Bilkent University

Department of Computer Engineering

Senior Design Project

Project short-name: Neophyte

Project Specification Report

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Progress Report

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1 Introduction

In a rapidly digitizing world, having technical skills is very crucial since, nowadays; almost everything requires some form of programming. As technology has been developing, we have become more dependent on it and use various technologies to accomplish specific tasks in our daily lives. Technology is being implemented in almost every section of our lives and business structures. This is the reason why, many countries such as England, Singapore, Estonia and US have started programming education in early ages, because the sooner a person learns how to create programs, the stronger their problem solving abilities get. This education also amplifies their computational and analytical thinking skills. For instance, UK made the most ambitious attempt to get kids coding, with changes to the national curriculum in 2013. ICT – Information and Communications Technology – is out and replaced by a new "computing" curriculum including coding lessons for children as young as five [1]. Such knowledge is important not only to individual students' future career prospects, but also for their countries' economic competitiveness and the technology industry's ability to find qualified workers [2].

However, it appears that Turkey is a little belated to educate children about programming compared to other countries. According to International Computer and Information Literacy Study (ICILS), who conducted among students between 6-15 years from all over the world in 2013, it has been acknowledged that only 1% of students from Turkey have advanced computer knowledge. On the other hand, 35% of students from Korea, 34% of students from Australia and 33% of students from Poland have advanced knowledge about computers and programming [3]. In order to offer an effective and simple solution for this problem, the project Neophyte will be proposed. With Neophyte, we aim to teach children how to code while making them entertained by playing different kinds of games they like. Neophyte creates a platform

where children can interact with each other in an exciting way and improve their programming skills.

In this report, first a description of Neophyte will be provided. Then, an insight about the constraints regarding to this project will be given. Afterwards, the professional and ethical issues will be listed and discussed. Finally, the functional and non-functional requirements of our project will be included.

1.1 Description

Project Neophyte is a learning tool for children in elementary school and middle school ages. This tool helps children understand the concept of programming by teaching them the way of computer scientists and basics of simple algorithms. As it was discussed in the introduction, it is important for children to learn algorithm creation in early ages, as it will affect their problem solving skills and computational thinking skills.

This project aims to raise awareness among children about computer science topics by dragging their attention to these topics with games and fancy graphics. It is important for these games to be easy to understand as it should be challenging enough. Our baseline for these games will be psychological researches and pedagogical reports on child informatics.

Our application will consist of a number of small games (like flash games) and medium length scenarios that will contain many problems along the path of gameplay. For instance, the player will go through a parkour mission, and when players come to a point where they have to go up from stairs, there will be a sorting problem. If the player sorts the given container with success, the game will let the player go up from the stairs. This was of the more advanced examples of our project. Another example, which is easy enough for children, is that they will be tutored along the gameplay. First series of missions will let children conduct experiments on the system itself. They will be guided to create algorithms and make small game appliances. Then,

according to their area of interest in real life, they will be directed to the games in these areas.

The language of this project is in Turkish and English for now. Normally, making these applications in another language than English is not good for many students, because the keywords of programming languages are all in English. Studying on foreign language basics are sometimes complicating for programmers. On the other hand, we are making this project for children in early ages of education, as our main mission is to endear coding to children, we will have no such apprehension on language. Plus, many children in Turkey still do not get proper English education in Elementary and Middle school.

Finally, this project also helps psychologists and penologists in many ways, such as, understanding a new way of children and a different way of communication with them. This project may take the initiative for a new research area as children will be motivated to use this system for both entertainment and educational purposes.

1.2 Closely Related Technologies

According to our market research, there exist applications offered in the market to teach children programming. These applications can be listed as follows:

- **Blockly:** This web based application is Google's simplified programming platform. This application helps kids in early ages of understanding programing concept. The help they get on this topic is about defining the algorithms in a simpler manner with graphics objects (jigsaw puzzles)[4].

- **Scratch:** This is another web based application from Massachusetts Institute of Technology (MIT), that helps children build games with, again, using jigsaw puzzle parts with different tasks. (i.e. a puzzle's job is to create a for loop and another puzzle is for boolean operations) This application is also good for building games for fun but it lacks a mission. Without a mission, children are pointlessly wandering around the application, trying to find a purpose for their appliances [5].

- **CodinGame:** This is the last web based application that we have found on our area of interest. This application is for more advanced coders, maybe around last years of high school or university age. This application is also useful but not for children [6].

Although these applications have similar functionalities to our system, Neophyte will have different and improved features than existing applications. First of all, Neophyte allows users to play the game in multiplayer mode. There will be tournaments based on completing time of the given tasks. Moreover, Neophyte provides children a platform in which they can follow each other and send direct messages. Therefore, this project will offer an improved and engaging environment where children may not only learn to program, but also have opportunities to be creative using programming.

1.3 Constraints

1.3.1 Implementation Constraints

- The application will run on Windows environment and will be developed in Java.
- Unity Game Engine will be used as main game engine.

1.3.2 Economic Constraints

- Our application can be accessed from application's own website and requires one time purchase.
- We are planning to charge some prices for specific in game modes, shortly in game purchasing.
- This project might also be purchased by schools, universities and many other educational facilities for academic purposes.

1.3.3 Ethical Constraints

- In our system, we will store personal information (name, e-mail address, location, company, school etc.) of users. Therefore, we will not share any personal information with any third-party application.

- Through authentication, the actual user's information will be protected.

1.3.4 Sustainability Constraints

- We will provide a standard rating system to our users and they will be able to give feedbacks about the application.
- Users will be able to rate in game features after end of the milestone assignments.

1.4 Professional & Ethical Issues

In terms of our application, personal data privacy, contents of games and social impact on children are our main professional and ethical issues.
First of all, we will collect personal data from users such as name, e-mail, location, company and school. Considering this, users might be worried about their privacy. In order to handle this problem, an end-user agreement will be provided at the beginning of the game. Thus, users will be aware of sharing their information. Also, data provided from users will not be shared among third-parties or otherwise and we will ensure data privacy by using authentication.

Furthermore, due to the fact that users of our application will be children, we will be focusing on their psychology while deciding on contents of games. According to the American Psychological Association's (APA) report on violent videogames, there is a consistent relation between violent video game use and heightened aggressive behavior, aggressive cognitions, and aggressive affect and reduced prosocial behavior, empathy and sensitivity to aggression [7]. Therefore, our games will be appropriate for children and will not contain any kind of violence.

Moreover, we will provide children an environment in which they can easily socialize instead of becoming distant from their friends while spending time on our game. This is the reason why, Neophyte will be a platform where

children can make new friends by following each other and also, by sending direct messages to each other. Therefore, we will promote them to be social.

2 Requirements

2.1 Functional Requirements

2.1.1 System Functionality Requirements

- The system should contain a help menu which explains how the game is played, where to and how to write code.
- The system should display the name and the total score of a user to other users.
- The system should pause the game and should stop all movements when the pause button is pressed.
- The system should be able to show credits.

2.1.2 User Functionality Requirements

- The user should be able to sign in via filling signup form with credentials.
- The user should be able to log in with registered e-mail address and password.
- The user should be able to edit personal information (name, e-mail address, password, location, company and school) in his/her profile whenever he/she wants.
- The user should be allowed to play single player or multiplayer.
- The user should be able to access the help menu that consists of information about how to play the game.
- The user should be able to pause the game whenever he/she wants.
- The user should be able to save the game whenever the game is paused.
- The user should be able to load the game whenever he/she wants.
- The user can toggle music on and off.
- The user can change game language between Turkish and English.
- The user should be able to view other user's profiles consisting of their personal information.
- The user should be able to follow other users.

- The user should be able to send direct messages to other users.

2.2 Non-Functional Requirements

2.3.1 Usability

- The user interface must exhibit conceptual integrity and simplicity.
- The user interface should be user-friendly in this way; users can spend their time, enjoying programming rather than struggling to figure out how to play the game while writing code segments.

2.3.2 Performance

- The system should react to user's input as soon as possible.
- Load time should be minimal.
- Controls should contain the minimum delay possible.

2.3.3 Extensibility

- The application should be able to include and support new features with ease in order to maintain the excitement and interest of the user, so it should be developed in a way that makes it easy to update.

2.3.4 Security

- The system should ensure security of personal data of the users.

2.3.5 Reliability

- In game compiler will be kept up-to-date in SDK terms.
- Coding assignments are strongly related with gameplay so that system integrity will be ensured.

3 References

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