Turning the Tables: An Interactive Surface for VJing

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ABSTRACT

In this paper we describe VPlay, a multi-touch tabletop application that allows users to mix and manipulate multiple video streams in real-time. Our aim is to explore how such an interactive surface can support and augment practices around VJing – a form of video performance art that is becoming increasingly popular in nightclubs and other music events. We conclude with observations from a field deployment, which highlight some initial thoughts and reflections on our design rationale.

Author Keywords

VJing, interactive surface, tabletop, collaboration, tangible interface.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

VJing is a form of live video performance art, often undertaken with DJs and musicians to create a visual backdrop within nightclubs and other music events. Current Video Jockey (VJ) practice typically utilizes laptop computers running dedicated VJ software, with additional peripheral input and output devices, such as MIDI surfaces, scratch pads, mixers and so forth (see Figure 1).

Although offering a huge range of functionality, such as mixing, scratching and effects, VJ software tends to be very complicated and this can lead to the VJ becoming fully immersed in the VJing process at the expense of engagement with the audience. Additionally, it is not uncommon for audience members to be unaware that the visuals are being created and mixed in real time. In part, these issues stem from the fact that the VJ is often behind a laptop computer, which hides many of the onscreen interactions and forms a natural barrier between the VJ and the audience.

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One approach to overcoming these issues might be to allow members of the audience to become involved in the creative process. Clearly, there will be times when the VJs will want full control over their performance, however, opening up the process at other times may encourage a new creative dialogue to be formed between the VJ and the general public. However, this still leaves the question of how we can facilitate an opening up of the interface in light of the complexity of conventional VJ setups.

Credit: Mauritius Seeger

Figure 1: Typical VJ set up, showing laptops (running Resolume and Modul8 software), video mixer, monitor and other peripheral devices.

By comparison to existing computer hardware, such as that used by VJs, the physical form of tabletops has often been suggested to afford a higher degree of collaboration [19]. Direct input tabletops, in particular those supporting multi-touch interaction (for either single or multi user) arguably promote the use of easy to understand natural hand ‘gestures’ for directly manipulating digital data. These kinds of technology could potentially offer an interesting route through which we can design more participative and inclusive VJing experiences.

Figure 2: (i) Close-up showing multiple users interacting with VPlay, (ii) two VJs collaborating during the field trial.

In this paper, we describe VPlay, an interactive surface tool for creating live video mixes that is aimed at providing new types of VJing experiences, as shown in Figure 2. Our aim is not to build a fully fledged VJing tool such as Resolume [16], but instead we are interested in how a more accessible interface can enhance the creation of live video performances. By increasing accessibility at the interface – through simpler controls, direct manipulation, bimanual interaction and increased physical access – we hope to lower the barrier for collaborative interactions between both VJs collectively and VJs and the audience.

In the rest of this paper we articulate the capabilities of our system and reflect on its use in a preliminary real world deployment. We conclude with notes from this deployment, which highlight the benefits of the system and areas of focus for future work.

RELATED WORK

VJing has its roots back in the 60's and 70's with the development of analogue video synthesizers such the CEL Chromascope [2]. The 80's saw a proliferation of digital electronics which led to systems such as the FairLight Computer Video Instrument [6]. Nowadays, VJing tends to be based around VJ software, for example Resolume or Modul8 [14, 16], running on laptop computers. A full history of VJing is given in [7].

Much previous work has been done in the field of tabletops addressing various research questions from the underlying techniques used for sensing [8] to the social impacts of such systems. A great deal of work has focused on the beneficial impact that tabletops have for collaborative tasks [18, 19] and also for allowing openness of interaction [19].

The user interface design we have adopted is based on the general principle of a dataflow network [4]; the movement and transformation of data is represented by a series of connected objects that form a graph. The benefits of this approach have previously been demonstrated in a number of fields including visual programming [9, 20] and music and multimedia development [13].

Our work also has analogy with tangible tabletop systems, particularly those looking at video manipulation [3, 11, 12] and music composition [15], in particular reacTable [10]. In this first version of the system we have chosen a purely digital implementation, however, we have begun to explore tangibles as discussed later.

VPLAY: SYSTEM OVERVIEW

The VPlay user interface has been designed around a small number of objects that when dragged into close proximity automatically connect based on a predefined set of rules. The graph of objects, thus created, represents the unidirectional flow of video data between objects, with the final output being rendered in a preview window. It is worth noting that multiple graphs can be created simultaneously, thus allowing different users to prepare mixes prior to connecting to the main output window for display within the performance space. Finally, the creation of each object and selection of video clips is made through a simple menu system.

To provide additional user feedback, each object displays a small thumbnail preview of the video data as it passes *out* of the object, as shown in Figure 3. The various different object types supported by the current implementation are listed below:

- *Source Objects:* video clip loaded from a file, that loops automatically, or a live video stream from a camera.
- *Mixer Object:* mix two video streams into a single stream using alpha blend, luma key, or inverse luma key processing.
- *Effect Object:* apply an effect, such as blur, contrast, pixelate, tile, rotate, mirror, threshold, outline, etc.
- *Splitter Object:* split the incoming video stream into two identical output streams.
- *Recorder Object:* record the incoming video stream to a file.
- *Display Object:* preview the output video mix; the primary display object can also be fed to an external device for projection within the performance space.

We have experimented with a number of different interface schemes, but in all cases we have attempted to minimize complexity. Currently, touching an object near its centre and dragging it allows it to be moved within the interface. Objects can also be rotated by touching their outer edge and dragging in a circular motion. In the case of an effect object, rotating it allows the effect parameter to be adjusted, for example, the block size of the pixelate effect. Video clip objects can also be rotated allowing the user to 'scratch' the clip, i.e. seek to any arbitrary playback point. Also, simply touching the edge of a video clip toggles the play/pause state and finally a flick gesture on the edge of a video clip allows the playback direction to be reversed.

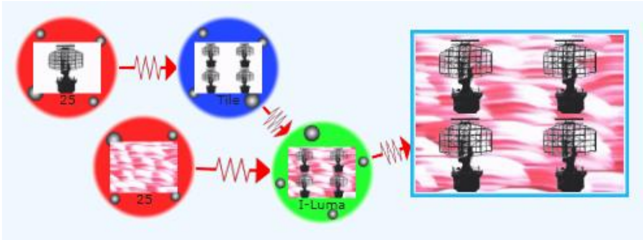

Figure 3: The VPlay user interface. In this example, two video clips (on the left) are connected to a display object (on the right) via an inverse luma key mixer and a 'tile' effect object.

One aspect of the interface that we are still investigating concerns the setting of parameters for mixer objects. Our current approach is to use the lengths of the input connections to determine the percentage contribution of each of the two inputs. This scheme has the benefit that a single gesture can be used to cross fade between two video sources; simply dragging a mixer object closer to one source causes that source to dominate the mixer object's output and vice versa with the second source. However, this approach also has the downside that the spatial layout of objects within the interface now becomes important and simply by moving objects the user will cause changes to the overall video output.

In the more general sense, this issue relates to how multiple parameters of an object can be controlled, for example, the playback rate of a video clip (in addition to its playback position as described above). The future work section later offers a possible solution to this problem through the use of tangible objects.

In spite of these open questions, we have attempted to ensure that the interface offers a ‘walk-up and use’ affordance, allowing simple initial experimentation, which leads the user to progressively learn through exploration of its features. In parallel with this, expert users can take advantage of the almost endless possible arrangements of objects to create more complex and visually appealing video mixes. For example, using a combination of splitter, mixer and effect objects, it is possible to create feedback loops which can then be used in a variety of ways. Simple loops can be used to create new and unusual effects, whereas more complex and finely tuned feedback loops continue to generate endlessly changing output patterns.

In addition to the VPlay software, we have also developed a bespoke rear projection-vision table system employing infrared (IR) based FTIR technique for multi-touch sensing [8]. To aid in the transportation of the table in real world settings, it has been designed to be collapsible, as illustrated in Figure 4.

Figure 4: (i) Table in its collapsed state, (ii) ready for use, and (iii) close up of edge lit IR LED illumination, acrylic sheet, latex sheet and drafting film.

AN INITIAL DEPLOYMENT OF VPLAY

Our design process for VPlay is predicated on a model of iterative development based on its exposure to the VJ community and the public at live music events. In this initial phase we deployed the VPlay system at a small nightclub. VJs regularly perform at this venue and on the night of deployment several were present with their standard equipment. The system was set up on the side of the dance floor so that both VJs and members of the audience could engage with VPlay from three sides of the table (there were no physical barriers between the public and the system). Our ethnographic praxis led to the collection of field materials through video capture, photography and direct observation, including direct interaction with the VJs and members of the public who used the system. Below, we briefly reflect on some of our experiences.

Collaborating VJs

During the deployment we saw many instances of collaboration. VJs used the system extensively together as shown in Figure 2. The multi-touch nature of the system was crucial in this respect, as it allowed people to interact simultaneously side-by-side. We saw examples of divide and conquer strategies where VJs would compose graphs separately and then seamlessly mix between the outputs of these. We also saw many examples of VJs building graphs, picking clips and chaining effects together collaboratively.

Although the literature highlights the collaborative aspects of tabletops [18, 19], we found it interesting to see this taking place in the context of VJing, especially when compared to traditional VJ set ups. Opening up the process of VJing brings a range of new possibilities in terms of collaborative creativity.

Audience participation

By virtue of placing a large publically accessible tabletop adjacent to the dance floor we also invited the curiosity of the audience. After an initial awareness phase, people approached the table, watched VJs and other audience members using the system, and then started to interact themselves. These distinct stages, or zones of engagement, follow patterns similar to those reported in [1].

An additional advantage of openness at the interface was that a working VJ was able to effectively support the learning of a novice user by giving them their own practice window to begin building effects whilst they used the same tool to concurrently perform live. In this way the directly observable performative aspects of VJ practice were made more public and the novice users’ interactions could be shaped by the directions of the working VJ.

The values of multi-touch

During the deployment, we observed audience members typically only using a single finger for interaction. This is perhaps not surprising given the novelty of multi-touch interfaces. However, more expert users (the VJs) had a tendency to quickly assemble components of the graph using multiple fingers, but to then switch to a single finger to fine tune particular parameters.

A critical aspect that multi-touch sensing did enable was support for multiple *users* interacting at the same time. As discussed previously, there were clear participative stages of approach to the device, and the multi-user capability allowed novice users to interact with the device whilst a more experienced user was concurrently engaged in producing publicly displayed content.

Eyes free interactions

Feedback from VJs who used the system provided a further insight, focusing around the need for ‘eyes free interaction’ at critical times during system use. Although the VPlay interface provides output preview windows, there were times during the performance when the VJs were focusing their visual attention on the projected displays, yet still interacting with the system. This problem of split attention occasionally led to situations where the VJ lost acquisition of a digital interface control, momentarily disrupting a mix.

This observation has led us to consider a range of new design possibilities such as improving the hit testing behavior in the UI, making the digital targets bigger or providing gestural mechanisms to allow the user's fingers to 'lock' to digital objects in certain modes. However, a more obvious design solution is to incorporate tangible objects into the design. Given their rich tactile qualities, tangible objects potentially offer users the opportunity to continue to interact with the interface without needing to look directly at it.

FUTURE WORK

Inspired by observations made during the deployment, we have been designing various specialized physical objects that aim to overcome some of the issues mentioned above. For example, to help users 'scratch' a video clip, we have developed the tangible object shown in Figure 5, which is used by placing it over the digital object on the table surface.

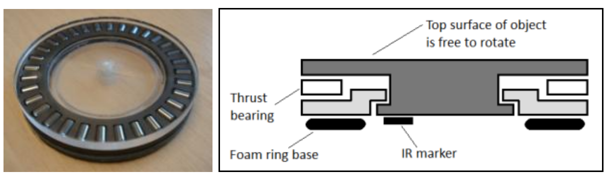

Figure 5: Tangible 'scratching' object.

To provide support for tagged tangible objects, we have also been exploring the use of Diffused Surface Illumination as reported in [17]. This is achieved by replacing the acrylic sheet shown in Figure 4 with a material called EndLighten [5], which diffuses some of the IR light up onto the underside of the tagged objects, thus making them visible to the system.

We are also investigating the use of tangible objects to provide access to more advanced features within the interface. For example, rotating a tangible object over a video clip allows the clip's playback rate to be altered.

CONCLUSIONS

In this paper we have discussed an initial design for an interactive surface for VJing and live video mixing which enhances the possibilities for creative expression. The system shows promise, and has opened up an interesting intersection between performance art and audience participation. Our preliminary deployment has provided valuable information to help guide future designs of the system, particularly in the areas of tangible/hybrid forms of interaction and ways to more closely couple the digital with the physical.

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