Czech Technical University in Prague
Faculty of Electrical Engineering

Department of Computer Graphics and Interaction
Field of study: Human Computer Interaction

Content sharing in the EduARd system

MASTER'S THESIS

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ZADÁNÍ DIPLOMOVÉ PRÁCE

I. OSOBNÍ A STUDIJNÍ ÚDAJE

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II. ÚDAJE K DIPLOMOVÉ PRÁCI

Název diplomové práce:

Sdílení obsahu v systému EduARd

Název diplomové práce anglicky:

Content sharing in the EduARd system

Pokyny pro vypracování:

1) Seznamte se s aktuálním stavem projektu EduARd (rozšířená realita pro školy) [3, 4, 5].
2) Navrhněte a implementujte rozšíření stávajícího systému pro tvorbu učebnic o správu a sdílení 2D a 3D datového obsahu napříč portálem (tzv. tržiště obsahu).
3) Navrhněte a implementujte postup optimalizace přenášeného datového obsahu mezi aplikacemi pracujícími s portálem (editor, mobilní klientské aplikace). Spolupracujte při návrhu s kolegy řešícími další části systému (mobilní aplikace pro prohlížení obsahu).
4) Řešení průběžně testujte unit testy. Funkcionalitu ověřte vytvořením vhodného počtu kopií a úprav již existujících učebnic, jejich výběr konkretizujte s vedoucím práce. Ověřte nové učebnice na klientském zařízení. Při návrhu a realizaci uživatelského rozhraní tržiště postupujte dle metodiky UCD [2].

Seznam doporučené literatury:

[1] Fanie Reynders, Modern API Design with ASP.NET Core 2, Apress 2018
[2] T. Lowdermilk, User-Centered Design, O'Reilly Media, 2013
[3] http://eduard.fel.cvut.cz
[4] Jan Skála, Systém pro správu uživatelů projektu EduARd, BP FEL, 2019.
[5] Anastasia Surikova, Webový klient pro správu mobilních výukových úloh systému EduARd, BP FEL, 2019.

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III. PŘEVZETÍ ZADÁNÍ

Diplomantka bere na vědomí, že je povinna vypracovat diplomovou práci samostatně, bez cizí pomoci, s výjimkou poskytnutých konzultací. Seznam použité literatury, jiných pramenů a jmen konzultantů je třeba uvést v diplomové práci.

. | Datum převzetí zadání

Podpis studentky

Declaration

I hereby declare I have written this diploma thesis independently and quoted all the sources of information used following methodological instructions on ethical principles for writing an academic thesis. Moreover, I state that this thesis has neither been submitted nor accepted for any other degree.

In Prague .....

.....
Michaela Vlčková

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Michaela Vlčková

Title:
Content sharing in the EduARd system

Author: Michaela Vlčková

Field of study: Open Informatics

Subfield: Human Computer Interaction

Thesis type: Master's thesis

Supervisor: Ing. David Sedláček, Ph.D.

Abstract: The thesis is expanding the EduARd project features by adding the possibility to share the created content, therefore it widens the possibilities for its users to experiment with a lot more resources and to share their creations.
In the thesis, the summary of the project's current state is followed by the analysis of the similar services and dedicates a section for the analysis of the User-Centered Design methodology as the intended direction of development.
Then it proceeds to the design of the user interface for two considered user flows: The Marketplace resource addition and consumption.
It decides to implement the API as a separate service to fill the requirements without disrupting the current API implementation. The frontend section for the adding, using, listing and filtering of the Marketplace resources is integrated into the existing solution.
Based on the design, the prototype that allows the adding, listing and consuming of the resources is implemented. The thesis ends with qualitative user studies and quantitative user survey proposals.
Key words: EduARd, content sharing, ASP.Net Core, Postgres, React, virtual educational tools, user-centered design

Název práce:
Sdílení obsahu v systému EduARd

Autor: Michaela Vlčková

Abstrakt: Práca rozširuje možnosti projektu EduARd o zdielanie obsahu, čím umožnuje užívateľom experimentovať s väčším množstvom podkladov a zdielať ich vlastný vytvorený obsah.
V práci je stručný súhrn súčastného stavu projektu, nasledovaný analýzou podobných služieb a venuje sekciu analýze UCD metodiky, ktorú stanovuje ako zamýšľaný smer vývoja a návrhu.
Následuje dizajn užívateľského rozhrania pre dva zvažované užívateľské postupy: pridávanie a vyžívanie podkladov z trhoviska.
V rámci dizajnu práca určuje implementáciu API na obsluhu podkladov trhoviska ako oddelenú aplikáciu. Frontendovú časť implementácie na pridávanie, prezeranie a filtrovanie podkladov navrhuje integrovať do už existujúceho riešenia.
Na základe dizajnu je naimplementovaný prototyp umožňujúci nahrávať na trhovisko podklady, prezerať si tie už pridané a využiť akékoľvek z nich. Práca končí návrhom kvantitatívneho dotazníka a kvalitatívnej užívateľskej štúdie.
Klíčová slova: EduARd, zdieľanie obsahu, ASP.Net Core, Postgres, React, virtuálne výukové pomôcky, dizajn zameraný na užívateľa

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List of Acronyms

API - Application Programming Interface

HCI - Human-Computer Interaction

UX - User Experience

UCD - User-Centered Design

CRM - Customer Relationship Management

DTO - Data Transfer Object

XML - Extensible Markup Language

FR - Functional Requirement

UR - User Requirement

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Introduction

The thesis covers an extension to an already existing system. This first short chapter answers the fundamental questions: what is EduARd, and why the topic was created.

About EduARd

EduARd[1] is a system for developing and using teaching aids in the form of virtual educational paths consisting of the GPS bound books, tasks and 3D models created by the teachers of elementary and high schools for their students and pupils to use on portable devices. It consists of two major parts: Web editor for the teachers to create and manage all the educational paths materials and mobile applications used by students to consume prepared content.

Motivation

The creation of the resources can be challenging and time-consuming for the teachers. In most cases, the same or slightly modified content can be used by multiple institutions in various use cases. One of the ways to make the whole process easier is to allow the possibility to start from already existing content. As not all of the items are suitable for this approach, it depends on the author's judgement to decide whether the result should be published for others to take. It is the definition of the Marketplace this thesis is trying to design so the content received by students can have the highest possible quality and allow all teachers to be able to do more advanced materials to best explain and offer the knowledge on selected topics.

Chapter 1

Analysis

Aspects that are considered before the design begins are the current state of the EduARd system itself, other marketplace services used in the educational field, and the tools to approach the designing process itself.

1.1 The current state of the implementation

When writing this thesis, the system is ready and used by at least one institution. This fact provided an advantage of having existing production data used in both the design process and a test data set of the implementation.

1.1.1 Backend (API and database)

The backend part was developed as a Bachelor Thesis by Jan Skála[2]. It contains user and institution management and authentication, storage management of all the assets and source files of resources, and API for the web editor and mobile applications. Complete data structure is described in a form of relational schema in the figure 1.1.

The API uses the ASP.Net Core framework[3], built on .Net Core and C# as a programming language. All data are stored in PostgreSQL[4] database. The same technologies are used for the API of the implementation prototype to allow easier integration of the results of this thesis.

For the easy preview of the API, the Swagger API Platform[5] tool is used. It allows to visualise and test all API endpoints with its options directly in the web browser.

Figure 1.1: Relational schema of primary backend database.[2]

1.1.2 Web Editor for resources management (for teachers)

System for teachers was developed as a Bachelor Thesis by Anastasia Surikova[6]. It is available onhttps://editor.eduard.fel.cvut.cz/ and allows the management of the educational materials, in this case only the 2D sources named in the system as Books, whose edit layout preview is shown in the gure 1.2.

Figure 1.2: Web editor preview - Book edit.

It also contains the possibility to manage 3D scenarios and resources, developed as Bachelor Thesis by Michal Mráz[7]. This part is implemented separately and is embedded in the editor via iframe, as seen in the gure 1.3. It is hosted at https://ar.eduard.fel.cvut.cz/index.html and does not use the same front-tend framework as the rest of the web editor. For this reason, the implementation prototype of this thesis focuses on the Books, but since the source les of both types of content are represented in XML les, it should work with both types of content. Though, this statement is not tested.

Figure 1.3: Scenarios embedded section preview.