Com-Note: Designing a composer’s notebook for collaborative music composition

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Abstract— Although numerous digital tools exist to support the capture and editing of music, less attention has been paid to supporting the creative process of music composition. In this paper we report the design of a new tool in this area, targeted specifically at collaborative composition between a composer and one or more performers. The tool is an open source ‘composer’s notebook’ app called Com-Note, which supports the creation and exchange of multimedia narratives on an Android smart phone. Requirements for the design of Com-Note were derived in a case study of the collaborative composition process, as assisted by a digital storytelling app called Com-Phone developed on another project. This involved the creation and performance of a new work for trumpet and string quartet entitled Albumleaves.

Keywords—Collaboration, music, composition, composer, performer, digital storytelling, multimedia, narrative

I. INTRODUCTION

The composition of music is a complex, creative and collaborative act (Burnard 2012). This is currently done with a range of tools including the editing of musical notation, the playing, recording and playback of musical phrases, and their verbal discussion. Different styles of music are associated with different approaches to organizing these compositional activities. For example, contemporary classical music composition is still done mainly by a single composer working under a commission, and moderated by a musical score that the composer generates and refines through orchestral or ensemble performance (e.g. Hayden & Windsor 2007). Popular music may be more collaborative in its origins, with a lead composer/songwriter sharing more of the early musical ideas for a piece within a band. This may be done in group sessions through performance demonstrations and without rigorous musical notation. Jazz music is even more extreme in encouraging live collaborative composition through improvisation around a theme. In all these cases, there is a changing relationship between the original musical intention or idea, its notation in a musical score, performance of the music and its’ recording (c.f. Frisk & Osterjö 2006).

Existing tools for music composition, like GarageBand, Sibelius and Symphony Pro, focus mainly on the latter parts of the process by supporting the generation of synthesised performances from musical notation, or the automatic transcription of performed music into notation (via MIDI interfaces). Music editing software also allows multitrack recordings to be laid down and mixed into different arrangements. Many of these facilities are presented through a personal computer, and amplify the abilities of individual composer/musicians who are able to realise musical intentions without extensive collaboration with other performers. Modern software packages also support cloud-based archiving and sharing of music files, but editing is still done through a single-user workstation. Research into composer/performer collaboration shows a whole host of collaborative practices that take place through rehearsals and remote interaction between musicians, but few of these are supported by existing technology (e.g. Clark et al 2013, Collins 2012, Davidson 2004).

In this paper, we explore an alternative approach to the support of music composition which addresses earlier parts of the process and encourages greater collaboration with performers. This approach is based on the simple use of mobile phone technology to capture and share musical intentions and ideas, as and when they occur. The core notion is that of a ready-to-hand composers’ notebook into which he or she can quickly enter ‘sketches’ of compositions for personal reflection and feedback by performers. Although these sketches might include musical recordings, they are intended to be a vehicle for discussion and comment rather than for mobile music editing. Half diary and half messaging system, the notebook can be used by performers as well as composers, and is designed to facilitate communication between them.

A similar motivation lies behind recent work by Bainbridge and colleagues, but they focus on support for a centralized library of musical ideas called Apollo, accessed from a workstation interface (Bainbridge et al 2012). Our approach is simpler and based around a portable multimedia notebook suggested by our own previous work in a different domain. We had developed a community media toolkit called Com-Me for mobile digital storytelling in rural India and South Africa: http://digitaleconomytoolkit.org/ This allowed local news stories to be shared primarily through audiotext narratives on mobile phones, rather than through text-based communication (Frohlich & Jones 2008). Because the toolkit is open source, it can be easily adapted for other uses. One of
these might be the sharing of musical fragments, notations and verbal comments in music composition. This suggests a kind of digital storytelling for musicians wishing to circulate musical ideas within a small group.

In the rest of this paper we explore this idea during the creation of a new work called *Albumleaves* for trumpet and string quartet, using the Com-Phone Android app from our toolkit (Frohlich et al 2012). This involved close collaboration between two of the authors of this paper: Tom Armstrong as composer and Simon Desbruslais as trumpet player. The findings of this Com-Phone trial were then used to create a new version of the app called Com-Note specifically for the music context. In this way, Com-Phone was used as a ‘technology probe’ for uncovering requirements for Com-Note (Hutchinson et al 2003), which we subsequently implemented as described below. The study was designed to address the following research questions about the music composition process:

1. What is the value of recording and sharing multimedia narratives in collaborative music composition?
2. How can this behaviour be better supported by mobile technology?

II. METHODS

A naturalistic opportunity to trial the Com-Phone app arose during the composition of a contemporary classical piece of music for trumpet and string quartet. The piece, called *Albumleaves*, was commissioned from Tom Armstrong by trumpet player Simon Desbruslais as part of a new album of trumpet music by Signum Classics, and was also intended for live performance. The Ligeti quartet were hired to provide the string parts and also included in the composition process which was collaborative from the outset (http://ligetiquartet.com). As an evolution of his own practice, Armstrong had already experimented with the development of more open scores and compositional ideas that were refined through interaction with performers. The intention with this piece was to develop this practice, with Com-Phone providing additional opportunities to document and share musical ideas more easily across the distributed composer-performer group of six. The resulting piece was created over about 6 months from April 2013 and performed at Kings College Chapel in London in November 2013.

At the beginning of the composition process, three Galaxy Note smart phones were given out to the composer (Armstrong), trumpet player (Desbruslais) and string quartet (the Ligeti Quartet). Each phone supported the creation and sharing of short digital ‘stories’ in a series of multimedia frames combining image, sound and text, through the Android Com-Phone app. See the online user manual for full details: http://www.digitaleconomytoolkit.org/manuals/com-phone.pdf

Essentially, narratives can be made in the form of a storyboard of frames, as shown in Figure 1. Each frame is composed of any combination of image, sound or text items, with up to three layers of sound opening up as clips are added. Images and sounds can be imported from the phone’s memory, or recorded live through camera or dictaphone functions. Narratives are represented as ‘smil’ files and play full-screen as audioslideshows. They can also be converted to other file types, such as webpages (html) or video clips (mov), and exported off the phone to another device, emailed or posted to a YouTube account. In the context of this study, Com-Phone therefore allowed the composer and performers to individually dictate ideas or comments, insert existing music comparisons, make new music recordings, take pictures of musical scores or other sources of inspiration, and share them with each other for feedback.

Figure 1. The Com-Phone interface.

Members of the musical group were encouraged to try out the app during the composition process and to exchange the resulting narratives with each other for this ‘trial’ period. Both pre and post-trial interviews were held with the group, and all resulting narratives were collected for analysis. The interviews explored current practices of collaborative composition and how these were affected by use of the Com-Phone tool, as well as providing an opportunity to describe use of the app and the recorded narratives, and any difficulties encountered. All interviews were transcribed for thematic analysis. Multimedia transcripts were also created for each narrative showing the sequences of images and text, references to recorded music and a transcription of any recorded speech. The resulting findings are based primarily on repeated viewing of narratives themselves, and analysis of interview and narrative transcripts. Some inspection was also made of YouTube channels used by Armstrong & Desbruslais for narrative exchange, as these contained a log of when narratives had been uploaded and some associated textual comments. Analysis was focused on answering the two main research questions, and designing a new Com-Note app which would be more useful than Com-Phone for this context.

III. COLLABORATIVE COMPOSITION OF ALBUMLEAVES

Participants reported different existing practices of collaboration in the pre-trial interviews which form a baseline for assessing the impact of Com-Phone. For example, the composer (Armstrong) had a habit of keeping a logbook of handwritten notes on each of his compositions, as a reflective diary on the process. These were useful for future academic collaboration and talks on the composition process, as well as resolving problems with the composition as he went along. He also reported use of a digital Dictaphone for recording long periods of rehearsal with performers, which he could listen back to later. Finally, he was in the habit of emailing pictures
of musical score to performers for comment during the process of composition.

In contrast, the trumpet player (Desbruslais) reported responding to fragments of score received by email and recording himself performing such fragments for self review. Recording applies a kind of live performance pressure which is useful for improving practice. This was said to go along with other tricks such as lining up ten matchsticks and knocking down each matchstick in turn following a perfect rendition of a piece, but starting the series again after one mistake.

Members of the quartet described recording live rehearsals in video form and archiving these in a shared Google Drive account for later review. Any difficulties with an emerging composition would be worked out face to face in rehearsals or through follow up contact with the composer. Whereas Armstrong and Desbruslais were actively seeking new methods of greater collaboration, the quartet expressed some skepticism about needing to influence the composition itself. They felt that was the composer’s job, whereas their role was to interpret and perform the composer’s intentions as represented on the score: “We are not huge believers in the idea of back and forth operation. Once the score is complete then that’s the end of the composer’s role”.

Throughout the composition process a total of 18 narratives were created and shared on Com-Phone. An additional x narratives were recorded by Armstrong for personal use and not shared with the others. The average duration of each shared narrative was 8 minutes, comprising 4 frames which typically contained a photograph with text label and some combination of voiceover and/or musical recording. Most frames contained only a single channel of sound, but this could include serial presentation of voiceover and music recorded and performed in the same recording session. However, narratives varied between 8 and 1223 seconds in length, and between 1 and 19 frames, reflecting considerable diversity of form. While most photographs were of handwritten scores, others included pictures of people, instruments, computer screens or rehearsal contexts. Of the 18 narratives, 3 were made by Armstrong, 9 by Desbruslais and 7 by the quartet, although Armstrong’s were long multi-frame narratives at the beginning middle and end of the composition process, while the quartet’s were short sections from a single early rehearsal.

By analysing the participants’ narrative constructions and post trial interview data, we found that participants used their devices very differently, either as a journal of the creative process, as a mechanism for commenting on the technical and aesthetic properties of the composition, or as a focus for creating the finished sound. We will illustrate these three uses by summarizing the narrative and post-interview analysis together for Armstrong, Desbruslais and the quartet respectively.

**Com-Phone values to Armstrong**

Figure 2 shows a typical narrative from the composer (Armstrong) early on in the creative process. This particular narrative was 20 minutes long and comprised 13 frames assembled over multiple days. The first three frames are shown in the figure and show some handwritten notes and two annotated pages of a musical score in the making. They are accompanied by voiceover narration about a technical problem Armstrong faced at the outset, resulting from a decision to allow performers to play self-contained pages of the score in any order and to distribute parts of the page in varying permutations between instruments. The third page labeled ‘Perm success!’ describes the solution to this problem derived from the use of four-by-four tables for allocating the four string parts. Later frames of the narrative address the trumpet player Desbruslais directly to explain the solution to pass onto the string players in rehearsal. Armstrong’s subsequent narratives are similar, but start to include responses to Desbruslais’ narratives containing short discussions and performances of the score. The overall form of communication is a cross between a spoken diary and a multipart voicemail, illustrated mainly with pictures of handwritten musical notation of various kinds.

![Figure 2. Narrative 2 – ‘Quadrants’](image)

When interviewed about his use of Com-Phone, Armstrong described three main values of the resulting narratives. First, he felt they replaced his written logbook as a method of documenting his creative practice. In this respect the content was authored for his own reference and also for a more general audience of the future who might want to examine his work: I think I was thinking, what if someone, when I’m dead, comes across this [laughter]. Second, the narratives were felt to be useful for discussing the emerging sound of the piece with Desbruslais, who was not only one of the performers but also the commissioner of the music. The fact that both parties could include musical demonstrations within the narratives made it possible for the composer to demonstrate certain musical intentions, for the performer to play early fragments of the score and for the composer to hear what they sounded like: To have a system like Com-Phone as Simon says, very clearly recording and documenting the different versions, is really helpful because there were instances where I had written things that were essentially unplayable... So taking the ideas I had and changing them until they sounded like they would work, that was interesting. A third value of the narratives derived from those made in rehearsal, allowing Armstrong to eavesdrop in a way that was not possible before: It’s a window, and the important thing is, I’m not there...I can listen to it at my leisure and tactfully respond.

**Com-Phone values to Desbruslais**

Figure 3 shows a typical narrative from the trumpet player Desbruslais halfway through the composition process. It is seven minutes 45 seconds long and comprises three frames accompanied by voiceover and music narration. In fact all narratives by Desbruslais include recorded performances of the music, explained by surrounding voiceover. Unlike Armstrong’s narratives which are ambivalent with regard to the audience, Desbruslais narratives were exclusively for
Armstrong and usually start with the greeting ‘Hi Tom’ on the first frame. They therefore sound like multimedia voicemail messages and often discuss the playability and sonic effects of the emerging score. For example, in the three frames shown in Figure 3, Desbruslais introduces the issue of pedal notes for trumpets which are an extended lower range of notes achieved with a special blowing technique, and demonstrates their sound on a C trumpet, flugel horn and piccolo trumpet for Armstrong to hear.

Figure 3  Narrative 12 – ‘Trumpet pedal notes’

Like Armstrong, Desbruslais reported three main values of these narratives in the post-trial interview. One of these was similar to Armstrong’s value of hearing what the score sounds like, which in Desbruslais case involved performing the sound. This value was somewhat different in the performers’ case, as Desbruslais was trying to communicate an insight not only into the technical playability of the score but also his playing technique and interpretive style: It’s not just technical things I’ve been able to offer, but it’s almost like Tom has had a greater insight into the way my mind works, the way I look at a score and then try and realise it. In some cases this resulted in suggested changes to the score and arrangement. Desbruslais also valued the Com-Phone narratives as a practice aid for himself. This replaced his own previous use of a Dictaphone: I would record myself on a regular basis anyway and listen back to it. Finally, he valued the exchange of narratives with Armstrong as a way of keeping track of the progress of the composition. This supported his role as commissioner of the music and kept him more involved in its evolution: I guess I have quite a hands-on approach with my composers because this commissioning model we have been talking about can sometimes remove the personal interaction.. with the composer.

Com-Phone values to the quartet

Figure 4 shows a typical narrative recorded by the string quartet early in the process. It was recorded in their first rehearsal session and is seven minutes nine seconds long. It is made up of five frames of music and voiceover, indexed mainly with individual pages of the score they are playing. The first frame is somewhat different, comprising a sound check to a picture of the rehearsal room. All frames have a textual title, which is something all participants did for every narrative. Each rehearsal frame begins with a verbal explanation of what is being attempted, followed by the performance itself. Many frames include a subsequent discussion between the performers, but this is often inaudible and not really designed for an intended audience.

Figure 4. Narrative 3 – ‘First run’

In fact the nature of the intended audience for Com-Phone narratives was unclear to the quartet who did not fully buy into the aim of collaborative composition as shared by Armstrong and Desbruslais (see above). For them, the use of Com-Phone to record rehearsal performances stood in for their existing practice of video recording rehearsals. Although it had the effect of chunking up the rehearsal recording into more manageable parts, there was an overhead of interrupting the rehearsal that the quartet didn’t like. Essentially, it slowed them down: So going through this process really extends the time that we would normally spend on doing something. However, they did recognise the value of sharing narratives asynchronously between face-to-face rehearsals, or even skype rehearsals, which were often difficult to arrange: It’s hard to get four of you together at the same time, and then five of us and then six of us when the composer is involved... I can personally imagine using this to send something over to a composer in America and say ‘did you really mean this?’ or ‘did you get the cleft wrong in the viola part?’.

Problems with Com-Phone

All participants found the Com-Phone app itself easy to use to create narratives. The main reported problem lay in how to share and review the narratives more effectively in the collaborative music context. Armstrong and Desbruslais wanted to exchange narratives directly with each other, to play fragments of photographed score, and to comment on individual frames. None of these activities were easy to perform with the current version. Instead, the original multimedia files (.smil format) were saved as video clips (.mov format) and uploaded to a YouTube channel for sharing. This allowed participants to review the narratives as films, but not to edit them, or zoom in/print out the visual scores for playing. Consequently, Armstrong and Desbruslais resorted to saving fragments of the photographed score as pdf documents and emailing them to each other in parallel to the narratives. These were then printed out to play. Some discussion of the narratives then moved to email or YouTube comments, rather than taking place within narrative responses as desired. This was frustrating since the .smil format of the original narratives remained highly editable, and lent itself to extension with new frames or audio layers. With a little revision, frames could technically support spoken commentary on recorded music as it played back: something that was thought to be highly attractive when suggested to participants.

IV. COM-NOTE DESIGN

To optimize some the values of multimedia narratives discovered in the trial and address reported problems with Com-Phone, we held a design workshop to consider new functionalities for a composer’s notebook app. This resulted in
the following modifications to the open source code, and release of a new app called Com-Note: http://digitaleconomytoolkit.org/extending-com-me/

Synchronized sharing and annotation of the narratives

The sharing mechanism of the Com-Note app needed to facilitate effective and effortless collaboration between the composer and the performer. The original sharing methodology for Com-Phone supported three main ways of sharing: video upload to a social media sharing platform, creating a webpage with shared video, or direct sharing over Bluetooth connectivity. Based on the elicited requirements, a sharing mechanism using the cloud storage platform Dropbox was introduced. The user has the option to link Com-Note to an existing Dropbox account, thus enabling instant upload and download of the narratives, as depicted in Figure 5. More than two users can join a shared Dropbox folder to annotate and share the narratives seamlessly with automatic synchronisation.

Figure 5. Com-Note sharing mechanism

Narrating over music recordings & selective channel playback

Laying additional audio tracks over the existing audio in the narrative emerged as an important feature for both composers and performers in order to efficiently express immediate feedback on the shared narrative. A way of recording over a playing track was supported, as long as users listened to that track with headphones to avoid feedback. Additional support was also provided for muting or balancing the volume level of each audio layer, with three volume controls as shown in Figure 6. This enabled selective channel playback, and as well as optimising the user's sonic experience when mixing different kinds of sound.

Zoom in/out on images of musical score

Com-Note’s screen real estate is very limited on a smart phone or tablet. This makes it difficult to read the details of musical scores on any frame. An image zoom in/out functionality was therefore developed using hand gestures to address this problem.

Printing of musical scores

An additional feature of wirelessly printing the image from any frame of the narrative was added, provided a compatible printer is available nearby.

V. DISCUSSION

In this study we have tested out the value of multimedia narratives in collaborative music composition (research question 1). This was done by trialing the use of the Com-Phone app on a smartphone with a composer and five performers during a composition process. The main discovery was that the value of this process differs between participants, and the extent they ‘buy into’ collaborative composition as a goal. The four members of the string quartet involved in the study were busy professional musicians who did not particularly want to extend their role into co-writing or refining the score, whereas the trumpet player commissioned the music and was keen to track its evolution and input to its development. The composer was particularly interested in this as an extension of his own previous collaborative practice.

The extent to which these values were supported by the Com-Phone app was also tested in the study (research question 2). Com-Phone supported greater transparency and communication between the composer and trumpet player than was usual through their previous habits of emailing fragments of score to each other and discussing the music face-to-face. They each used the app to document their ongoing progress with composing and performing the emerging music, and to comment on each other’s reflections. Commentary was less direct than they wanted it to be, and mediated by a YouTube channel where narratives could be reviewed but not edited selectively. Hence Com-Note was created to support automatic synchronization of narratives across two or more phones via a shared dropbox folder. Better support was also provided for ‘director’s cut’ commentary during recorded music playback, and the viewing or printing out of photographed scores.

The ability to create editable multimedia narratives that can be passed back and forth between partners is reminiscent of a multimodal messaging system called Voicefax that we were involved in developing many years ago (Daly-Jones et al 1997). Users could annotate electronic documents with speech and writing on a tablet computer and pass the documents back and forth with additional annotations. This halved the number of messages required to do the same task in fax or voicemail alone. Some of the same dynamics seem to have been at play.
here in allowing musicians to record comments more spontaneously and with greater feeling in spoken rather than written language, but also to share music notation and performances as a basis for such comments within the same system.

Further work is now needed to evaluate the Com-Note app with a broader range of musicians from different musical traditions. It might also be tested by ethnomusicologists as a research tool for ‘listening in’ on the creative process, and communicating opportunistically with composers and musicians during composition. A final use of Com-Note might be to exploit the new collaborative features aesthetically. Frame-based segments of music might be invited from different musicians who might build up a full piece through a single collaborative narrative itself. This would bring the tool full circle back to a more conventional music editing approach, but across a mobile and distributed socio-technical platform.

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REFERENCES


