

UNIVERSITY OF MUNICH
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Master Thesis

Web-Based Creator for Activity Sculptures

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Zusammenfassung

Die Sammlung persönlicher Aktivitätsdaten wurde durch die zahlreiche Anzahl an Anwendungen und Geräte enorm vereinfacht. Diese Anwendungen und Gerätschaften, die hauptsächlich das Ziel haben, Nutzer zu einem aktiven Lebensstil ermutigen, können in Smartphones, wo sie die Vielfalt an Sensoren ausnutzen oder als tragbare Accessoires wie moderne Uhren oder Armbänder gefunden werden. Abgesehen davon, dass klassische Datenvisualisierungen Einblicke in den Aktivitätsdaten verschaffen können, ist es auch möglich den Datensatz durch physikalische Objekte, auch als Aktivitätsskulpturen bekannt, zu visualisieren. Es wurde bewiesen, dass Aktivitätsskulpturen Nutzer positiv beeinflussen, da die Nutzer sich für ihren aktiven Lebensstil belohnt fühlen. Um den Prozess der Visualisierung von Information in Skulpturen weiter zu forschen wurde ein Web-Konfigurator für Aktivitätsskulpturen entwickelt. Durch die Nutzung moderner Web-Technologien erhält der Nutzer eine Plattform die ihm es erlaubt seine Daten unkompliziert zu exportieren und ermöglicht ihm die Gestaltung einer 3D druckbaren Skulptur. Für die Entwicklung des Konfigurators, wurden aktuelle Konfiguratoren analysiert mit dem Ziel Best-Practices im Bereich des Interface- und Interaktionsdesigns zu erkennen. Um den Nutzer eine breite Vielfalt an möglichen Anpassungen für die Skulptur, wurden 4 verschiedene Skulptur-Prototypen entwickelt. Letztendlich wurden für die Validierung des Prototyps eine online Demoversion veröffentlicht und eine Nutzerstudie durchgeführt. Die Resonanz der Nutzer zeigte, dass unser Prototyp einfach zu bedienen war und, dass die entstandene Skulptur ästhetisch und sinnvoll überkam.

Abstract

The recollection of personal activity data has been greatly facilitated by the increasing amount of applications and devices that encourage users to measure their activity with the primary goal of health improvement. These devices range from mobile applications taking advantage of smartphone sensors to dedicated fitness trackers presented as modern watches and bracelets. Apart from the analytical insights about the data obtained through classic data visualizations, it is also possible to visualize the information through physical objects also known as activity sculptures. It has been shown that activity sculptures have a positive influence in users making them feel rewarded for their active lifestyle. To further study the process of visualizing activity information into sculptures an web-based activity sculpture creator was developed. This tool takes advantage of modern web technologies and offers a platform in which users can export their data and allows them to experiment creating variations of an activity sculpture which can also be exported for 3D printing. For the development of the configurator current product customization platforms were analyzed for gathering best practices in user interface and interaction design. In order for users to have a sculpture with a high degree of variability for the data to be mapped on 4 different sculpture prototypes were developed. For the validation of the configurator an online version was released and a user study was performed. User feedback showed that our prototype was easy to operate and that the obtained sculptures were appealing and meaningful to users.

Task Definition

Activity Sculptures are physical (3D printed) representations of personal tracking data (e.g. step count) that dwell between the artistic and the abstract. For this master's thesis the student will develop a web configurator that will allow to individually create said activity sculptures (a similar example can be seen in www.shapeways.com/creator/statement_vase).

The focus of the thesis will be the development of interaction concepts and their implementation in the configurator. The concepts will be examined and improved in smaller iterative user studies. Another important aspect is a seamless and easy import of external tracking data (e.g. export data from tracking apps). The result should be a stable working prototype that can be used for follow-up works.

Possible research questions

- What interaction concepts are possible? What are their advantages and disadvantages?
- What degree of freedom is possible and meaningful while designing a visualization?
- What is a possible design space for said activity sculptures?

Tasks

- Research and related works (e.g. data visualization, configurators)
- Development of interaction concepts
- Concept implementation
- Planing and executing several small user studies
- Written thesis and presentation of work

Requirements

- Programming skills in web development and computer graphics

I confirm that I independently prepared the thesis and that I used only the references and auxiliary means indicated in the thesis.

Munich, May 17, 2015

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1 INTRODUCTION

Introduction

1 Introduction

The presented work deals with two major topics: web customization platforms and activity sculptures. For the former topic interaction processes and usability aspects applied in current projects are of great interest as they provide a foundation on which the author's prototype will be built upon. The latter will help the user explore and engage with their activity data first in virtual and later in physical 3D space. The following sections describe an in depth look at the motivation of this work, the problems that are set to be resolved and the goals to be achieved. To conclude this chapter a general overview of each chapter will be provided.

1.1 Motivation

1.2 Problem definition

1.3 Goals

1.4 Content overview

2 BACKGROUND & RELATED WORK

Background & Related Work

2 Background & Related Work

2.1 Interactive Product Visualization

2.1.1 Gates 3D Configurator

2.1.2 Makervis

2.1.3 Twikit

2.2 Activity Sculptures

2.2.1 Sweet Atoms

2.2.2 Nike FuelBand Fibers

2.3 Activity Data Sources

2.3.1 Fitness Tracker API

2.4 Summary

3 PROTOTYPE DESIGN

Prototype Design

3 Prototype Design

3.1 Requirements

3.2 Sculpture Design

3.2.1 3D Graph

3.2.2 Activity Landscape

3.2.3 Activity Flora

3.2.4 Activity Vase

3.2.5 Prototype Validation

3.3 Configurator Design

3.3.1 Ideation Process

3.3.2 Prototype Validation

3.4 Summary

4 IMPLEMENTATION

Implementation

4 Implementation

4.1 Requirements

4.2 Technology Stack

4.3 Configurator Architecture

4.3.1 Data Source

4.3.2 Withings API Integration

4.3.3 Sculpture Generation & Rendering

4.4 Summary

5 USER STUDY

User Study

5 User Study

5.1 Study Design

5.2 Questionnaire

5.3 Participants

5.4 Procedure

5.5 Limitations

5.6 Results

5.7 Summary

6 CONCLUSION

Conclusion

6 Conclusion

7 FUTURE WORK

Future Work

7 Future Work

Appendix

A Online Questionnaire

B User Study Results

B.1 Questionnaire Results

B.2 Heat Map Images

C Prototype Sketches

C.1 Sculpture Prototypes

C.2 Web Configurator Prototypes

D Code Snippets

Contents of the enclosed CD

Thesis

- L^AT_EX Document
- PDF File

Presentations

- Initial presentation
- Final presentation

Activity Sculpture Web Configurator

- Prototype sketches
- Source code
- Gitlab and Github mirrors
- Instructions for deployment
- Login Data

Sculptures

- Prototype sketches
- .stl 3D print ready example files

User Study

- Questionnaire
- Results
- Heat map images

References