with the result, it could be better but I like the final result.

**References**

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