

# Crossmodal Referencing as Automotive Fission Concept

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## ABSTRACT

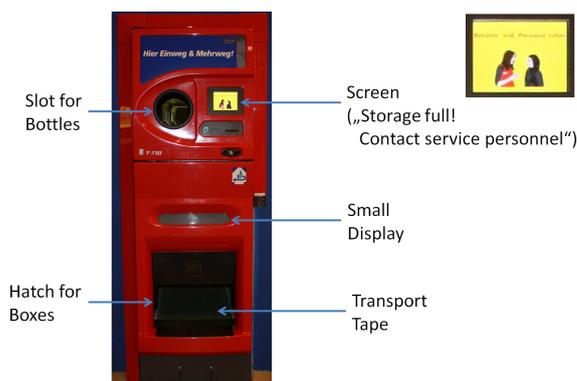
A number of public interfaces [2] use crossmodal referencing in order to circumvent restrictions by the users current focus on a limited communication channel. We collected a number of examples in order to illustrate the underlying concept. Our aim is to raise awareness for this approach, concluding that crossmodal references in the car are helpful to bridge the gap between information inside the car and the environment.

## 1. INTRODUCTION

Public user interfaces are often limited by spatial constraints. At the same time, information presented to the user needs to be as clear and unambiguous as possible in order to avoid confusion and to minimize the service personell required. A common multimodal fission [1] approach is to use a limited communication channel that is likely to be in the focus of the user to refer to a more suitable communication channel.

## 2. CROSSMODAL REFERENCING

Referencing across visual displays can be found at public stations for returning empties - both bottles as well as boxes of bottles (see Figure 1). Single bottles are inserted in the round opening at the upper part of the machine, boxes of bottles are put on a transportation tape behind a square hatch at the lower part of the machine. Once the user has finished returning the bottles, he can push a button and have a refund voucher printed for store credit. The main part of the user interface is located on the upper part of the machine and consists of a screen, a button and the voucher-printer. However, when inserting boxes in the hatch, the users focus is most likely at the bottom part of the device. If at that time a problem occurs, e.g. the tape being stuck or the storage space exhausted, a small one-line display right above the hatch lights up and informs the customer about a problem being explained in more detail on the screen. The customer now focuses on the screen and is informed about the nature of the problem and instructed to contact a store



**Figure 1: Revenue machine for returned empties**  
clerk. This cross-display mechanism is also used on some vending machines with credit card payment option, such as ticket selling machines. The main part here is a touchscreen. However, when typing his credentials, the user is looking at the keypad. If his attention is needed on the main screen, a short message is shown on a one-line display above the keypad.

Another example of crossmodal referencing spanning different modalities (visual and auditory) can be found at train stations and airports. The display showing the departure times has only limited space for additional information, so if there is an important information to be added, the passenger sees a short note “please listen to announcement”, which is sufficient to raise his awareness of the situation and if necessary he can turn off his mp3 player to hear the announcement.

The previous examples illustrate two dimensions of cross-modal referencing. One being references between spatially distributed visual output devices of different capabilities. The other is the reference between two modalities, such as referring visually to an audio announcement or vice versa. Transferring this concept to the car will add another dimension: Referring from internal output channels to external channels or even the other way around. The other two dimensions can be applied as well, using several dimensions simultaneous is possible. We conclude that crossmodal references in the car are helpful to bridge the gap between information inside the car and the environment.

## 3. REFERENCES

- [1] M. E. Foster. CoMiC Deliverable 6.1 State of the art review: Multimodal fission, 2002.
- [2] W. Wahlster. Smartweb: multimodal web services on the road. In *MULTIMEDIA '07: Proceedings of the 15th international conference on Multimedia*, pages 16–16, New York, NY, USA, 2007. ACM.