Gotscha! - One Way To Support Learning

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Abstract

As the importance of computer science is rising, certain games that support the developement of abstract thinking, analytical skills and decision making, are becoming more and more interesting at an early age. Through identification and describing relationships between items, children develop a foundation to early math skills and basic concepts of computer science (e.g. combinatorics of finite affine and projective spaces, the theory of error-correcting codes, hashing, etc.) [**?**]. The pupils individual learning speed and lack of concentration, if not receiving the right amount of attention, is another challenge by itself. Without individual fostering, children are at high risk of losing interest. Through this thesis the teachers will be introduced to a tool for their pupils. Focused on classification of objects with certain properties, the pupils get introduced to a computer-based learning environment. There they can individually train and improve themselves in this field. In the mean time the teachers can concentrate on the majority of their pupils and have the opportunity to work with pupils on an individual basis, without feeling the pressure of having to support everyone at once. It has shown, that gamification and game based learning has enormous potential. It takes time to learn how to create games. Once overcome, creating further games is not as hard as one may think. In the created test environment the test subjects have shown more concentration, individual work behaviour and more willingness to learn than in the whole group. Keywords : phaser 3, typescript, debugging, testing, from a topic to the game, how to tackle a new framework

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Contents

1

Introduction

the background on and motivation for your research - technological trends of the area - open problems - recent promising developments - introduce more specific terminology which is not widely known. - Provide good motivation for your work, - explaining its technological, research or economic importance - The motivation simply two or three good reasons are enough to make your research important.

a summary and outline of your paper, telling readers what they should expect to find in it.

- a problem description, which is slightly more detailed than in the abstract. - a description of your solution - some arguments on its impacts - key concepts and categorize its approach.

Close your introduction with a description of your pa- per outline - what sections it contains - what the reader will find in each.

A proper flow 1. context 2. present your proposal 3. provide the verification 4. conclusions.

As the importance of computer science is rising, certain games that support the developement of abstract thinking, analytical skills and decision making, are becoming more and more interesting at an early age. Through identification and describing relationships between items, children develop a foundation to early math skills and basic concepts of computer science (e.g. combinatorics of finite affine and projective spaces, the theory of error-correcting codes, etc.) [**?**]. The pupils individual learning speed and lack of concentration, if not receiving the right amount of attention, is another challenge by itself. Without individual fostering, children are at high risk of losing interest. Through this thesis the teachers should receive a tool for their pupils. Focused on classification of objects with certain properties, the pupils get introduced to a computer-based learning environment. There they can individually train and improve themselves in this field. In the mean time the teachers can concentrate on the majority of their pupils and have the opportunity to work with pupils on an individual basis, without feeling the pressure

of having to support everyone at once.

Background

The key contribution of computer science to general school education is rooted in the concept of *algorithmic thinking* [**?**]. One way of introducing kindergarten and primary school pupils to algorithmic thinking and it's concepts consists in making them solve problems with and without computers. This can be achieved using age- and knowledge-appropriate learning materials. Several papers with corresponding online learning environments have been proposed [**?**, **?**, **?**, **?**]. This work is going to be added to the implementation of "INFORMATIK BIBER in KG und 1/2" by Jil Weber [**?**]. The focus of this work will not solely lie on the translation of the existing teaching material to a computer-based learning environment, but also on introducing learning methods in a gamified environment which not only complements the teachers with their teachings but also assisting them.

Goals of the Thesis

The main objective of this thesis consists of planning, analyzing, implementing and testing a computer-based learning environment on the topic of classification. The student studies the already existing implementations of "INFORMATIK BIBER in KG und 1/2", analyses the capabilities of kindergarten kids and first graders, develops an interactive classification tool, implements it then on a platform compatible with the implementation of "INFORMATIK BIBER in KG und 1/2" and conducts an evaluation with test subjects. We expect the student to find a suitable implementation that integrates neatly into our existing system mentioned before. The outcome of this thesis is a well-documented, stable and reliable prototype, providing the functional elements to be used in schools.

1.1 Section

SECTION 0

1

Related Work

In this section we are going through some previous works in a the same area. Starting with mainly publications, in a second part we take look at gamification and game based learning and in a third part we look at existing educational software and highlight their pros and cons to build on the experiences made there.

1.1 Previous work

Sonja Tabea Blum Kevin Tang Sarah Kamp Jil Weber

1.2 Gamification and Game Based Learning (GBL)

4 5 6 7 8

1.3 Existing Educational Software

https://einfachinformatik.inf.ethz.ch/kindergarten https://en.wikipedia.org/wiki/The$_{L}earning_{C}ompanyhttp$
$//en.wikipedia.org/wiki/Reader_{R}abbithttps://en.wikipedia.org/wiki/OutNumbered$!

pro: player didnt recognize he was learning something con: every level needed the same level of knowledge in every category

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1.4 Checklist

X - list of research works that are related to your paper—necessary to show what has happened in this field. X - critique of the approaches in the literature—necessary to establish the contribution and importance of your paper.

X distinguish and describe all the different approaches to the problem.

Critiquing the major approaches of the background work will enable you to identify the limitations of the other works and show that your research picks up where the others left off. This is a great opportunity to demon- strate how your work is different from the rest; for ex- ample, show whether you make different assumptions and hypotheses, or whether your approach to solving the problem differs.

DIE FRAGE: ein neues framework, einfach zu lernen, ja nein? aufwand, vorteile, nachteile

2

Design

In this section we will capture the requirements for our learning environment. We will look into the cognitive and motor abilities of the target audience and some elements of gamification which will be analyzed and assessed. The existing environment our work should be implemented has conditions as well. Those will be taken into consideration while evaluating a suitable framework.

2.1 Requirements

Target Audience

Elements of Gamification

Additional Conditions

Framework

human - kinder koennen nicht lesen und schreiben, keine groesseren zahlen und keine buchstaben -

Game - capturing name - objects categories nad subcategories - easy level - easy level under harder difficulties - limited sorting -> hashing - set easy - set hard - overview - gamification - track progress - time based - correct wrong - visual gratification - have fun dont recognize you are learning - optics - randomization and more options for variety - sound - story like - menu -

levelmenu - fullscreen - flow - exitbutton - returnbutton -

2.2 Checklist

- explicitly describe all the hypotheses and assumptions of the environment on which the problem will be stated. - Put good effort in realizing all explicit and implicit assumptions that you make, and clearly state them. It is important to provide support for your assumption choices. The more valid and acceptable your assumptions are, the more valid and acceptable your work will be. The system model section should always have a figure. The figure should demonstrate the parameters of your system model. Prepare the figure so that it can later be reused or enhanced to demonstrate your solution.

Often, this section is merged with the system model. State your problem clearly. Be as exact as possible into stating what the question of the problem is. It reflects poorly upon an author if he cannot describe or does not know what problem his solution addresses. But most im- portantly, it will be easier for successive researchers to classify your work.

3

Implementation

In this section all implementation tools and approaches are explained. First our used framework will be explained, then how our different objects are generated and at last how these two are combined to our final solution.

3.1 Phaser 3

Scenes

3.2 Object generation

3.3 The Game - Gotscha!

3.4 Checklist

- overview of your solution. Give a good explanation of its rationale, concepts and mechanisms. If your solution relies on a theorem or some other undocumented concept, make sure that you explain them before you carry on to the detailed description.

The main part of this section is the thorough descrip- tion of the solution and its functionality. The description should not contain arguments on correctness or design de- cision debates; simply, describe the mechanisms of your solution and avoid explanations of the "why so" type. Dedicate a separate paragraph or two on the latter, if you deem necessary.

Disassemble your solution to its functional components and explain them separately. For example, if you describe a distributed algorithm, explain the protocol-specific part (message format, etc.) separately from the semantics and decision-making part of the algorithm. It is both important and useful to provide figures demonstrating the functionality of your solution. Make the figures look similar to the system model figure, if ap- plicable, and exploit the similarities and differences to point out important aspects of your solution.

Analysis can be of two types: qualitative and quantitative. The former means to show some properties (qualities) of your solution, while the latter means to show some performance aspects of your solution. Qualitative analysis is usually proof of correctness, however it could be proof that the solution possesses some desired property. For algorithms or protocols, a proof of correctness is always welcome. Quantitative analysis is mostly performance analysis. It is important to explain what performance metric you use and why you have selected the specific metric. Choos- ing a metric that has been widely used will make the comparison to other solutions easier.

4

Evaluation

4.1 Section

Section 4

4.2 Checklist

Depending on your budget and available time, you may have performed simulations or even some experiments. In either case, it is important to describe the environment of your experiments or simulations. This includes stating the parameters and conditions of the environment (sim- ulated or real), what measurements were taken and how they were taken. You need to establish the fact that your simulation or experiment results are statistically stable, meaning that they are representative of the space of possible results. Performing experiments and simulations is a subtle mat- ter, always putting the validity of your data at risk in many aspects. Before you perform the simulation or ex- periment, educate yourself on how to perform simula- tions, how to interpret the results and how to present them in graphs and figures. Each figure (or graph) should be well explained. Dedi- cate at least one paragraph for each figure. Describe what the reader sees in each figure and what he should notice. Moreover, reason on the results—are they the way they were expected to be? Avoid giving tables of numerical data as means of presenting your results. Compare the performance of your solution to the per- formance of one or two competing solutions. Usually, when you simulate or experiment on your solution, you simulate it in contrast to a competing solution. You have to make sure that the test scenarios are fair and make an argument about the fairness of your comparison in the paper. A special case of experiment is the usability test. Many times, although the performance of a solution can

be im- pressive, the applicability of it can be minimal. Usability test is a type of experimentation, which determines the acceptance of a solution by end-users or its suitability for certain applications. Usually, papers on software product solutions contain usability tests.

Conclusion

The conclusions section, similar to the introduction and related work sections, serves two purposes. The first is to elaborate on the impacts of using your approach. The second is to state limitations or disadvantages of your so- lution, thus enabling you to provide directions for future research in the field.

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Declaration of originality

The signed declaration of originality is a component of every semester paper, Bachelor's thesis, Master's thesis and any other degree paper undertaken during the course of studies, including the respective electronic versions.

Lecturers may also require a declaration of originality for other written papers compiled for their courses.

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