Control and Representation of
Time in Tangible Interfaces

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it’s difficult to design tangible interfaces that deal with time...
SOUND ARTS RESEARCH CENTRE

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Tangible Interfaces

Temporal Media (music)

Interaction Design

theory

subject

methods
Thesis Aims

1. Identify key design problems.

2. Extend an existing and robust model of TUIs (the MCRit model) to specifically address temporal media.
MCRit

(Ullmer 2002)
Time-specific MCRit

**Embodyement**

*Time requires embodiment for tangible control*

**Diagram**

- Control
- Rep-T
- Rep-I
- Model

**Physical**

**Digital**
Time-specific MCRit

**Embodiment**

*Time requires embodiment for tangible control*

**Change**

*Change is required for the direct representation of time*

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**Diagram**

- **Control**
- **Rep-T**
- **Rep-I**
- **Model**

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**Physical Digital**
Time-specific MCRit

**Embodiment**
*Time requires embodiment for tangible control*

**Change**
*Change is required for the direct representation of time*

**Metaphor**
*Time is understood through metaphor*

- Control
- Rep-T
- Rep-I

*Physical Digital*
Embodiment
Time requires embodiment for tangible control

Contained Time

Handle on Time

Embodied Time
Temporal-MCRit evaluation

- 18 participants.
- Compare designs recommended by temporal-MCRit to those that go against the recommendation.
- This simulates design-from-scratch. More thorough would be using multiple designers and multiple projects.
- Very hard to quantify success of a design, so functionality is tested alongside subjective experience.
Metaphor: *Standard VS Euclidean*

Embodiment: *Buttons VS Handle*

Change: *Standard VS Minimal Change*
Design Evaluation

YouTube:
1.3 million views & 2700 comments

MAKE: instructions to make your own.

User Study:
600 teenagers over 4 days each sketching a re-design (half focus on time, half on general improvement)
Summary

1. Key design problems identified as:
   - scalability of workspace.
   - controlling time as well as events.
   - representing time without movement (collision metaphor is dominant...)

2. MCRit model has been adapted to specifically address temporal-media.
Further Work

Path Sequencing
(controlling time not events)

Entropic Tangibles
(static representation of time)

Hierarchical Tangibles
(scalability of workspace)
any questions?
graphs...
Model (Metaphor) Results

Standard BeatBearing

- participant 1
- participant 18

Euclidean BeatBearing

- participant 1
- participant 18
Control (Embody) Results

Positional Error

red = handle
blue = buttons

Speed Error
Comparison & Questionnaire

Moves Made

Easiest?

Which mode was easiest to understand?

Which mode was most fun to use?

Most Fun?