

# Tangible needle, digital haystack: tangible interfaces for reusing media content organized by similarity

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## ABSTRACT

This paper presents the design process of a desk-set tangible user interface for the navigation and manipulation of media content organized by content-based similarity with off-the-shelf/flea market devices. For intra-media navigation, a refurbished portable vinyl player has its inside mechanics replaced by a webcam monitoring circular gray code analyzed through computer vision for position/speed tracking. For inter-media navigation, a 3D force-feedback controller is mounted in upright position on a truss with cell clamps, repurposed as trackpad. For media recomposition, motorized faders recall the effect presets of the closest/last selected media item.

## Author Keywords

Tangible interfaces, content-based similarity, contextual inquiry, known-item search.

## ACM Classification Keywords

H.5.2 Information Interfaces and Presentation: User Interfaces—*Input devices and strategies (e.g., mouse, touchscreen)*;  
H.5.4 Information Interfaces and Presentation: Hypertext/Hypermedia—*Navigation*

## General Terms

Performance; Design; Experimentation; Human Factors

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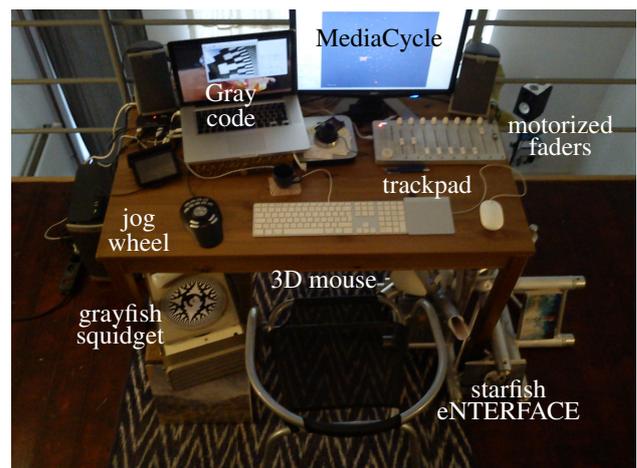


Figure 1. Desk setup with controllers for intra-media (bottom left) and inter-media (bottom right) navigation, with redundant standard devices (desktop, front) and motorized faders for media recomposition (desktop, back)

## INTRODUCTION

User interface design cycles can be imprinted by feedback loops, notably when film makers inspire with their creative dreams repurposing technologies as featured in science fiction movies, while technologists end up designing user interfaces tailored for media content organization, manipulation, serving media arts. For instance, in movie *The Final Cut* (Naim, 2004), the protagonist uses a steampunk-like desk with a wooden interface to edit *rememories*, movie montages from memory implants of bygone people. Two books by the late Moggridge bridged together provide cues through interviews on the design for interaction [5] and media [6].

### ORGANIZING MEDIA CONTENT BY SIMILARITY

This work builds upon past prototyping attempts aiming at providing a user interface tailored for media content manipulation [4]. The aforementioned and current prototypes were developed with the *MediaCycle* framework (<http://www.mediacycle.org>) which allows to represent media items in a 2D visualization reminiscent of a galaxy and sorting piles on a desk, based on their content. Information obtained from feature extraction (temporal, spectral and perceptual for audio; visual and temporal for video) and clustering can be associated to visual variables: the multi-dimensional distance between media items scaled down to 2D is induced by the position of the items on the visual representation, descriptors mapped to contour and color of glyphs form thumbnails for each item. Brent offers an alternative for audio [3].

### INTENTION

A question left open was: how can the expendable, almost infinite space of the *digital haystack* of media collections, be paired with a user interface that makes digital fishing efficient and pleasurable? Through *tangible needles*, in other words, tangible user interfaces inspired by past technologies related to media practices?

### DESIGN CUES

We target experts, creative users of media content. Their experience usually with musical instruments or multimedia controllers lends us to favor bimanual interaction, so that the two modes, intra- and inter-media navigation, can be assigned to each hand.

### Inter-media: the starfish eINTERFACE

The *starfish eINTERFACE* is a 3D force-feedback controller, the now extinct Novint Falcon, mounted in upright position on a truss with cell clamps initially available for arts stage setups. The whole holds without extra tape, the device is clamped against the metallic structure acting as cradle. It is positioned under the table, at a height and distance such as the user hand can rest on it, as seen in Fig. 1. The device is set up on a force-feedback space as in [4] but rotated: the knob is blocked on an horizontal plane (otherwise the force sends it upwards), and is either attracted to the corresponding closest media item in the visual space, or is added friction when passing over such items. It thus feels similar to a car gear shift, or a space-shift colliding into space debris.

### Intra-media: the grayfish squidget

The *grayfish squidget* is an eco-friendly repurposed turntable. As seen on the laptop screen of Fig. 1 and below, a circular gray code ring printed with Wheel Encoder Generator (<http://code.google.com/p/wheel-encoder-generator/>) has been fitted to both inner and outer faces of the turntable. Inside, for speed and position tracking including direction; outside, for aesthetic and explanatory purposes (apparent motion). Replacing the factory mechanics of the salvaged turntable, a Playstation Eye webcam aiming upwards senses the gray code ring, the least-weight bits on the outer edge, aided by extra illumination (a backlit USB hub). A computer vision application made with OpenCV reconstructs the binary

bits of slices in realtime so as to recover speed and orientation, or position at low speeds. Initially we wanted to make a force-feedback device towards physical effects, but we noticed that the inertia of the platter made the current solution interesting for browsing lengthy media files. An alternative we had in mind was to retrofit a Wiimote gyroscope and accelerometer, making the tangible wireless.

### Re-media: motorized faders

Motorized faders recall the effects parameters associated to the closest node determined at any given time by the inter-media controller. Thus new media content can be created.

### EVALUATION

A usability study with known-item search tasks is in progress. Similarly to the video browser showdown [2], participants browse collections from the One Laptop Per Child sound samples with either the aforementioned user interface, or a jog wheel for intra- and a trackpad for inter-media navigation, continuing [1]. A sound is heard, the user interfaces' efficiency is tested through the speed of finding back the sound. Feedback from a questionnaire, including the effects of motorized parameters, provides a qualitative evaluation.

### CONCLUSION

We provided an "*eco punk*" solution for tangible navigation in and manipulation of media collections (organized by content-based similarity). Mostly everything needed to reproduce the setup can be sourced easily and/or for cheap, requires no soldering but just science basics. The user can comfortably and creatively manipulate media content.

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