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## **Repairing and developing software infrastructures: the case of Morevna project in Russia**

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Gorno-Altaysk is a remote city in Southern Siberia located close to the border with Mongolia. It is the capital of the region of Altay in Russia, a mountain area populated by tourists in the summer, and with about 60 000 inhabitants during the rest of the year. The closest large city is Novosibirsk, located 500 km away and accessible by overnight train. Besides being geographically isolated, Gorno-Altaysk is also at the fringes of any Russian or global media production. Nevertheless, over the past decade it has become a small but important node for the proliferation of open digital culture. A vibrant micro-community of anime fans crafts there independent computer animation shorts and explores, repairs and distributes free software for making it.

About ten years ago one of these fans, self-taught digital animator Konstantin Dmitriev, launched an ambitious personal project with the aim of finding ways to create digital animation using non-pirate technological frameworks. In a context in which piracy is considered part of national culture (Kiriya, 2012), his decision embodied a desire to overcome some of the frameworks of control embedded in pirate technologies that limited him to adapt his creative practice to local circumstances. Realising that the tolerance to piracy could end at any moment, and in search for collaborators beyond Russia to join his project, Konstantin considered the available technological alternatives

at hand.

In the mid-2000s, costly proprietary software for computer graphics production was rapidly proliferating, but non-proprietary, broadly accessible alternatives were largely underdeveloped. Konstantin found an abandoned, free software<sup>1</sup> program for vector animation called Synfig. Synfig had many bugs, limited functionality and was very unstable. Lack of technical documentation had resulted in few individuals knowing how to work with this program. Rather than giving up, Konstantin engaged in a ten-year long endeavour that he named 'Morevna project' to study, repair and ultimately develop the software so that it could be used in actual digital animation production.

This article analyses the efforts and mode of repair of Morevna project with the aim of discussing how alternative software infrastructures can emerge out of frictions, failure, and repair in a process of continuous negotiation of interests of practitioners across diverse contexts and media-related practices. The article aims further to draw attention to the important role of local contexts and cultural infrastructures in the process, and how their integration with online resources and actors can give vitality and traction to attempts to establish non-pirate frameworks for media production, also shaping the form which these attempts take.

Drawing on theories of infrastructures (Larkin, 2013; Star, 1999) and repair (Jackson, 2014), this article conceptualises such integrations as a specific mode of repair that leads to the slow, mundane and fragile formation of what I refer to as 'situated' digital infrastructures for cultural production. The article further suggests that while pirate-based media production can push creators to search for and develop alternative infrastructures, the latter emerge as fragile frameworks that are constantly threatened by collapse and suspension. The continuous work of integration of diverse interests across local and online media-related practices becomes an essential stabilising force needed to

perpetuate these infrastructures and prevent them from falling back into oblivion.

### **Infrastructures of breakdown**

Around the world, software piracy continues to inform practices of cultural production. It represents a central infrastructure for acquiring media production skills and for media circulation, and plays an important role in digital media preservation practices.

A notable part of the literature on piracy has focused on practices of illegal content consumption and questions of copyright infringement (Cammaerts, 2011; Cohen, 2006; Gillespie, 2007; Lessig, 2004; Newman, 2013). Yet, as de Zeeuw et al. (2015) note, piracy is much more complex than the issues of illegality through which it is commonly discussed. The production of piracy can be seen as a political exploration of sovereignty and de-identification in surveilled and regulated online environments. Understood as ‘parametric politics’, such explorations take infrastructural design as their starting point and aim at transforming ‘the machinic arrangements of logistical media apparatuses’ (de Zeeuw et al., 2015). In effect, the infrastructural design of piracy comes to represent individuated responses to problematic aspects of dominant technological configurations.

Infrastructures of piracy are also deeply related to the production of individuated experiences of modernity and globalisation in geographical areas where access to global media content is either too costly, or materially and technically restricted (Athique, 2008; Larkin, 2004; Liang, 2009). In such contexts, infrastructures of piracy emerge through innovative practices that cater to local needs and tastes, creating new genres of media – such as film making based on recycled materials (Liang, 2009) – or new networks of video and audio media distribution (Larkin, 2004; Sezneva, 2012) as well as low-cost new media production (Sundaram, 2014) which blur the boundaries of the legal and the illegal.

Liang (2009) uses the term 'infrastructures of creativity' to denote the connection between piracy and the emergence of alternative media production infrastructures, often based on low-cost materials, home-assembled video cameras and computers, low internet bandwidth and other material aspects. In their ground, these 'infrastructures of creativity' are based on practices of distortion and breakdown. Larkin (2004) uses the term 'semiotics of distortion' to depict the constant condition of media corruption that surrounds the infrastructures of media piracy. Taking as an example the gradually degrading products of the Nigerian pirate media industry, Larkin shows vividly how starting from a low-quality film copy, video tapes and CDs are distorted ever more in the endless process of further reproduction, consumption and circulation of copies. Semiotic distortion is in this context rather literal, but it can also be interpreted metaphorically, as a form of cultural resistance when integrated in parallel infrastructures of media production based on the recoding, remixing and redefining of popular cultural content to address very local audiences, as Liang (2009) suggests.

The distortions which the infrastructures of piracy produce are contradictory to general conceptualisations of infrastructure. Common understandings of infrastructures define them in terms of being generally invisible until break down (Star and Bowker, 2004). Their invisibility is often strategic for their secure operation (Starosielski, 2015) and stems from the ontology of infrastructures as complex network architectures that connect people, places and flows of exchanges (Graham and Marvin, 2001: 11). Piracy as an infrastructure complicates this understanding, as the material aspects of pirate infrastructures are often invisible per se, operating in a regime of illegality, or a parallel public sphere (Kiriya, 2012), one that functions with breakdown as a starting point, existing at the borderline between the visible and the invisible. For piracy to function, technologies need to be cracked, disrupted, degraded and potentially recoded. In many

countries, the promise of technologies comes with a common experience of permanent technological collapse and a temporal detachment from the global through an artificially imposed mode of ‘waiting’ – for films to arrive, for a faster internet infrastructure to be built – that prompts the emergence of infrastructures of piracy (Liang, 2009). In such moments, from an infrastructure of breakdown, piracy becomes an infrastructure of repair, one that has the capacity to fix gaps in the temporality of potential experiences of media.

This article does not aim to delve deeper into the nature of piracy as such, but rather sees it as a material context which can also give birth to specific practices of repair that aim at creating non-pirate infrastructures for media production in the global media fringes. The permanent state of distortion and breakdown that surrounds these practices represents a force of friction (Tsing, 2005) that can ignite the search for alternatives to itself.

As an infrastructure based on breakdown, overcoming piracy in its material dimensions implies triggering repair as a mode of action. Rather than mobilising repair mainly in moments of infrastructural failure, repair can thereby emerge as a subtle productive force that simultaneously holds together existing pirate infrastructures, and also evokes the emergence of their alternatives. How does the latter happen?

### **Infrastructuring through repair**

The search for non-pirate alternatives can emerge in cases when media producers attempt to enter the professional labour market of the media industries (Velkova, 2016), or more frequently through forms of activism that negate copyright and control frameworks embedded in proprietary technologies. In the latter case, the work of

hackers<sup>2</sup> and the free software movement have been particularly strong examples. However, as Liang (2009) sharply notes, the possibility to resort to building alternative infrastructures through inventing new legal frameworks and forms of organising, as those employed by the free software movement have come from a position of privilege to disavow the global, one that is not easily available to many located in the world's peripheries. Nevertheless, once in place, the diverse legal and technological artefacts developed by the free software movement can become an inspiration for other actors to embrace and recode them in other practices of cultural and technological production (Coleman, 2013; Kelty, 2008). Thereby, the privilege of rejecting piracy through the material infrastructures of cultural production has, as Powell (2015) notes, made free software into a resource for a broader range of actors who use it as means to reach other ends rather than an end in itself.

There are today numerous free and open-source programs available online. Yet, many of them are in constant decay, some falling into a state of obsolescence faster than others, as not every such software project produces a community – in many cases programs emerge as personal projects to solve specific tasks. At the same time, as Mackenzie (2006: 12) notes, software needs to be carefully maintained as it is under constant pressure by changing hardware, and by other software. The needs and ambitions of cultural producers whose work is dependent on software are also not static, and can lead to the rediscovery of software and its repurposing in ways as to serve the circumstances and needs of users other than those originally intended for. Such revival can represent the base to form new infrastructures<sup>3</sup>.

Practices of repurposing and repair emerge often as a result of diverse types of structural failures. Parks (2015) notes how the failure to provide lower electricity prices to homes in rural Zambia has led to individual, yet widespread practices of repurposing

car batteries to power television sets and stereo systems maintained by self-taught geeks. In Turkey, self-taught engineers and entrepreneurs who have acquired their skills through apprenticeships, technological repair and online forums perform a crucial societal function by maintaining cyber cafés that mediate knowledge and access to digital resources between the governmental policy of censorship and the broader population (Harris, 2015). In the high-tech Bay Area in California middle-class women build hackerspaces as a way to try to combine creative work, hacking and motherhood in a desire to ‘have it all’ and use failure as a productive way to establish alternative notions of hacking, challenging masculine-dominated technological culture (Rosner and Fox, 2016).

Steven Jackson (2014) observes how taking breakdown rather than growth and progress as a starting point for thinking about new media technologies can open up a new horizon of enquiry into the contemporary politics of media. Repair, as he defines it, constitutes ‘an aftermath’ that grows ‘at the margins, breakpoints, and interstices of complex sociotechnical systems as they creak, flex, and bend their way through time’ (Jackson, 2014: 223). In this sense, repair becomes a force of hope, of craftiness, of reconfiguration and of adjustment to changing or unexpected circumstances in media technologies. Jackson (2014: 227) further observes that repair is based on simplicity and distributed expertise that emerges not in smooth, linear progress but through break downs, reaching the limits of practices, and searching for ways to overcome them. From this point of view repair emerges through the forces of friction. Tsing (2005: 5) defines friction as ‘the awkward, unequal, unstable, and creative qualities of interconnection across difference’ through which cultures are produced, one that provides an opportunity for reconfiguring structures of power and cultures from within. Repair is one such way, as it is capable of producing technological difference, by fitting

technologies to national contexts, individual circumstances and personal stories (Jackson, 2014: 227). The work of fitting, Jackson (2014: 223) notes, is a work of articulation, one that adjusts and calibrates sociotechnical systems to function smoothly while interacting between their different parts. This work of calibration is based on improvisation (Graham and Thrift, 2007) which is in turn constitutive for infrastructural development, defined as ‘the historical process of development of many tools, arranged for a wide variety of users, and made to work in concert’ (Star and Bowker, 2004: 34). Repair, in this sense, can both act on things broken and become an act of development that illuminates the fallacy of the linear outlook of technological progress and invention. Thereby, the synchronisation work done through repair defines the ontology of infrastructures as: ‘things, and also the relation between things’ (Larkin, 2013: 329). Rosner and Ames (2014) call the effects of such work ‘negotiated endurance’, one that aggregates the expectations of durability, functionality and local circumstances of operation of material objects of diverse actors.

Such work of synchronisation and adjustment has not been a common focus in studies of media. However, its centrality in the formation of infrastructures through repair makes it a necessary object of empirical attention, not least because it also hides an ethical dimension. Adjustments represent a way to take responsibility for technology, one that its designers tend to evade (Suchman, 2000). Repair assumes such responsibility at its very bottom, as it rests upon ‘an ethics of mutual care and responsibility’ (Jackson, 2014: 231). The latter, in Jackson's terms is both a form of routine maintenance work, and a practice of resistance through tailoring the ways in which technologies are appropriated.

In the field of technological design, the work of adjusting and assuming responsibility has been called ‘artful integrations’ (Suchman and Bishop, 2000),

understood as a mode of connecting diverse actors, interests, practices and ways of work, and reorganising them to negotiate a common interest mediated through technology. It is a process of situating technology in an attempt to negotiate ‘one's own technology’ across practices in which it is used or planned to be used (Suchman and Bishop, 2000: 9). Integrations are ‘artful’ because they do not emerge following a smooth, linear and friction-free logic, but rather stem from ‘laborious reconfigurations – always partial, provisional, and precarious – to familiar arrangements and modes of action’ (Suchman, 2000). In this light, repair emerges as a provisional, always tentative mode of action that reconfigures the ways in which technologies mediate relations, interests and individual ambitions across practices. It materialises at the nexus between individual and collective anticipations of a future aligned to specific technologies, and the actual work of integration of concerns across practices *into* them.

The next sections illustrate one way in which this work can happen with an obsolete piece of free software as a starting point, using the case study of the Morevna project. My ambition is to demonstrate how the work of integration of concerns, together with anticipations for a future related to specific technologies leads over time to the formation of new, non-pirate software infrastructures and a gradual situation of infrastructure.

## **Methods**

Entwined with one another, technological development and repair are timely and rhythmic phenomena (Jackson, 2014). Repair can either stretch over long (and often indefinite) periods of time, or come at an intermittent and rather unpredictable pace. This poses methodological challenges in terms of how to capture it as a mode of action

beyond singular moments of breakdown, and how to gain a broader perspective on the ways in which it drives the gradual development of infrastructures.

The case through which I address repair is Morevna project. It started in 2007 as a personal endeavour of one individual, Konstantin Dmitriev, in the Siberian city of Gorno-Altaysk to find ways to create digital anime films with free software. The online presentation of the project describes it as

an independent initiative aimed at testing and improving open-source tools by adopting them in real animation production. As part of those activities we [are] documenting the developed workflows and approaches to help others learn from our practices and publishing results of production as free content (Morevna project, n.d.).

Morevna project started with a double anchoring in breakdown. It wanted to free itself from the prevailing culture of piracy in Russia that informed much of the production of digital media in the country at the time. Its mode of doing so was to start with the repair of a free software program for 2D animation, Synfig. The program was proprietary until 2005 when it was abandoned and relicensed by its original author as free software. Since 2007, Morevna project became the catalyst behind its repair and the creation of a user community around it.

It has not been possible for me to study the project in its full duration, since 2007 to date. The data collection took place from 2012 to 2016. My approach was based on qualitative methods through which to understand the evolution of the project, its history, its modes of work, the participants involved and their roles and personal ambitions. I studied the extensive online documentation which Morevna's initiator had published on the project's production blog, [morevnaproject.org](http://morevnaproject.org). This material gave contextual information which was complemented with tens of formal and informal Skype

interviews with the project leader, Konstantin Dmitriev. On some occasions, these interviews took the form of oral history of the project and its changing intentions and problems from the beginning to the present day. It was through these interviews that the centrality of repair emerged as a key topic of concern of the project. On other occasions, the interviews focused on ongoing project developments, but the conversation often became future-oriented, with Konstantin envisioning new refinements of his creative ambitions as an animation director through particular fixes or extensions of Synfig. These interviews were revealing for the anticipatory work that underpinned technological adjustment in the project. Following Suchman (1987), I interpreted the conversations as a form of articulation that situates technologies in the middle-ground between plans and actual actions, conditioned by specific material and social circumstances.

The interviews with Konstantin were extended by a two-week-long participant observation in November 2014 in Gorno-Altaysk during which I met six more individuals affiliated to the project at that time. One of them was the main Synfig software developer, and the remaining five were Synfig users, four of whom female<sup>4</sup>. In addition to the participant observation, I interviewed two more project participants via Skype, one from India and one from Italy who had minor, one-time contributions with visual artwork to the project. Finally, two animators close to Konstantin who worked for large animation studios in Moscow and St. Petersburg provided more contextual information about the relationship between software piracy and media production in Russia.

All interview material was transcribed. The analysis involved identifying patterns and common themes that could narrate and nuance the story and meaning of Morevna project over time. The interview material has been anonymised with the

exception of that of a few respondents who are referred to by their original names, as the nature of their involvement in the project made it difficult to keep them anonymous.

Based on this temporally and spatially fragmented methodology, I was able to reconstruct and sketch out some important moments of repair and actors involved in it which are presented in the next sections.

### **Identifying the need for repair**

As noted earlier, repair emerges from the entanglement of local circumstances, breakdown, and the individual aspirations and negotiations of technology across practices.

In terms of local circumstances, in the Russian media context, software and content piracy are considered part of the national culture. Often allowed to proliferate, piracy has frequently been used instrumentally by the Russian state for practising censorship and negotiating its terms of access to international institutions (Kiriya and Sherstoboeva, 2015; Sezneva, 2012). In 2004, the state purposefully refused to enforce anti-piracy legislation in order to negotiate its terms of access to the World Trade Organisation. But in 2006, it shifted position and organised a major crackdown on producers and distributors of pirate CDs containing illegal software and entertainment media. Rather than reducing piracy, the move strengthened the positions of several formerly state-run factories for optical disc production (Karaganis and Sezneva, 2011: 156). Occasionally, these crackdowns also targeted users of pirate software. Karaganis and Sezneva (2011) discuss the particularly controversial case of a school principal called Ponosov from the city of Perm who was arrested after pirated versions of Microsoft Windows were discovered on computers in his school. After a trial lasting

several years, he was released, and started campaigning for free and open-source software.

The infrastructures and culture of piracy in Russia are arguably even stronger the further one gets from the cities of Moscow and St. Petersburg. An animator from Moscow explained the difference through her interaction with visual culture teachers from rural Russia:

If in Moscow and St. Petersburg we got the culture that it is easier to buy software, it will pay off, it is not the case in the countryside. There, it will never pay off the investment, or they [the teachers] feel unsure that Adobe will actually get to receive their money. So they flood the chat with questions about how to crack it. Then I decided to give a webinar on Krita. But then, people started asking – what is this obscure program? We want to work in reputable, real software. Why should we study this?

(interview, September 2016).

The above quote reflects vividly the ambivalences created between the infrastructures of breakdown and the striving of individuals to be part of the global. The use of industry-developed proprietary software becomes embedded in the politics of cultural identification that creates links of belonging to the contemporary global media production industries. But this very same rationale embeds its users in the culture of piracy, practices of breakdown and software disruption, propelling and stabilising the infrastructures of piracy, making cultural producers their legitimising agents, and propagators.

Morevna project emerged as an attempt to reject the connection between piracy and the global as the only viable option for local media creators, in an effort to assert the

capacity of local agency and global belonging in remote locales. Morevna's founder, Konstantin, explained:

I wanted to do a miracle. I want to show that if someone wants to do something, you can do it even if it is very hard. It is not like, someone can come and tell you, go to Moscow...I would like to become a precedent...This feeling of power over your own life, and this feeling of drive – to be able with your own hands to make change – to make impossible, incredible things gives you very high adrenalin.

(interview, May 2014)

The main tool for accomplishing his goal became Synfig. He discovered it by chance in early 2006. It lacked features, stability and a community of users at the time, but it carried a promise for becoming a viable alternative to pirate software: ‘Ugly website. Ugly program which crashes all the time. I had to compile it!...But Synfig gave me a total control over each element of an animation film. At first this was rather scary, but it was completely awesome’, Konstantin remembers (interview, November 2014).

The promise of gaining such control reflects a belonging to a culture of making and desire for technological self-sufficiency, but they do not come without frictions. The choice of Synfig prompted the need for finding creative ways to match Konstantin’s own ambitions with the limitations of his choice of software:

There are many ways to do animation. But the problem gets to the functionality of free software. If you know how to do it on proprietary software, you switch to free software and you realise that there is simply no such functionality, this workflow...you are in a way trying to do the same thing, but through a

compromise between the functionality, the possibility to improve all this, and your own capabilities.

(interview, November 2012).

Since Konstantin had no past experience in repairing software, his project became about finding ways to make repair and software development happen. As Sennett (2008: 10) argues, imperfect and incomplete tools stimulate imagination and develop ‘the skills to repair and to improvise ... resistance and ambiguity can be instructive experiences’.

Between 2007 and 2012 Konstantin tried to organise Synfig’s repair as an online project as part of making a short animation film with it. He tried to find online collaborators, but failed as the project did not manage to attract enough interest. A couple of aspiring riggers and animators from India and Italy joined occasionally and contributed with conceptual art or minor one-time tasks but their commitment to the project was short-lived. One of them remembers:

The project was really stimulating, and the idea of being able to contribute to the creation of an animated film has really excited me that's why I really wanted to join them [...] My collaboration lasted only few months [...] That period was very hard for me, so I had to quit drawing for a little and rearrange my ideas.

(interview with Yuumi Hikari, September 2014).

As much as free software can offer a possibility for growing an online community (Benkler, 2006), this growth may not emerge naturally by sharing software and projects for making media with it online. Konstantin experimented by trying to attract contributors through other free software graphics communities, but with little success. During this time, he studied Synfig on his own, by trial and error, and documented his knowledge in an online manual.

Failing to progress was nevertheless a productive moment for turning to explore existing cultural infrastructure in Konstantin's local environment and trying to integrate it with resources from the online sphere. As Rosner and Fox (2016) write, and as noted by other studies (Medina, 2011; Peters, 2016), failure can play a central role in achievement by way of offering moments of reflection through which to transform techno-cultural practices in their ground. In the case of Morevna, transformation was not so much in terms of practice, but in terms of creating and restoring missing links between local structures and online resources that helped push Synfig's repair further.

### **Repairing software through fitting together local structures with online actors**

Konstantin organised repair in two directions. One was to introduce the software to young aspiring media producers still not part of the culture of piracy, connect them to online developers, and collectively repair Synfig in ways that match their individual creative ambitions. The other was to speed up and stabilise the process of repair by finding local and online financial resources.

In terms of the first of these orientations, a local folk arts and crafts school for extracurricular activities for school children, 'Adamant', in the city of Gorno-Altaysk, became a crucial cultural infrastructure. Established in 1996 by the local government, the school is one of the few in post-Soviet Russia to offer free classes to school children in performance arts, painting, animation, and crafts such as ceramics and pottery. Over time, these classes have become informal hubs for experimenting with creating independent projects using a variety of techniques and materials, ranging from sand and plasticine to computer-generated 2D and 3D animation. A Moscow-based animator noted that 'all Siberia is a very powerful frontline of enthusiasts who use their own

money and enthusiasm to make serious animation studios for children. They study technologies, they buy equipment, they explore software' (interview, September 2016).

Konstantin has been teaching animation at the Adamant school since 2013. When I visited the studio in 2014, the classes lasted for two hours and were attended by about six students aged 11 to 16 years old. Most students had little knowledge or interest in software, they were driven there by a strong passion for fan fiction and digital storytelling, wanting to make their own animations, having been enthusiastic media consumers for years.

Digital storytelling has been generally portrayed as easy to produce, as it relies on what many have referred to as 'standard industry-made digital equipment' (Hartley and McWilliam, 2009; Lambert, 2012; Lundby, 2008). For many media producers outside of the global West this implicitly translates into resorting to pirate digital equipment. Yet, as Morevna project's ambition was precisely a rejection of the latter, Konstantin embedded Synfig in the work of the students in the animation classes. If the students' parents provided for the hardware – usually locally assembled laptops and digital drawing tablets – Konstantin has been helping them with software. In doing so, Konstantin integrated his own interest in Synfig development. The students' individual visual projects became a testing and learning ground to make Synfig useful in real production, simultaneously nurturing a small local user community in the absence of an international one. The animation projects helped Konstantin and the students to identify bugs, possibilities and limitations of the software through practice.

These activities established and activated links between the students' projects, Konstantin's own ambitions to make an anime film with free software, and a volunteer developer from Spain interested in helping to improve Synfig. When the program was failing to meet the expectations of its users, Konstantin was collecting information

about the problem and trying to resolve it either on his own, or in cooperation with the online developer. Occasionally, some of the students would discover that a functionality was missing, and ask Konstantin to help with implementing it. One former student, currently freelancing animator remembers:

I tried to work as an animator [with Synfig], but then I wanted to have a special feature. OK? So, I say, make me one... Then they [developers] would make it and give it to me, asking - can you work with this? I would then try it and I tell them – no, there is a bug... So, I am an artist who tests a program, I am one of the first to test it.

(interview, November 2014)

As Suchman (2000) writes, for technologies to be made useful, practitioners having different roles in technological use and development must effectively take up the work of design through activities that incorporate technology 'into an existing material environment and set of practices'. Such activities establish 'working relations' that cross the boundaries of established enclosed spheres of technological production and use, allowing to situate them in actual needs and practices. This work ultimately converts repair into an act of infrastructural development that connects and organises people and practices across contexts. Synfig's evolution from an 'ugly, crashing program' to a software that could be used in digital animation production was therefore crucially contingent on the mediation between the different individual ambitions, levels of knowledge and personal interests surrounding Synfig.

Even though Konstantin's own creative projects were much more technologically ambitious than those of his students, the work of the latter was crucial for defining

certain directions of Synfig's development by working with it even in moments when it was functionally at a very immature stage. The use of partially repaired objects and their tight integration with software development is a fundamental component of the work of repair.

### **Speeding up development through integrating local with online financial resources**

The process of improving Synfig was slow and mundane. For long periods of time, Morevna stalled completely, while on other occasions it rapidly progressed. All work was done on voluntary basis, which brought the project to a complete halt several times and set an uneven rhythm to the work of repair. Konstantin explored ways to speed up and stabilise Synfig's development by integrating local and online sources of funding.

In Russia, state and oligarch-run oil and gas companies exercise great influence on the media and provide funding for it (Smirnov, 2014; Vartanova, 2013). A series of short free-lancing projects for entertainment media commissioned by some of these companies, and by Novosibirsk-based start-ups represented a sudden source of income for Morevna project on several occasions between 2013 and 2015. Konstantin was commissioned to make short animations to be screened at private events. For one of the first such projects, a small team consisting of Konstantin, some of his local students, an animator from Costa Rica and one from Novosibirsk collaborated to make a four-minute-long animation short through which they developed a technology for rapid production of multiple character animation, lip synchronisation and dubbing in Synfig. As Konstantin recalled, 'There was a technological gap for making very quick animation at the time. It normally takes two years [to animate that number of characters], but with this technology we will help fill in this gap' (interview, March 2015).

Part of the income from these projects funded a two-month salary to one Synfig developer to repair bugs and include the new technology for rapid character animation. This moment of Synfig's development established indirect links between the larger financial and media ownership structures in Russia, the animation community in Gorno-Altaysk, and an online developer, all of them mediated by Konstantin through his Morevna project.

Although fragile, and rather fragmented, a technical and financial infrastructure was emerging through this mundane, disparate and improvisational form of repair based on interconnections. This work was contingent on the presence of an actively involved software developer who could perform the actual work of repair as the predominant part of the small user community around Synfig, who were hobbyist artists in need of technical features to realise their creative projects. But at the moment when Synfig seemingly started increasing its community of users due to the new technological features, the main developer left the project for personal reasons. A local developer from Gorno-Altaysk emerged as a replacement, driven by a desire for visibility and credibility for his work, long suppressed in his previous job at a local accounting software company:

I got good conditions for developing Synfig. The salary was not important, we collected funding through donations so that I could work permanently without looking for other projects. But the advantages were that I can make public my code, and I can get fame [...] plus I have always liked to work with programming graphics.

(interview, November 2014)

The work of this developer was funded through a specific online crowdfunding campaign. For a year between 2013 and 2014, Konstantin set to collect US\$ 1000

monthly through the crowdfunding platform IndieGoGo with the motivation ‘to provide a way to control the direction of development and support the vitality of Synfig development at the same time. Users can choose the [development] priorities and all collected funds will go to support further sustainable development of Synfig’ (IndieGoGo, 2014).

The campaign was a success, as each month animators from Sweden, Russia and other countries used the opportunity to order features or prioritise bug fixes in an attempt to advance their work as free-lancers in the media industries in Europe (Author). In this way, the user interface of the program was improved, and the general performance of the software speeded up, while catering simultaneously for the individual wishes and needs of a diverse group of users.

These requests and modes of work altered the orientation of the project from a local effort of resistance to piracy to an infrastructure of value for computer graphics artists generally. By August 2016, Synfig had about 3000 users and about 500 downloads a month, starting from none nine years earlier. By integrating local cultural and financial infrastructures with the individual ambitions of media creators across contexts and practices Morevna project created a fragile infrastructure in which the local community in Gorno-Altaysk had become an important resource for other digital creators for getting help with training, bug-fixing and Synfig functionality development.

This turn represented a challenge in its own right, as the project outgrew the initial ambition of rejecting the local dependency on pirate infrastructures. As Konstantin admitted:

I became autonomous, I can do everything I want with my program...But at the same time I am less autonomous from all this infrastructure that I have created – I need to maintain it. I am not autonomous in relation to my community – I can

not ignore some things. I understand that I cannot disappear from the network for a day. I can not not check my email because I need to solve issues that emerge every day.

(interview, March 2015)

As infrastructures grow through the practice of repair, the people involved are given greater responsibilities for performing maintenance, becoming important stabilising nodes that drive forward, mediate, and ensure an acceptable level of operation.

### **Conclusions: Situating software infrastructures**

The case analysed in this article provides opportunities for rethinking the relationship between practices of free software development, piracy and repair. For specific creative practices of digital media production, free software can emerge as an alternative not out of the privilege to reject the global, as Liang (2009) suggests, but to reject the prevalent (outside of Western contexts) entanglement of software piracy and participation in global cultural production. Such disentanglement, based on repairing and developing alternative software infrastructure for media production, does not need to be initiated by hackers. Aspiring digital artists and cultural producers can now bend software infrastructures to fit their needs and push for their development through the politics of negotiation embedded in repair. This specificity leads to the redefinition of the role of hackers and technologically savvy individuals in such infrastructural development, from having a leading role, to gaining a more symmetrical position in relation to the needs and desires of other actors who have an interest in software.

This is an important difference from how many communities around free software development function. Repair, as mobilised in Morevna project, changes the way in which we can understand the value of participation in free software (and thereby

infrastructural) development. In many free software communities contribution to software is connected to an implicit system of meritocracy that defines one's authority in the community (O'Neil, 2014). For the one or two software developers involved in Morevna, the project has undeniably been about such merit and recognition. But, considering that the majority of other individuals involved, including the project leader, were not developers, software development was of different value. For cultural producers, reputation comes from the recognition of the symbolic products they produce which can be shown and appreciated. Their work gains higher value when developed, first, by non-pirate technologies, and second, by self-made ones adjusted to their individual creative demands and practices, as it brings them closer to an artisan, craft-like way of work. Therefore, specific configurations of repair, such as connecting local with online actors, institutions and resources in one common practice of infrastructuring, is related to the need to reconcile a spectrum of different values connected to and dependent on software development.

In effect, the mundane repair performed in such a mode leads to a process of, somewhat paradoxical, situating of the infrastructures being developed, or the production of what may be termed 'situated infrastructures'<sup>5</sup>. The paradox in the concept stems from the general understanding of infrastructures as systems that create the grounds on which other objects can operate. As such, they aspire to universality, tend to outcompete other systems and as a consequence, rather frequently get monopolised. Understanding infrastructures as situated rejects the possibility for universality and redefines them as constant objects of contestation and re-definition that happens through repair. The question of whose priorities and problems are catered to first in the practice of repair becomes a moment of alignment of mutual interests that requires a fragile balance between the collective effort and dependency of many people

on the functioning of infrastructures, and individual ambitions and needs. Repair, as a process of situating infrastructures, can therefore emerge as fragile and tentative as the infrastructures of breakdown that it may try to evade, such as those of piracy.

Finally, what form the process of situating infrastructures will take is largely dependent on local circumstances and socio-political contexts. The Synfig software, as a form of digital infrastructure for media production, has been repaired as a result of the complex entanglement of shifting attitudes to piracy by the Russian state, individual local desires to connect to creative communities beyond national borders, and the search for the technological means to do so. This particular context configured in very concrete ways the spectrum of possibilities for financial, cultural and technological resources that could be used in the project that emerged out of a form of digital scarcity and infrastructural breakdown rather than from a critique of abundance, as other forms of repair infrastructures can take in Western contexts (Kannengießer, 2016). Therefore, place, locality and local circumstances still play a crucial role in technological projects and contribute to the situatedness of infrastructure even when it is distributed, online, and entangled in multiple life-worlds and ambitions.

## **Notes**

1. Throughout this article I use the term ‘free software’ because it reflects more precisely Synfig’s ideological outlook as aligned with that of the free software movement and ingrained in its distribution license, GNU GPL. Nevertheless, the interviewees in this study used a mix of terms such as free software, open source, free and open-source with a rather open attitude to the ideological distinctions between ‘free’ and ‘open-source’.

2. Following Coleman (2016), hackers are understood here as skilled technologists in whose practices craft and craftiness converge, and who often have a liberalist political outlook.

3. Here I refer to Star and Ruhleder's (1996) observation that infrastructures rarely emerge from scratch but tend to be built on an installed base.

4. In contrast with many free software projects in which women are a minority, in this one they had a dominant presence. Nevertheless, common gender divisions got ingrained through the division of labour in the project as women were responsible for the aesthetic work of animation while the few men coordinated or performed actual software development and directed the anim  shorts.

5. The concept is derived from Suchman's (2000) discussion of 'situated technologies' which is in turn a development of Haraway's understanding of situated knowledges.

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