

# AUGMENTING A RUGGED STANDARD DJ TURNTABLE WITH A TANGIBLE INTERFACE FOR MUSIC BROWSING AND PLAYBACK MANIPULATION

Andreas Pabst, Roger Walk

University of Ulm  
{andreas.pabst, roger.walk}@uni-ulm.de

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## Abstract

TIMBAP is a new solution for the digital disc jockey (DJ) that provides a rugged tangible interface for music browsing and playback manipulation. Like many others it is based on an acoustic timecode signal recorded to vinyl records. In contrast to existing digital solutions however, it completely releases the DJ from mouse, keyboard and monitor. Instead it relies on physical interaction with the standard club turntable only. The rotation of the turntable serves as a means of scrolling through the music collection automatically. The user stays in control though as this can always be overridden by a manual intervention like holding the record or winding it back. In order to provide goal-oriented search, we also support a direct absolute positioning using the tone arm.

## 1 Motivation

A disc jockey (DJ) plays music to an audience in different environments which can be a dancefloor, a bar, a fashion show or any other public or private setting. Until today many DJs refrain from all digital media (especially CDs) for their practice and stick with vinyl records and record players instead. There are many reasons for this behaviour including the need to stand out from the crowd. The richly nuanced natural interaction possibilities form the most important argument in favour of turntables though. Also the preference is very much connected to the success story of the Technics SL-1200 model. Despite its historic age of 35 years this model is still installed in nearly all dance clubs worldwide. Many of the so-called turntablists who use the turntable as a musical instrument will insist on using only the Technics SL-1200 due to the great tactile feel [6]. Furthermore it has proven robustness to an extraordinary degree, as some of the first models are said to be doing their duty until today.

This is why in 2002 Stanton Magnetics decided to build a new digital DJing system called Final Scratch that can be controlled using a regular turntable. They equipped the customer with special vinyl records containing an acoustic timecode signal. The timecode is constantly read from

the incoming audio signal and mapped to playback velocity and absolute position of a digital audio file. This way DJs are enabled to manipulate the playback of audio files in exactly the same manner as they would handle a regular record. Hard-won technical skills like scratching or beat-matching can thus be applied to the digital domain without any loss. However, none of the existing systems goes beyond the plain standard WIMP interface for the DJs' other duty, which many consider to be even more important: music selection.

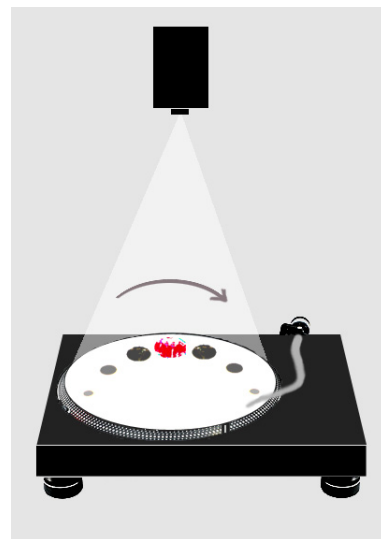


Figure 1: The graphical representation of the music browsing task is projected onto the turntable platter

We claim to have enhanced the user interface of digital DJing systems by using the common physical interaction patterns a DJ is used to [5] not only for playback manipulation but for music browsing and selection as well. The standard turntable becomes a complete tangible interface for digital DJs. It already provides rich and fine-grained input possibilities the turntablists have taken advantage of ever since. On the output side however, only auditory feedback can be presented to the user. This might be sufficient for musical expression tasks like scratching, for the stateful music browsing and selection task though, a graphical representation can effectively not be avoided. Hence we decided to augment the turntable with a fully operational tangible interface, so it can serve as a controlling device

and as a graphical display at the same time. As depicted in figure 1 this was achieved by projecting a graphical representation of the current state onto the timecode record spinning on the record platter. For a luminous and sharp display with high colour fidelity the record should be made of white vinyl preferably. Concerning the musical expression task of DJing, projection onto a standard turntable within a digital DJing system has already been proposed by Andersen. He planned to project a circular waveform. [1]

In section 2 we will analyze the traditional way of music selection by examining interviews of active DJs in order to extract requirements for TIMBAP. We will then describe our idea of an aimless automatic browsing mechanism in section 3. As a goal-oriented search mechanism is needed as well we propose to enrich the interface with switchable tag cloud positioning in section 4 and 5. In the final section 6 we will conclude our achievements and goals for TIMBAP.

## 2 Analysis of the music selection task

In order to determine the users' requirements for the use case music selection we interviewed more than 160 active DJs for electronic and/or dance music. Most of them are semi-professionals or hobby DJs. In general, a DJ will begin searching his record bag for the next song after he has started a record and put back the one he played before. Depending on the length of the songs the timeframe for browsing the collection and selecting a record can be harshly limited. According to 48 percent of the participants between 30 and 60 seconds are usually spent searching for the next record. We also found out that DJs will look for a specific record in most cases, but only 12 percent disclaimed that they ever browse their collection aimlessly. This convinced us to include both an automatic browsing and a search mechanism. Concerning goal-oriented search the key question is what information the user is able to provide about the record that he has in mind. The results in table 1 show the reliability of visual anchors provided by cover art.

<i>artist</i>	<i>title</i>	<i>label</i>	<i>cover art</i>	<i>place in bag</i>
61,2 %	46,1 %	59,2 %	<b>86,2 %</b>	66,45%

Table 1: What DJs have an idea of in a goal-oriented search.

A similar finding supports this: 92 percent of our interviewees approve that they recognize a record by its cover art when browsing for a specific one. This led us to the rather obvious idea of representing the digital audio files not purely textual, but as record items in the graphical representation - moving geometrical objects rendered with the corresponding cover art as a texture.

## 3 Aimless browsing and music selection

For TIMBAP we wanted the automatic turntable rotation to be translated to an effortless browsing of the music collection. This can be useful when the DJ has not yet a record

in mind. To do so, the DJ would simply start the turntable and watch the record items pass by. Halting the turntable would pause the audio signal and thus pause the browsing. As a mapping between the circular rotation of the turntable and the horizontal scrolling of the record items we have adopted the conveyor belt metaphor [7]. This visualization metaphor presents items as a list on a conveyor belt. In our case the turntable acts as a gear wheel to manually or automatically drive, stop and rewind the belt and thus the items. This affordance is supposed to be rather obvious for most users.

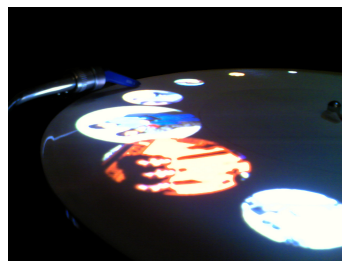


Figure 2: conveyor belt of music symbols

The browsing ends when a record item is to be selected. Unfortunately, the turntable interface does not provide any means to issue a direct command. To overcome this shortage, we decided to scale record items the bigger, the closer they are to the center of the platter. You can see this in figure 1. It is always the largest item that is assumed to be in focus. To actually select it for playback the record item has to be kept in focus for a certain time period. It will then grow to the full size of the turntable to visually indicate that it is being activated. When the full size is reached it is active and the DJ can start the playback by simply releasing the record. In an analogous manner the full-sized record item starts to shrink again towards its regular size when the turntable is halted for some time. The DJ can then activate the automatic browsing again by releasing the record.

## 4 Tag cloud positioning for navigation

In most cases however the DJ searches for a specific record. At this point you might think we would regret having eliminated keyboard and mouse. On closer inspection however, the turntable is equipped with some sort of pointing device: the tone arm. DJs are used to handle it precisely and rapidly from their skipping through heaps of mediocre records in the record shops. Unfortunately with an unsorted music collection the location of a certain audio file in the groove can only be guessed. This is why with TIMBAP the music collection is always sorted by a criterion. This might be artist name, label name, style, predominant colour in the artwork etc. If the record items are distributed linearly over the full length of the timecode, a music piece for example by Mozart will hence appear when the timecode record is around half played. The DJ can set the tone arm to the middle and then subsequently adjust it by resetting or spinning forward or backward. He will soon come across his favourite Mozart piece.

