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# Meet The Frumbles – A Post-Digital Toy Orchestra

**Luís Fraga**

engageLab  
University of Minho  
Guimarães, Portugal  
luispintofraga@gmail.com

**António Coelho**

engageLab  
University of Minho  
Guimarães, Portugal  
antonio.coelho@tripleddesign.pt

**Pedro Branco**

engageLab / Dep. Sistemas  
Informação  
Universidade do Minho  
Guimarães, Portugal  
pbranco@dsi.uminho.pt

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**Abstract**

“Meet the Frumbles” is a group of felt robotic characters that talk amongst themselves and interact with the audience. Empathy, cuteness and gags are explored as communicational facilitators and ludic interaction between a felt robot creature’s orchestra and its human conductor. Creative coding using computer vision, electronic prototyping and physical actuators was used to implement the autonomous physical existence, sensing and behavior of creatures.

**Author Keywords**

digital art; affective computing; post-digital; toys; robotics; humor

**ACM Classification Keywords**

H.5.1. Multimedia Information Systems: Artificial, augmented, and virtual realities; H.5.2. User Interface: Prototyping.

**Introduction**

The general proliferation of touch screen devices and applications lead to an explosion of easy to use entertainment applications, offering novel and fresh interaction possibilities. On the other hand, and according to the authors’ perception, this rapid increase is creating habituation and contributing to certain user

### The creature orchestra state machine

The behavior of the orchestra as a whole goes through the following states:

**Idle:** waiting for users to come within range;

**Sing** (3 sub-states):

**Preparing:** 1, 2, 3, 4 count before music starts;

**Playing:** note triggering based on movement and direction of conductor hands and baton;

**Coaching:** if the user is not moving in front of creatures, humorous samples will be played back to provoked users to perform the desired gesture;

**Cheering:** celebrating the end of a song;

**Goodbye:** sad about users leaving;

**Too Close:** asking users to get back within optimal body tracking distance.

numbness towards screen based experiences, making it harder to surprise users.



Figure 1. Meet the Frumbles (beta prototype)

“Meet the Frumbles” is an entertainment experience that explores an alternative direction to a screen-based interaction. It borrows a post-digital attitude towards a more human concerned paradigm, assuming a more direct communication with the user by sharing the same physical space, exploring interplay between empathy, humor, social politeness or lack of, contributing to a suspension of disbelief by its mere presence, movement and voice. “Meet the Frumbles” lets users engage with an orchestra of tangible talking monsters that sing in response to the gestural rhythm and direction and make funny remarks at the user’s performance standing right in front of them.

### Concept

Social bonds are essential to the human being. The need for a positive and symbiotic inter-human relationship extends to other species, as it is easily verified by the willingness for some persons to have pets. Bearing this issue in mind, we aim to explore if

users also easily engage with automata through a positive and humorous attitude in terms of appearance and speech. Using that question as a starting point, we have explored music, humor and cuteness as positive emotion enablers in order to create a striking and joyful experience for users.

Artistically, this project can be framed in a neo-pop art movement, taking hints from artists like Jeff Koons, Golan Levin and Ken Feingold. As in Pop Art, when “Meet the Frumbles” is misplaced from its primary function, it ceases being a mere entertainment object and assumes a provocative aesthetic function when showcased in a different setting such as an art gallery.

### Design Process

Various interactive art evaluation studies reveal that it is hard to have users interacting as expected with art objects [1, 2], specially in more formal settings such as an art gallery. Throughout the design process we have taken into account frameworks that clearly describe the phases of a successful interaction with art objects [3, 4], which helped us planning mitigations for a set of predictable usability problems. These Human-Computer interaction (HCI) frameworks also support the evaluation process of “Meet the Frumbles” concerning a successful and fun interactive experience.

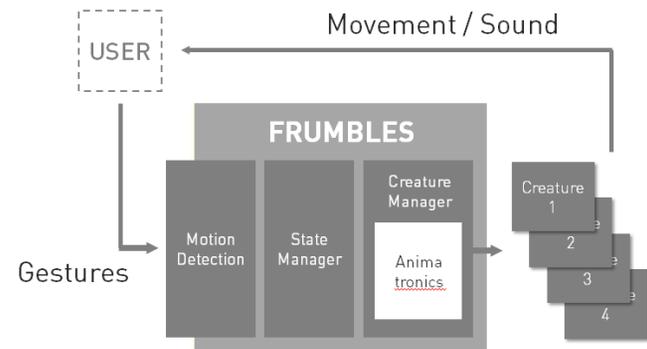
### Interaction

Four creatures behave as an orchestra singing, in response to the movements of a conductor (the user). A state machine was implemented to adjust the Frumbles response according to the user behavior, helping to deepen the connection and supporting the suspense of disbelief towards the robotic creatures [5]. In idle mode, the Frumbles complain about how bored

and lonely they are and keep calling for someone to get near them. As soon as users enter the creatures' field of view, the user closest to the creatures will be elected as the conductor. The Frumbles instruct the user to perform orchestra conducting gestures. The creatures will produce musical notes and groans as per the movement and direction of the conductor hands and baton. A music stand with a sheet featuring notes and gesture signs (akin to flag semaphore visual signaling) further assists in coaching the user to perform the right gestures. This stand also acts as a positional marker and in setting a musical vibe. When the user pauses or gets to near the creatures it is surprised by provocative comments and humorous notes, contributing to create a ludic and joyful setting.

### Technical Implementation

A Kinect camera (version 1) was used to detect user presence and gestures. The implementation is based on skeleton tracking provided by the SimpleOpenNI library on top of which we developed custom gesture detection based on hand velocity and acceleration to better fit our purposes. For the animatronics component we have used an array of servo motors connected to an Arduino microcontroller. These input and output components are controlled in a Processing application which manages sound playback and all the business logic related to the orchestra state management as users come, interact and go.



**Figure 2.** Meet the Frumbles block diagram

The Frumbles voice is pre-recorded. State changes are driven by presence, movements and inactivity. Each state has a set of speech samples from which the system chooses one for playback. We have also created a simulator to easily fine tune the behavior of a larger number of creatures, and in particular to find the right timing for each state change and individual creature reaction.

### Creating Believability

The design of anthropomorphic interactive creatures raises a certain set of expectations in terms of perception and behavior. When those expected reactions are violated, they will easily set "Meet the Frumbles" within the Artificial Stupidity domain [6]. From the various vectors from which believability of robotic actors may arise (Anthropomorphism, Physical Design, Motion, Speech) [5] we were particularly interested in evaluating the specific contribution of humorous speech and appearance. The first step in this process was to assign each creature a different personality and "tone of voice". This framing was crucial for drafting the speech samples, selecting the

voice actors and defining how puppets look. We ended up with a simple but varied setup of *a capella* singers: the nice guy, the goofy guy, the sexy girl and the impolite guy. For each of these Frumbles, over 60 voice samples were recorded in studio covering the various moments of the orchestra state machine lifecycle. These recorded samples featured very strong local accents and occasionally impolite humor matching the slang of northern Portugal. This multiple creature setup, each with multiple samples per state, contributes to a variability and liveliness of the creatures over the course of time. The system can run for a couple of hours without speech repetitions being very noticeable.

### **Usability tests**

To test the believability and interaction with the orchestra, usability evaluation tests were performed using a beta version of the system (i.e. character aesthetics were not final). The planning of interaction using theoretical frameworks [3, 4] did help anticipate user interaction hurdles, but on initial testing some users demonstrated problems in grasping its interaction model. On subsequent tests session, we introduced extra coaching tips, which proved vital to minimize entry level interaction problems.

After fine tuning, results showed that observers considered it was fun to be with the creatures, and their liveliness also received positive feedback. Well-timed and contextually relevant comments together with the funny coaching tips have also been identified as one of the strengths of the experience. These features surprised users and provoked laughs and smiles, proving even more interesting than the planned main attractor, the musical orchestra.

### **Conclusions/ Future Work**

“Meet the Frumbles” is a group of cute creatures that talk amongst themselves and with the audience, leveraging on music and bad taste gags as engagement and realness facilitators. Usability tests confirmed users have fun and perceive technically simple automata as lively and fun creatures, surprising even. This project is artistically motivated while its interaction design was based in HCI frameworks and iterative design.

### **Acknowledgments**

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