

Multicolour 3D-Printed Geovisualisation

Diploma Thesis

Introduction

In an era of technological advancement and carrying a “computer” in your pocket, 3D printing still awes the general onlooker. The 3D printing landscape has continued to evolve since its introduction in the 1980s. One of the many innovations in 3D printing has been printing models with multiple colours. This advancement has trickled down to consumer-grade 3D printers that are more accessible to the public. Multicolour 3D printing using low-cost Fused Filament Fabrication (FFF) technology enhances the geospatial applications of 3D printing. This research explored the potential of creating vibrant, detailed 3D geovisualisations using FFF type 3D printers and associated tools.

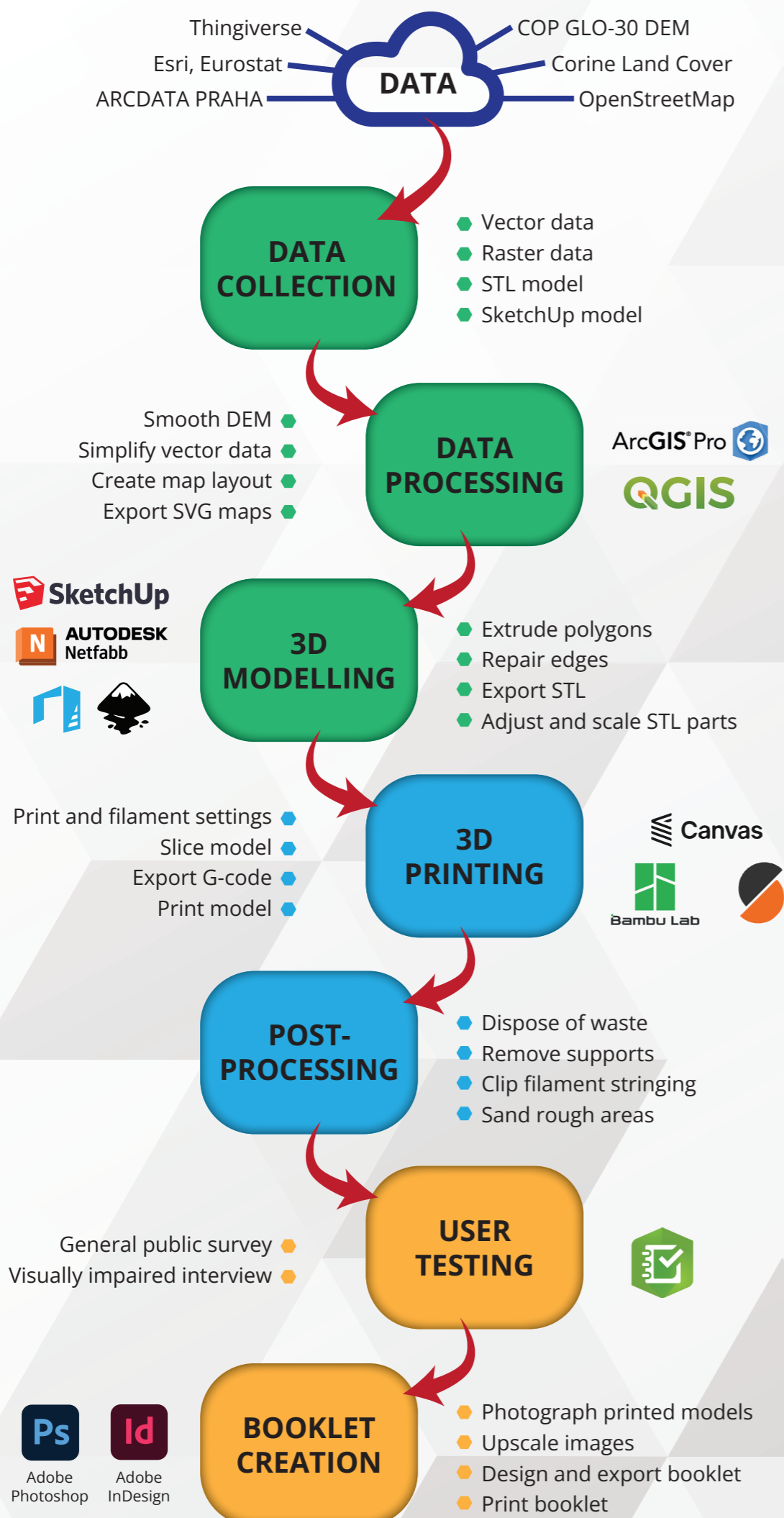
Objectives

The overarching aim of the diploma thesis was to explore, examine and evaluate the possibilities of multicolour 3D geovisualisations, primarily focused on FFF type 3D printers and compatible tools available in the 3D Laboratory of the Department of Geoinformatics (KGI) at Palacký University Olomouc (UPOL). The study examined various approaches to combining filament colours in complex models of more than two colours distributed horizontally and vertically. To achieve this aim, four sub-goals were identified.

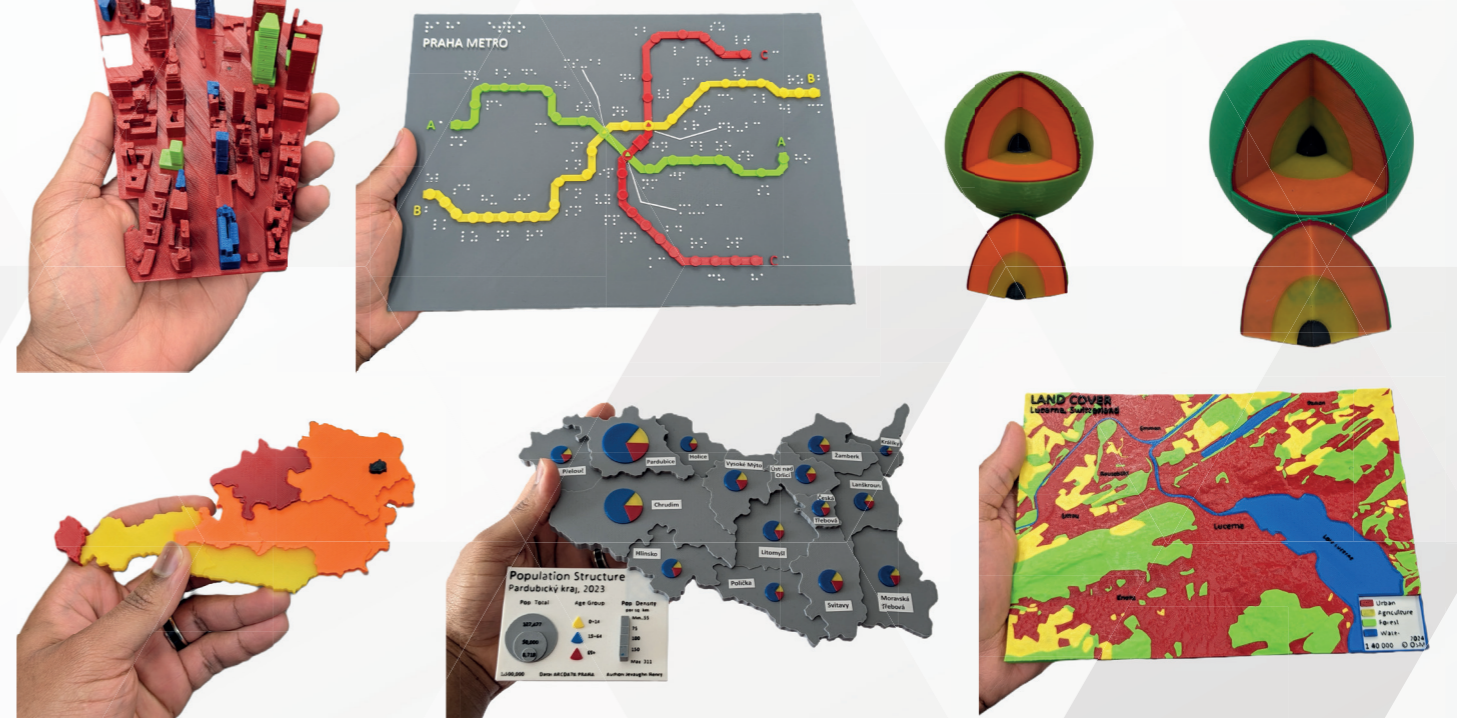
SUB-GOALS

- To prepare 10 models (with varying complexity) to test the available multicolour printing equipment.
- To develop and optimise printing parameters and processes for achieving high-quality FFF multicolour prints.
- To create a multicolour 3D printing booklet for use in the department showcasing the printing results and lessons learnt.
- To assess the environmental impact of multicolour 3D printing (focused on waste material).

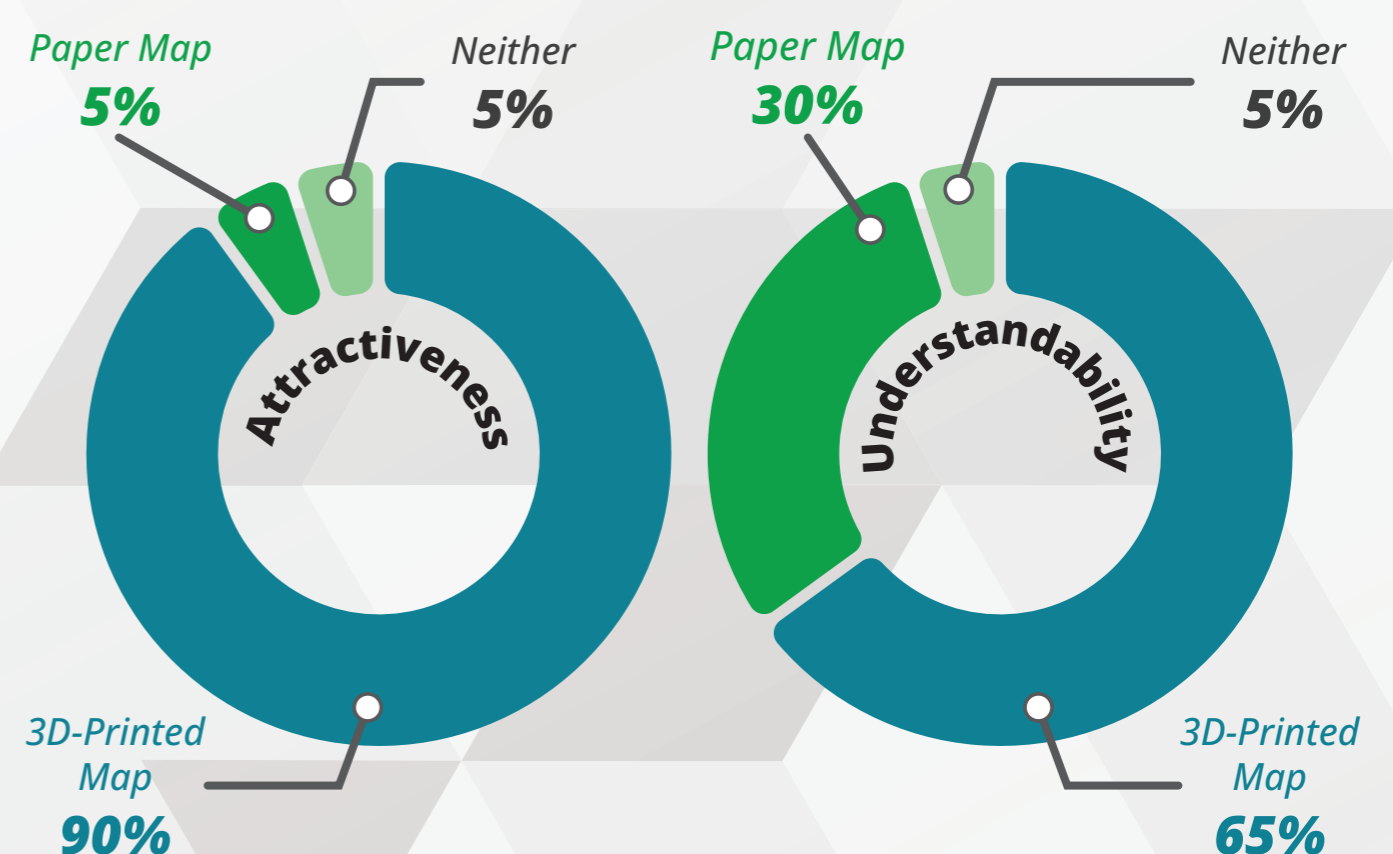
Methodology



Results



User Testing



Conclusion

The research has resulted in a deeper understanding of the potentials and challenges of multicolour 3D geovisualisations. Future studies may focus on refining printing processes, enhancing accessibility features, and developing sustainable printing practices to minimise environmental impacts. Among the tested equipment, the Prusa XL stood out for its efficiency, albeit with cost considerations. The balance between price and functionality with multi-material add-ons for single extruder printers was explored, and even though there is increased waste and print time this option offers superior value and is more likely to be adopted by a wider audience.