

# Exploring Cultural Heritage in Augmented Reality with *GoFind!*

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**Abstract**—Historic photo collections are important instruments to document the development of cityscapes in the course of time. However, in most cases, such historic photos are buried in archives that are not easily accessible. But even when cultural heritage archives are opened and exposed to the public, for instance by specialized digital libraries, the value of the individual images is limited as they can only be used in the context of the digital library’s retrieval engine and independent of the actual location that is being displayed. With *GoFind!*, we bring the retrieval engine of historic multimedia collections to mobile devices. The system provides location-based querying in historic multimedia collections and adds an augmented reality-based user interface that enables the overlay of historic images and the current view. *GoFind!* can be used by historians and tourists and provides a virtual view into the past of a city.

## I. INTRODUCTION

As time goes by, cityscapes exhibit changes which are often happening so slowly that they are almost unnoticeable. Over years, decades and centuries, however, these gradual developments have the power to substantially change the face of entire cities. To enable the experience of such changes and to set them into their local context, we present *GoFind!*, a system which combines location-based multimedia retrieval with an augmented reality client for mobile devices. *GoFind!* enables users to query collections of historic multimedia content for perspectives of their current surroundings and overlay them onto their current view using a mobile device. This way, *GoFind!* offers a virtual window into the past.

In this paper, we present the *GoFind!* retrieval capabilities and the AR-based user interface on the basis of a historic multimedia collection of the city center of Basel.

The remainder of this paper is structured as follows: Section II surveys related work in the field of augmented reality in cultural heritage applications while Section III describes *GoFind!*’s architecture. Section IV briefly outlines what can be seen in the demonstration and Section V concludes.

## II. RELATED WORK

When considering multimedia collections in a mobile setting like in touristic applications, two challenges arise: First, novel query types are needed that go beyond pure keyword search (e.g., ‘show me all images that have been taken from the current location’, or ‘show me all photos of bridges that look similar to this one’). Second, the search results need to be presented in an attractive and intuitive way to a user.



Fig. 1. View of a current cityscape with an augmented reality overlay.

Conventionally, retrieval systems organize search results in ranked lists, ordered by relevance (similarity). When search takes place on mobile devices with limited screen sizes, this approach is no longer effective. Augmented reality provides an innovative approach to visualize retrieval results by using an overlay between different result objects, or an overlay between the current camera view of a mobile device and the retrieval results. While this has been addressed in various types of applications, only few highly specialized systems for selected locations in touristic applications exist [2], [4]–[6], see also a survey in [3].

## III. *GoFind!*

This section describes *GoFind!*, its system architecture and modes for user interaction.

### A. Architecture

*GoFind!* is comprised of two system components: i.) the back-end which processes retrieval queries and provides the multimedia data and ii.) the front-end which handles all user interactions. For the back-end, *GoFind!* uses the vitrivr [8] content-based multimedia retrieval stack which also supports spatio-temporal queries [1]. The front-end component of *GoFind!* is implemented as an Android mobile application and built upon Unity3d<sup>1</sup>. It uses Google ARCore<sup>2</sup> for the functionality required for the augmented reality display, such as visual odometry estimation. The front-end communicates

<sup>1</sup><https://unity3d.com/>

<sup>2</sup><https://developers.google.com/ar/>

