

# Object-Based Production: A Personalised Interactive Cooking Application

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## ABSTRACT

We present the Cook-Along Kitchen Experience (CAKE), a prototype that illustrates an interactive, personalised and responsive audio-visual experience created using Object-Based Media concepts and techniques. CAKE combines existing technologies in novel ways to create a distinctly new experience - a cookery programme that dynamically adapts in real-time as you cook with it. We demonstrate the novelty of the user experience - people can interact with the application and see a visualisation of how CAKE responds to live input, using a data model and scheduling algorithm.

## Author Keywords

Object-based media; interactive television; algorithms; production; design; user experience

## ACM Classification Keywords

H.5.m. Information Interfaces and Presentation; H.5.2 User Interfaces

## INTRODUCTION

Object-Based Media (OBM) describes the representation of media content by a set of individual assets together with metadata describing their relationships, and associations; how they should behave and be rendered at the point of consumption. New object-based interactive video formats support in-programme personalisation to tailor the sequence of content in response to input from a person, and modify the information contained within it and the presentation of such content. OBM standards are maturing and have been demonstrated in prototypes designed to facilitate novel personalisation in broadcast. The BBC is pioneering this work [8] and has several exemplar prototype OBM experiences [7]. In this paper we demonstrate the Cook-Along Kitchen Experience (CAKE).

CAKE follows a traditional TV cookery show format – featuring a chef explaining how to cook dishes, but it is created in an object-based way, so the programme becomes interactive and can adapt to a person by responding to input in real-time. CAKE’s *in-programme* personalisation takes the form of allowing people to customise recipes to personal tastes or dietary preferences, and quantities.

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In the CAKE application, the programme is constructed as a collection of ‘objects’ that are compiled using a metadata structure, which defines relationships between them and how they should change or re-assemble in response to a person. This creates an interactive piece of content that is seamlessly rendered in the browser using BBC Research and Development’s IP Studio technologies. CAKE is the first audio-visual adaptive prototype of this kind that was produced end-to-end using object-based approaches.

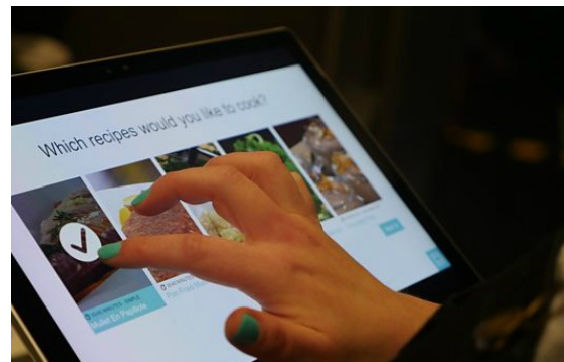


Figure 1: Configuring preferences with CAKE

## THE COOK-ALONG KITCHEN USER EXPERIENCE

CAKE supports an interactive dialogue between a person and the cooking show to support preferences and circumstances, and to support completion of method steps in one or more recipes. It adapts ‘in-the-moment’ to a person’s progress, so dishes can be created at their pace. This is in contrast to traditional instructional cooking content found in media (print, broadcast or online), typically presented as a fixed, simple sequential list of steps that are intended to walk someone through a cooking process. Interactivity in instructional video has been shown to have a beneficial effect on learning [4] and ‘responsiveness’ to interaction is identified as a key feature [8]. CAKE helps a person plan and execute cooking a recipe in real-time by supporting key components and mechanisms of instructional material, which are not easily afforded by traditional linear programmes [7] e.g. synching of content delivery with real-time activities to support learning in practice [3,5], capacity to practice/repeat important concepts or steps, progression at individual pace [3] and feedback on individual progress [7]. Similar to multimodal interactive learning systems like L.IVE [6], CAKE has the potential to bring together multimodal information from different sources in ways that help

facilitate learning, whilst being entertaining. CAKE is deemed suitable for wider content scenarios with a learning or instructive component.

Interaction with the system begins by selecting dishes, choosing how many people to cook for, and entering preferences based on context and resources, e.g. the number of cooking hobs available. Once the initial conditions are set, a cooking schedule is ‘sketched out’, when a person starts to follow the recipe steps, the programme works at their speed, as content is rendered dynamically, responding and changing in real-time to accommodate pace and progress.

## KEY FEATURES

Based on explicit audience input, CAKE scales the ingredients in a recipe, catering for different numbers of people easily. It is multimodal, in that objects, or recipe steps in this case, can be rendered in multiple ways depending on the desired format. These can either be presented as audio-visual media (presenter-led video where recipe methods are demonstrated), or as text with graphics similar to recipe step cards or flashcards. The application supports a novel ‘switch view’ feature, allowing a person to choose steps as recipe cards or as Audio Visual (AV) segments. This feature showcases the multi-modality afforded by OBM whereby content can be responsively rendered in different forms to better accommodate device, context, and needs of a person. CAKE also monitors how long it has taken a person to complete steps (measuring against an expected duration, independent from the length of the AV media associated with each step), and adjusts the experience accordingly. In principle, this approach could be developed to support variable skill level.

## THE SYSTEM

The data model captures and expresses knowledge about how recipes are constructed and carried out. In CAKE, this includes recipes used, tools and resources required, assumptions about how an audience may behave, and general information about the presentation and narration of each step. The data model is represented in a directed graph depicting steps and dependencies in each recipe, along with information about each step such as expected task duration, required ingredients and appliances, and which other steps must have first been completed prior to its start. The application periodically updates this data with the current progress, to allow for decision-making by a scheduling algorithm – which plays-out media objects and recipe instructions in an optimal order. The Object Grabber and Rendering Engine (OGRE) takes into account recipe data, choices, expected behaviour, and current progress to make decisions about which steps to present at any given time.

## DEMONSTRATION

In this demonstration, we exhibit the CAKE concept, and provide the opportunity to interact with CAKE as an audience member. We also offer a unique under-the-hood

view of how OBM enables this experience through a live visualisation of the data model, showcasing how the scheduling algorithm renders the experience in real-time. We present the application on multiple devices, alongside our behind-the-scenes ‘CAKEBOX’ view. We demonstrate how it adapts to a person’s input, cooking requirements and showcase CAKE’s ability to seamlessly transition from one modality to another. Attendees can experiment with various inputs to CAKE and get immediate feedback on how their input is dynamically reconfiguring the programme play-out.

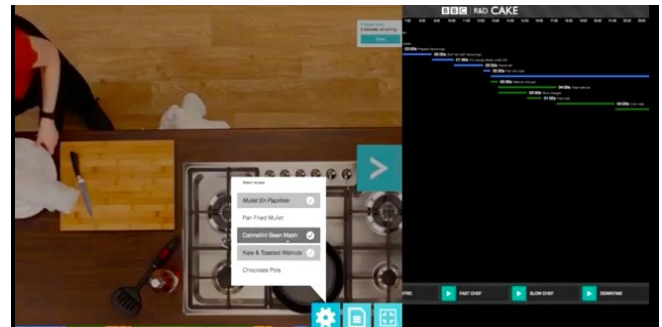


Figure 2: Programme view & back-end view

## FINAL REMARKS

Further information about CAKE can be found on the BBC R&D website <http://www.bbc.co.uk/rd/projects/cake> CAKE is currently live on BBC Taster <http://www.bbc.co.uk/taster>

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