

Investigating Technologies to Enrich Museum Audio Description for Enhancing Accessibility

Xi Wang

Queen's University Belfast, UK

xwang26@qub.ac.uk

ABSTRACT

Museums are typically dominated by visual experiences. This means that people who are blind or partially sighted (BPS) tend to be excluded from several aspects of the visitor experience, including emotional engagement. The purpose of this practice-led research project is to explore ways in which smart software-enabled technologies could be used to enrich audio description (AD) and to enhance accessibility and visitor experience for BPS visitors. Therefore, my 4-year research project, funded by the Marie Skłodowska-Curie doctoral training programme, investigates, develops and tests innovative access options for BPS visitors, using new technologies within diverse museum environments. Working with Titanic Belfast and Royal National Institute of Blind People in Northern Ireland, I pioneer three approaches that combine a commitment to low-cost accessibility solutions and emotionally engaged visitor experience and try to answer the following research questions:

- (i) How can I evaluate the complex impact of museum AD on BPS visitor experience and, in particular, how can I evaluate their emotional responses?
- (ii) How, and to what extent, can a storytelling approach, combined with the concept of “journey”, enhance museum accessibility and visitor experience for visitors with various sight loss conditions?
- (iii) How, and to what extent, can new technologies and smart maps enable access to these journey stories and provide emotionally engaging visitor experiences for BPS visitors?
- (iv) How easy can it be made for museums to produce their own interactive voice-driven audio descriptive guide to enrich visitor experience for BPS visitors?

The first question is addressed mainly in Chapter One. I present a study of BPS visitor experience in Titanic Belfast, and applies for the first time existing models of visitor experience in the context of accessibility. The study reveals that the complex nature of visitors' emotional responses and visitor experience in the live museum environment.

The second and third questions are addressed in Chapter Two. I develop and evaluate a new approach to accessibility which uses a multisensory smart map to present a journey-based story of *Titanic's* maiden voyage. The smart map uses readily available materials and affordable technologies, such as Raspberry-Pi. It also uses software-controlled multi-function buttons to enable BPS users to autonomously select the desired AD and level of detail. The results of a reception study show that the approach enabled BPS participants to experience significant emotional engagement with museum resources in Titanic Belfast.

The fourth question is addressed primarily in Chapters Three and Four. I propose a major extension to the standard passive audio descriptive device by developing an interactive voice-driven museum audio descriptive guide for Titanic Belfast (TBot), with built-in navigation instructions and a free format Question and Answer facility. This TBot uses text-to-speech technology, to generate AD from a textual knowledge base; speech recognition for input, to voice-activate the device; and a design platform that easily enables museum staff to produce, update and customise the audio descriptive guide. Altogether, the project contributes several methods to enrich AD for enhancing museum accessibility and visitor experience for BPS visitors both theoretically and practically.

KEYWORDS: Audio description, blind or partially sighted visitors, museum accessibility, smart map, technology, visitor experience

Completion of Thesis

Place: Queen's University Belfast, UK

Year: 2022

Supervisors: Prof. David Johnston, Prof. Sue-Ann Harding, Prof. Danny Crookes

Original language: English

提高博物馆无障碍可达性：博物馆口述影像新技术探索

王曦

英国贝尔法斯特女王大学

xwang26@qub.ac.uk

摘要

博物馆参观体验通常以视觉为主。因此，盲人和视弱群体 (BPS) 在游客体验上往往被边缘化，例如，博物馆很难照顾这类群体的情感体验。该研究项目以实践为主导，探索如何使用智能软件支持来丰富口述影像 (AD)，以此提高博物馆无障碍可达性和 BPS 游客体验。此课题由玛丽居里博士培训计划资助，为期四年，与贝尔法斯特泰坦尼克号博物馆和北爱尔兰皇家国家盲人研究所合作。课题旨在探索、开发和测试新技术，以此提高博物馆的无障碍可达性。我共开创了三种方法，将低成本的无障碍解决方案和情感体验相结合，并尝试回答以下研究问题：

- i. 如何评估博物馆 AD 对 BPS 游客体验的复杂影响，尤其是如何评估他们的情绪反应？
- ii. 叙事与“旅程”概念相结合的方法如何以及在多大程度上能为 BPS 提高博物馆的无障碍可达性和游客体验？
- iii. 新技术和智能地图如何以及在多大程度上能呈现这些旅程故事并为 BPS 游客提供情感体验？
- iv. 若博物馆需制作自己的交互式语音驱动的口述影像语音导览以丰富 BPS 的游客体验，这个过程可以变得多容易？

第一章就第一个研究问题进行了主要讨论。我进行了一项关于贝尔法斯特泰坦尼克号博物馆 BPS 游客体验的研究，首次无障碍研究背景下应用了现有的游客体验模型。该研究揭示了参观者在博物馆环境中的情绪反应和游客体验的复杂性。

第二章讨论了第二个和第三个研究问题。我开发并评估了一种新的无障碍可达性方法，使用多感官智能地图来呈现基于泰坦尼克号处女航的旅程故事。该智能地图使用 Raspberry-Pi 等现成的材料和低成本技术，还使用了软件控制的多功能按钮，使 BPS 游客能够自主选择所需的 AD 及其详细程度。调查研究结果表明，该方法提高了 BPS 参与者的情感体验。

第三章和第四章主要讨论了第四个研究问题，提出通过为贝尔法斯特泰坦尼克号博物馆开发交互式语音驱动的口述影像语音导览（简称 TBot），着重扩展了传统被动的口述影像语音导览。TBot 具有内置导航说明和问答工具，使用语音合成技术将文本知识库生成 AD，并通过使用语音识别技术激活设备。同时，我开发了一个 TBot 设计平台，使博物馆工作人员能够轻松制作、更新和定制口述影像语音导览。此课题提出了多种丰富 AD 的方法，以在理论上和实践上增强针对于 BPS 游客的博物馆无障碍可达性和游客体验。

关键词: 口述影像（AD），盲人和视弱群体（BPS），博物馆无障碍可达性，智能地图，技术，游客体验