



NEW IMMERSIVE SENSORY FUSION USING THE SENSEVIRTUAL AUGMENTED VIRTUALITY SYSTEM: REVOLUTIONISING SENSORY THROUGH AUGMENTED VIRTUALITY AND MARKETING 6.0 PRINCIPLES

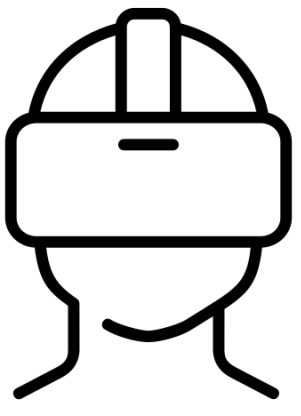
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INTRODUCTION

The adoption of **immersive technologies** to replicate **contextual cues** in sensory and consumer research is **increasingly popular** in food science and marketing, particularly within the framework of *Marketing 6.0: The Future is Immersive*. However, existing **Extended Reality (XR)** systems face several limitations.

KEY LIMITATIONS OF CURRENTLY XR SYSTEMS:



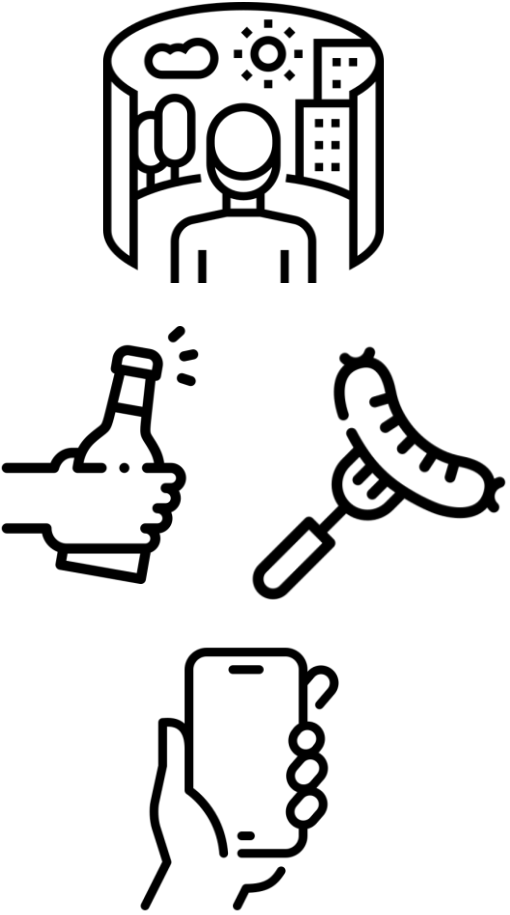
- **1.** Lack of realism and immersion
- **2.** Sensory evaluations conducted outside the virtual environment
- **3.** Low levels of personal presence in the environment
- **4.** Questionnaires with low variability
- **5.** Difficulties in large-scale implementation

METHODS

This study presents the development and the validation of the **SenseVirtual (Sense-AV)**, an augmented virtuality (AV) system designed for large-scale sensory and consumer tests.

The system stands out for its integration of **three key aspects**:

- **1. Realism and immersion:** Use of **360° videos** in 8K, captured in real environments and projected onto a chroma key area (Fig. 1)
- **2. Sense of personal presence:** Integration of real physical elements (food, utensils, participants' hands) visible through the headset (Fig. 3)
- **3. Data collection:** Real-time questionnaires on the participant's mobile device to assess hedonic, emotional, and sensory profiles, with the ability to collect audio of verbal comments and eye-tracking data (Fig. 4)



SYSTEM VALIDATION STUDY:

- **Participants:** 102 consumers (46.7 ± 12.6 years; 60.8% female)
- **Products:** Grilled sausage, mayonnaise (served with fries) and the chosen beverage (orange nectar or beer) in a combined menu
- **Sessions**
 - Conventional sensory booth (control)
 - Sense-AV (sports bar environment)
- **Data collection**
 - Overall liking (9-point hedonic scale; via mobile phone)
 - Verbal comments about the products (Sense-AV: orally recorded via headset; Sensory Booth: written on mobile phone)
- **Post session:**
 - Manipulation, comprehension, reading and response questionnaire (MCRRQ)
 - Engagement questionnaire (EQ) [1]
 - System usability scale (SUS) [2]
 - Virtual Reality System Usability Questionnaire (VRSUQ) [3]
 - Presence and Sensory Awareness (PSAQ) [4,5]
 - Individual interviews
 - Food intake

CONCLUSION

The Sense-AV system by Sense Test is a groundbreaking approach to sensory and consumer research by overcoming obstacles in real product interaction. It increases presence, engagement, and contextual realism beyond previous systems. Real-time data capture, including hedonic ratings, verbal feedback, and eye tracking, enables richer consumer insights. The technology supports large-scale implementation while maintaining ease of use and participant comfort. Sense-AV opens new possibilities for Marketing 6.0 strategies and advanced sensory science applications."



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Figure 1: Virtual environment (sports bar) observed by participants during sensory tests with the Sense-AV system.



Figure 2: Booth setup for the realization of sensory evaluations with the Sense-AV system at Sense Test facilities.

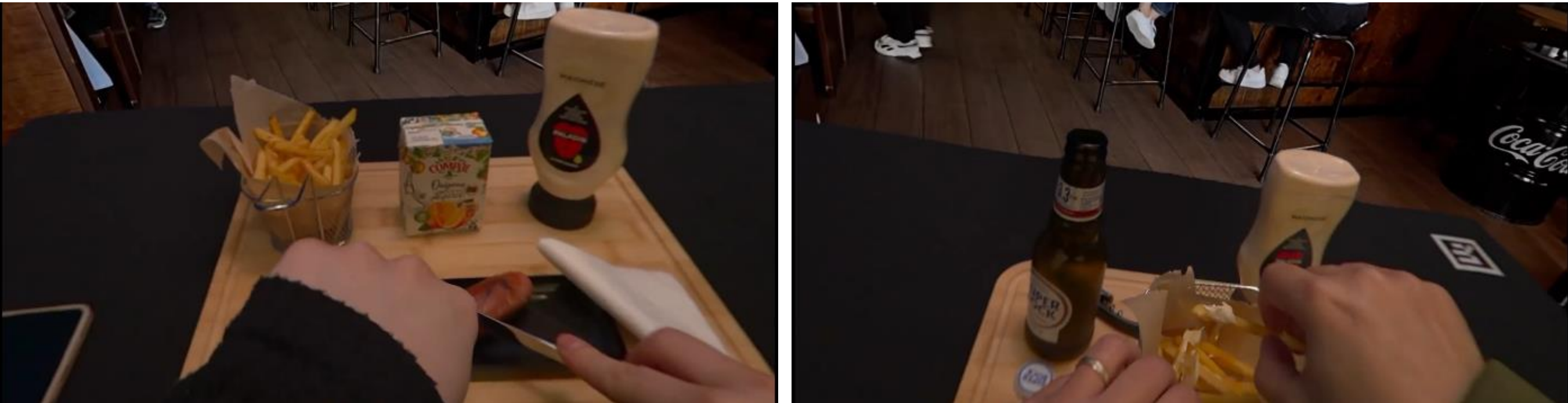


Figure 3: Booth setup for the realization of sensory evaluations with the Sense-AV system.



Figure 4: Evaluations (hedonic – left; free comments with audio recording – right) performed on participants' mobile devices.

RESULTS

- **Sense-AV System:**
 - **SUS:** 81.7 ± 14.4 (Grade A)
 - **VRSUQ:** 84.4 ± 14.5 Efficiency and 87.3 ± 15.9 Satisfaction
 - **PSAQ (1 to 7 scale):** 5.56 ± 1.46 Physical Presence, 5.06 ± 1.80 Social Presence, Self-Presence 5.27 ± 1.48 and Sensory Awareness 5.52 ± 1.40
 - **Interviews:** Most participants described the system as fun, immersive, realistic, and easy to use. Suggestions for improvement were specific and focused on technical aspects
- **Products commentaries:** Oral comments (Sense-AV session) had roughly twice the word count per comment and featured more intensifiers and contextual detail than written comments (Booth session)
- **Overall Liking and Intake:**

Table 1: Mean overall liking and intake (± SD) of the food products consumed during the sensory booth and Sense-AV sessions.

Products	Overall Liking			Intake		
	Booth	Sense-AV system	p value	Booth	Sense-AV system	p value
Sausage	8.22 (± 0.74)	8.20 (± 0.70)	0.869	31.50 (± 9.94) g	24.69 (± 11.85) g	<0.001
Mayonnaise	7.78 (± 1.19)	8.01 (± 0.88)	0.019	7.61 (± 5.73) g	6.54 (± 4.79) g	0.091
Nectar	8.11 (± 1.10)	8.10 (± 0.96)	0.794	23.24 (± 10.95) g	19.86 (± 15.16) g	0.023
Beer	7.94 (± 1.29)	8.00 (± 0.89)	0.850	151.02 (± 49.97) mL	102.52 (± 53.65) mL	<0.001
Chips	-	-	-	144.12 (± 44.90) mL	109.92 (± 47.04) mL	<0.001

No significant differences in overall liking, except for the mayonnaise that scored higher in Sense-AV. In general, food intake was lower in Sense-AV, possibly due to system novelty, unfamiliarity with eating while wearing a headset, and social or environmental factors.

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