Full Bloom: Diegetic UI for musical phrases in virtual reality

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Abstract—We propose a novel system for communicating musical note pitch and sequence information to users within a virtual reality environment. Our approach utilizes 'Blooms,' objects that resemble flowers with various petal arrangements. These formations, when constructed in view of users, act as diegetic, user-parsable encodings of their inputs. Blooms exist within the virtual space as simulated physics objects that collectively serve the role of a user interface.

Keywords—music, musicality, audio, sound, user interface, UI, diegetic user interface, user intent, input encoding, virtual reality, VR

I. INTRODUCTION

Beginning in February 2020, and inspired by Elliot Cole's Flowerpot Music (Melanie Voytovich 2018), our team set out to develop a virtual reality user interface capable of communicating complicated musical phrases in a manner that is similarly pitch-agnostic. Prior research suggests that the motor actions involved with VR use facilitate learning by means of embodied cognition (Jang et al. 2017).

We predicated our work on the assumption that an interface consisting of diegetic interactions between musical phrases and VR objects would engage the spatial memory processes critical to embodied cognitive tasks.
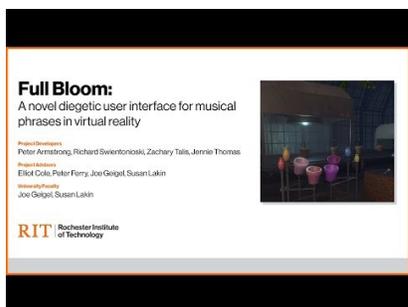
Fig. 1. A captioned video describing Full Bloom and its methodology. *https://youtu.be/pQ5JIh8Mo3Y*

Full Bloom draws upon the work of percussionist Peter Ferry. A graduate from the Eastman School of Music, Ferry explores the acoustic properties of common objects through his work leading large group performances on flowerpots. Full Bloom expands upon the 'household musicality' of instruments such as these.

II. METHODS

Full Bloom is a VR experience built using the games engine Unity 2019 that utilizes positionally-tracked hand controllers. With these controllers, we enable users to strike handheld mallets to a virtual drumkit. Each colored flowerpot in the drumkit corresponds to a different variety of Bloom petal and plays a unique percussive audio sample when struck.

Fig. 2. The Full Bloom conveyor belt machine. *https://fullbloomgame.com/images/paper/conveyor.png*

Striking a drumkit flowerpot also adds its corresponding petal to whichever Bloom rests in the center of a conveyor belt machine. Petals are encoded clockwise within the Bloom. The machine waits ten seconds for note input before dispensing this Bloom within the user's playspace.

Fig. 3. This diagram depicts a variety of Blooms and the types of musical phrases encoded within each petal arrangement. Striking the base of each Bloom replays the associated phrase. *https://fullbloomgame.com/images/paper/phrases.png*

The dimensional presence of Blooms transform Bloom construction into a matter of user-directed aesthetics. Arranging Blooms around the greenhouse environment allows users to strike several in quick succession, causing their corresponding note sequences to execute simultaneously.

Fig. 4. An example of decorating the Full Bloom environment with various Blooms.
https://fullbloomgame.com/images/paper/deco.png

III. DISCUSSION

Our approach successfully encodes musical phrases within a wholly diegetic framework. This allows the user to treat musical composition as a series of spatial tasks, executed in relation to their body.

By way of our encoding system, abstract musical concepts become tangible objects of VR self-expression.

IV. REFERENCES

Jang, Susan, Jonathan M. Vitale, Robert W. Jyung, and John B. Black. 2017. "Direct Manipulation Is Better than Passive Viewing for Learning Anatomy in a Three-Dimensional Virtual Reality Environment." Computers and Education 106 (March): 150–65. https://doi.org/10.1016/j.compedu.2016.12.009.

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