# SMARTKITCHEN Media Enhanced Cooking Environment

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## ABSTRACT
This work-in-progress paper describes our project SMARTKITCHEN, an interdisciplinary research project focusing on interactive display deployment in the kitchen - in particular around the cooking area. By applying a user-centered design approach the project aims to examine how screen-based interactive digital media can be accessed naturally in a constrained environment during the cooking process using multimodal interaction. Our main focus is on exploring new directions of supporting social and emotional aspects of the cooking experience. In this work-in-progress paper, we provide an overview on research directions, envisioned use-cases, and used technologies.

### Author Keywords
Multimodal interaction; multimodal interfaces; insitu-projection; smartkitchen; smart home; interactive displays.

### ACM Classification Keywords
H.5.1 [**Information Interfaces and Presentation]:** Multimedia Information Systems – *evaluation and methodology, video.* H.5.2 [**Information Interfaces and Presentation]:** User Interfaces – *evaluation and methodology, input devices and strategies, interaction styles.* H.5.3 [**Information Interfaces and Presentation**]: Group and Organization Interfaces - *collaborative computing, computer-supported cooperative work, evaluation and methodology*.

## INTRODUCTION
Cooking as a creative and social experience has become a strong trend in recent years. Within the context of a smart home, the aim of our project SMARTKITCHEN is to explore the deployment of multimodal user interfaces and novel interaction concepts in a media-enhanced cooking environment (Figure 1). Within this cooking environment users should be able to use digital and personalized media during the cooking experience without having to touch any device. As our cooking environment is designed to be context-aware, matching media support can be provided for each sub-task that is done in the kitchen e.g. reading and tracking of recipe texts and images, cooking videos, cooking shows etc. The explorations aim to support the cooking process positively and support social and emotional aspects of the cooking experience.

**Figure 1: Mock-up of the envisioned media enhanced cooking environment within a smarthome context.**

## DEPLOYED TECHNOLOGIES
For designing and building the interactive system using multimodal user interfaces and the underpinning interaction concepts, a combination of different interaction technologies will be explored: We envision gesture control, speech control and various display surfaces for interacting with the environment, for example, adaptive in-situ projection [2] or Augmented Reality systems. They serve as media content display and presentation of context-relevant information such as cooking time, pot temperature and similar parameters. Previous projects have already demonstrated the potential usefulness of similar technologies in a kitchen-like environment. MimiCook [5],


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a cooking support system, provides step-by-step instructions directly onto utensils and ingredients via projection. UbiBeam [3], a domestically deployable projector-camera system transforms an ordinary surface into a touch-sensitive information display.

## RESEARCH QUESTIONS

In our SMARTKITCHEN project, the main goal is to explore User Interaction and Digital User Experience. It aims to address the following research questions:

What are the needs, desires, and experience expectations of users regarding a media-enhanced cooking environment?

How can we design human-centered multimodal interfaces using natural interaction for a media enhanced cooking environment? How can we intensify existing positive cooking experiences and how can we design for new experiences related to cooking so that people enjoy and celebrate cooking events? How can solutions include social components such as sharing the cooking adventure with others e.g. networked cooking with friends over a distance or a grandson cooking together with his grandmother and learning her recipes?

Further we are interested in: How should a functioning prototype with high user acceptance look like? How can various multimodal technologies be connected within the cooking environment? Which technology is robust enough to be used in a real cooking environment? Which interface requirements arise from the perspective of smart home networking?

Since privacy and user data collection are an important aspects in our SMARTKITCHEN project, we address questions such as how the European data protection laws of 'privacy by design' and 'privacy by default' (EU Privacy Regulation EU) can be put into practice.

## RESEARCH METHODS

The deployed research approach within this project is based on the human-centered product development process in accordance with DIN ISO/IEC 9241-210:2010 [4]. For the planned media-enhanced cooking environment a prototype will be iteratively designed and developed in collaboration with users. During each cycle it will be tested and evaluated under realistic conditions and developed further based on the findings. Within this approach, Rapid Prototyping is followed by evaluations from a user perspective, technical views, and data privacy protection.

We employ methods that provide quantitative estimates and qualitative insights of the user experience. These estimates and insights will provide a comprehensive understanding of the experience especially for designers creating relevant multimodal information designs. To this end, Michael Burmester developed the Valencemethod, a process, which allows the formative evaluation of user experience [1].

## ORGANIZATIONAL ISSUES

The research project is divided into five major work packages reflecting the interdisciplinary research approach. Each package is carried out by an expert in his own field from the following areas: user experience design, information design, screen- and interaction design, digital media design and privacy protection law.

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