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Current multimedia applications are getting more user-centric by providing the user *control* over the content. Panorama video is becoming increasingly popular in that context, and we present an end-to-end real-time system called *Bagadus* to interactively zoom and pan into high-resolution panoramic videos. *Bagadus* integrates a sensor system, an event annotation system, and a video processing system using a video camera array. In this thesis, we focus mainly on the video capturing, user interaction and video delivery parts of *Bagadus*. The *Bagadus* prototype is currently installed and in use, at *Alfheim Stadium* and at *Ullevaal stadium* in Norway.

First, we look into the creation of the panorama video using multiple cameras, and we discuss several system-level details in implementing a real-time panorama pipeline. The developed pipeline creates a panorama of the size 4096 x 1680 pixels (almost 4k video) at 50 frames per second in real-time. Further, the panorama video is used to provide virtual pan-tilt-zoom services to the user, i.e., we present a design and implementation of a virtual viewer capable of providing interactive services in real-time.

Moreover, we present a real-time virtual camera system that can create smooth camera motion. Similar systems are frequently benchmarked with the human operator as the best possible reference; however, we avoid a priori assumptions in our evaluations. Our main question is simply whether we can design algorithms to steer a virtual camera that can compete with the user experience for recordings from an expert operator with several years of experience? In this respect, we present two low-complexity servoing methods that are explored in two user studies. The results from the user studies give a promising answer.

We also discuss the challenges involved in delivering such interactive services to a large number of users. One of the major challenges involved in Bagadus is the overhead to transfer a full quality panorama to the client, where only a part of the panorama is used to extract a virtual view. In this regards, we apply tiling to deliver different qualities of different parts of the panorama. Tiling has traditionally been applied to delivery of very high-resolution content to clients, and here, we apply similar ideas in a real-time interactive panoramic video system. A major challenge is movement of such a virtual view, where clients' regions of interest change dynamically and independently from each other. We show that our algorithms, which progressively increases quality towards the point of the view, manage to (i) reduce the bandwidth requirement and (ii) provide a similar Quality of Experience (QoE) compared to a full panorama system.