Interactive Parallax Scrolling Score Interface for Composed Networked Improvisation

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ABSTRACT

This paper describes the Parallaxis Score System, part of the authors ongoing research into to the development of technological tools that foster creative interactions between improvising musicians and predefined instructional texts. The Parallaxis platform places these texts within a networked, interactive environment with a generalised set of controls in order to explore and devise ontologies of network performance. As an interactive tool involved in music production the score system itself undergoes a functional transformation and becomes a distributed meta-instrument in its own right, independent from, yet intrinsically connected to those instruments held by the performers.

Keywords

NIME, NetScore, Realtime Web, FOSS, Improvisation, Composition

1. PARALLAXIS SCORE SERVER

The Parallax Score Server (PSS) is a networked score playout system targeted at human performers who interpret notational instructions from the web-browser. It is a multinodal server managed network with each performer's browser a node, these scores are tightly synchronised with one another over the network using realtime web technologies. Written as a web-app, no special software is needed to use the screen score it will run in any standards compliant web browser[1]. The score may optionally be projected and visible to both audience and performers but each member of the ensemble needs a laptop, tablet or touch-screen monitor placed on a music stand to allow them access to the control parameters of the score during performance.

This score playback system adopts a familiar[5], horizontal right to left, scrolling score paradigm, including a visual "playzone" and "playhead". The novel feature of this system is that each of the performance parts within the score can proceed at different speeds from one another. The multiple procession speeds of the individual parts result in a sonic equivalent to the parallax scrolling animation effect used in early side scrolling 8-bit video games such as *Super Mario Brothers* where the differing speed of the foreground and background give the impression of 3D depth in a two dimensional representation.

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The relative starting speeds of the parts are flexible and these relationships are malleable during a performance. The score does not function as a fixed set of relationships that must be maintained but as fluid document which encourages intervention. The system is a type of open form score but unlike the hypertextual or mobile forms seen in Stockhausen's Klavierstuck XI, Boulez's *Troisieme Sonate, Formant III, Constellation / Constellation-miroir* or more contemporaneously in the generative and network scores of Freeman[3], Vickery[5] and Hajdu[4], the PSS presents multiple asynchronous linearities with alternative readings of the text emerging from the varied and constantly changing part alignments.

2. SCORE AS META-INSTRUMENT

Figure 1: Parallaxis Live in Graz (Linux Audio Conference 2013).

The synchronisation between the individual score instances is achieved through bi-directional communications between the score clients and the score server. This network of multiple bidirectional links allows multiple forms of interaction to take place. The score may be approached according to a traditional top down hierarchical model where a master control interface has individual control over each of the scores. In such a scenario a director of a performance "conducts" by altering the speed of the different performers and subsequently alters the temporal relationship between the parts. Alternately, the individual nodes (performers) may exert agency and interfere with both the progression of their own part as well as that of their co-performers. These interventions may represent an act of subversion within the director based system or provide an opportunity to explore new structures and strategies in distributed performance systems. Once the performers are aware of the systems capabilities in this area, pre-performance discussions around version development may extend to incorporating game like strategies as typified in pieces such as John Zorn's *Cobra*.

The network synchronised score allows nonstandard spatial arrangements of the ensemble around (and beyond) the performance space as maintaining eye contact with a conductor or each other may become less relevant. The spatial arrangement becomes one of the pre-performance compositional decisions to be made by the ensemble in creation of

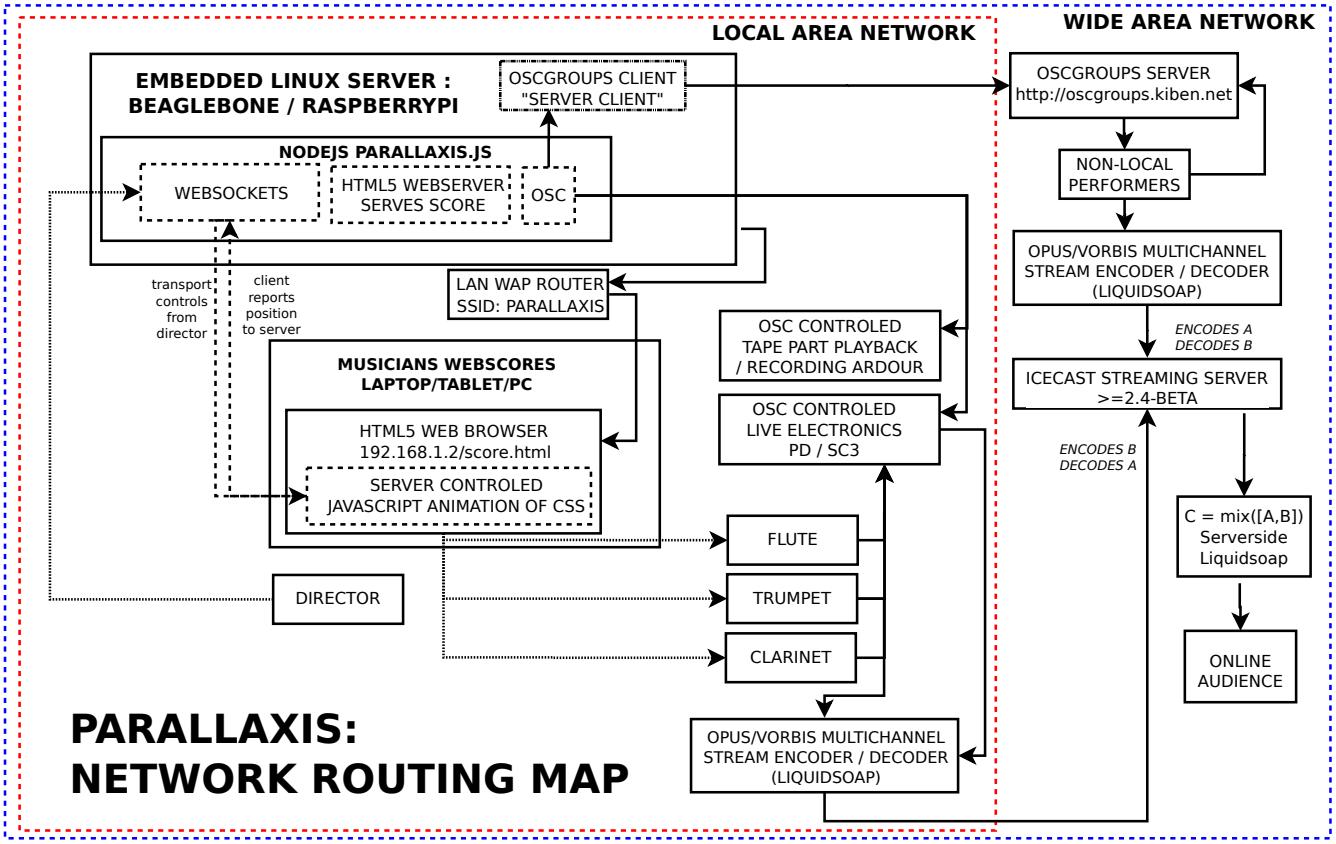

Figure 2: Network Schematic for *Parallaxis*

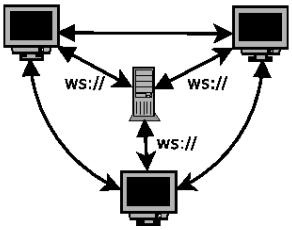

Figure 3: Distributed Model

a version. In the interpretation of scores written for this system there are many such pre and intra-performance decisions which operate on the infrastructural level.

The score file is loaded on to the server as a series of equal length vector graphics files, one SVG file for each instrumental/group part. These files are long strips of notation (not dissimilar to player piano rolls in proportion). The animation of the CSS stylesheet rule determining the location of these elements on the screen works so that the tail of score joins up with the head creating an infinite loop of music. Every prepared version may set new starting points within these cyclical instrumental parts.

The notation streams appear from the right of the screen and scrolls in a leftwards direction. In the left half of the screen are the shaded areas called the playzones, in the centre of these playzones is a vertical line representing the playhead, as the music passes over the play-head it is executed by the performer. The playback interfaces includes speed and direction controls for each part as well as a playzone and playhead, the playzone also acts as a pause button and loop area for the part. All performers may operate their own controls as well as the controls of any other performer using the system.

Touch screens devices are a preferred score interface along with an expression foot controller sending speed control data via OSC. Access to the controls must be quick with minimal effort or time with hands away from the instrument. More experimental instruments may incorporate score controls directly into their own performance interface using OSC which the score is listening for.

The scores prepared for this system by the author to date have used a combination of traditional proportional "time-point" notation and graphic notation. Scrolling this notational style over the fixed playhead demands a fixed moment of attack assuring an adherence to the precise temporal flow. Yet flexibility in interpretation of absolute pitch, tone, register colour and mode of attack remain under the control of the individual. Interventions to that flow may be made by, or directed at, any of the participants in the performance resulting in a structural and persistent change to the interrelationships between all parts. So the influence of the individual on the performance as a whole happens both on the micro and macro levels.

The independence of these strict temporal flows creates the parallax offsets and allows complex, organised rhythmic ensemble playing easily accessible to amateur or improvising musicians. Each musician may feel they are playing regular quarter note values, yet one musician may be playing 10% faster and another 10% slower. None of the musicians are worried about counting subdivisions of the bar and trying to execute complex nested duplets, yet very easily Liqetiesque polyrhythmic ensemble textures become obtainable, even by musicians who can manage traditional notation well, without the cognitive burden of the rhythmic calculations that

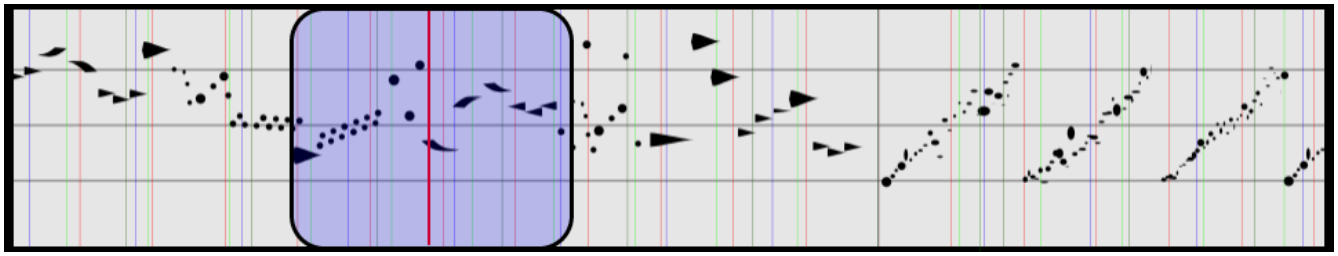

Figure 4: Example of a single instrumental part showing graphic notation, shaded playzone and the red playhead

may act to the detriment of the areas left more open to free. Scores may be created with periodicity and rhythmic structures in mind as with the author's *Parallaxis II for Ensemble* where the score was created on a grid structure based on prime number sequences lending itself to exploitation of isorhythmic patterns.

The drifting polymetricism which causes the parts to constantly move in and out of phase with one another may be seen as analogous to techniques used in Steve Reich's early tape works *Come Out* and *Ain't Gonna Rain* and more closely, Emmerson's *Spirit of '76* with its accelerating delay. However with these works the outcome is fixed, dependant on the staring conditions (the physical distance between the play and record heads of the reel-to-reel analog tape machine) whereas the author's *Parallaxis* works allow a constant ongoing adjustment of metric relationships. This is perhaps closer to an instrumental analogy of Pierre Schaeffer's concept of *jeu* as manifested through his studio based electroacoustic improvisations with turntables and tape machines.[2]

With the Parallaxis system, these ongoing interventions (or *jeu*) are distributed, often performed by multiple individuals within a group rather than by any one lone individual (as in a conducted/directed model). In this sense the score itself undergoes a functional transformation and becomes a collective meta-instrument used alongside those held by the individual participants.

3. NETWORK INFRASTRUCTURE

The score server is publicly available for review/reuse online [1] and is made with open source software (Node.js) and adheres to the Web Standard technologies HTML5, CSS3, Javascript, Web Sockets and SVG. It runs on a Local and/or Wide Area Network with intercommunication between score instances enabled through sockets.io (a node.js implementation of WebSockets). The server also sends a stream of OSC data (node-osc via an *OSC Groups* server) in tandem with the WebSockets stream. This allows integration and synchronisation of live electronics events with notational events in the score. This OSC layer is also useful to operate and synchronise with the transport controls of a Digital Audio Workstation either for alignment with a predefined tape part or to facilitate the creation of studio a recording.

The score may also be hosted on the public internet and used in tele-performance scenarios connecting performers via an high bandwidth audio streams using Jacktrip. Many networked performance scenarios may be facilitated by such a score system as illustrated in Fig.2 In Parallaxis for Flutes, 2012 the OSC transport control feature was used to facilitate a network collaboration between a flautist and a "scoreist" with the flautist using multitrack overdubbing techniques in one location while the score and DAW were manipulated live during the recording from another location [2].

The score server runs on the embedded Linux open hardware platform, BeagleBone or on a RaspberryPi, independent of the wide area network, so not vulnerable to problems with the internet connection, firewall or NAT restrictions. The score server is hosted on a specially created LAN using cheap and easily available T-Link hardware and the client-side score may run on any platform that is capable of running a modern web compliant browser including (but not limited to), Gnu/Linux, OSX, Windows, Android and iOS devices. The complete score server system weighs less than 200 grammes and costs under $100 including the wifi router. It does not depend on the presence of any proprietary software such as Max/MSP nor does it require any complicated software or hardware configuration. As such it is a very easily deployed, reliable, low cost and flexible solution.

4. REFERENCES

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[2] `https://archive.org/details/ParallaxisForFlutes`