MUVEs: a new opportunity to bridge (global) digital divide?

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Abstract:

Social inclusion is a complex topic that tries to address multiple different problems, among which digital divide. The digital divide problem should be looked at from different perspectives, reflecting the mosaic of its components (e.g., global digital divide, skills and education poverty, hardware and connection lack, etc.), that suggest different viable solutions. In this paper we envision a perspective use of Multi User Virtual Environments (MUVEs) – a specific type of Web2.0 applications – as a possible way to helpful bridge global digital divide in disadvantaged Countries, with specific respect to African nations. We firstly approach MUVEs paradigm to point out which among their characteristics could be effectively exploited to support the cultural background of African populations, then we sketch possible benefits and existing technical constraints linked to the diffusion of MUVEs in African contexts.

Keywords: web2.0, global digital divide, social inclusion, social network, online community, MUVE, Second Life, Africa
1. Introduction: global digital divide and social inclusion in the Web2.0 era

Supporting social inclusion implies the development of strategies aimed at combating and changing circumstances and habits leading to social exclusion. Social exclusion is a complex concept used to denote different forms – mainly related to economical aspects – of social disadvantage. Generally, social exclusion refers to processes where individuals and/or entire communities of people are systematically blocked from rights, opportunities, and/or resources which play a key role for social integration (e.g., housing, employment, healthcare, civic engagement). Such condition implies relevant social consequences, such as poverty, violence, psychological alienation, etc.

The so-called digital divide is one of the many aspects of social exclusion which may impact in many ways on people life. It refers to the gap existing between people effectively able to access and exploit digital opportunities and people who are not. Digital divide includes both the imbalance in physical access and in skills acquisition. Generally, the groups touched by this problem can be characterized from a specific socioeconomic, racial, generational, or geographical point of view. The digital divide has also relevant impact from the perspective of inequalities in technology access across the world: the term global digital divide underlines the great disparities in accessing the Internet and its opportunities (education, business, healthcare, etc.) between developed (primarily Canada, US, Japan, South Korea, Western Europe, and Australasia) and under-developed and developing Countries (such as Latin America, Africa, and Southeast Asia). This disparity traces a geographical division among nations (see Fig. 1), whose main consequence is the inability for developing Countries to benefit from the information age at the same pace of wealthier ones, further widening the economical unbalance between the two groups. Concrete examples of global digital divide are: lack of affordable and widespread Internet access (personal computers at home/work, public terminals, Internet cafes, public wireless access points, etc.), impossibility to effectively access e-commerce facilities (lack of efficient shipping services, electronic payment networks, price engines able to compare prices among retailers, etc.), impossibility to access and/or use information (libraries, maps, e-government services, newspapers, etc.), impossibility to coordinate and interact with other people (e.g., for commercial or political purposes), and many others.

In order to overcome the global digital divide we need to deal with the following major classes of obstacles: unavailability of hardware resources (increase of penetration rate of computers, mobile devices, and Internet connectivity should be coupled with cost reduction of broadband connection), gap in skills (both among users and technicians), unavailability of the vast majority of information in languages other than English, and a certain degree of resistance to changes and innovation in specific socio-cultural groups (Granovetter, 1983).
In this paper we tackle the problem of bridging the digital divide from a counterintuitive point of view: the exploiting of state-of-the-art Internet applications as a possible mean to help developing and spreading the use of ICTs in underdeveloped Countries. The main idea behind this approach is that – given the current situation in ICTs adoption and use – the “followers” strategy may not always be the most appropriate to help those Countries. Actually, in our opinion, it has at least two limits: firstly it implies a relentless and resource-consuming effort – usually not affordable –, to try keeping up with technological innovations and related skills, secondly it implicitly requires adapting to western cultural models. As a consequence, new ways to solve the problem are worth to be explored. In particular, we think that Internet-based 3D social applications may be able to offer an environment quite suitable to help acquiring skills useful to develop a relevant position in the information society while – at the same time – respecting cultural specificities.

To investigate the validity of our thesis, in §2 we will dig into Web2.0 and Multi User Virtual Environments (MUVEs) characteristics. In the following §3 we will focus our attention on the opportunities offered by Second Life in helping to gap social exclusion in African areas subject to the global digital divide. Finally, in §4 we counterpoise possible benefits of Second Life to technical constraints to its diffusion in African Countries and, in §5, we sum up our conclusions and trace possible future developments for this research stream.
2. Major characteristics of the Web2.0 paradigm and MUVEs

The term “Web2.0” was coined by O’Reilly Media at a conference in 2004 (O’Reilly, 2005) and it has become the label to refer to the so-called next generation of Web applications. Since a formal and agreed upon definition of the Web2.0 paradigm distinguishing characteristics was apparently impossible to achieve, the participants to the conference tried to trace a definition starting from a draft set of dichotomies counterpoising Web1.0 to Web2.0 sites and/or software applications. From this very first draft was already evident that the major difference between Web1.0 and Web2.0 was the different emphasis put on the role played by web users: passive targets of one-way information in the first case, against (inter)active providers of contents, interaction models and solutions in the latter.

Due to the strong emphasis on the participative role of users, the second incarnation of the Web has been defined “social Web”. The Web2.0 model, based on generation and distribution of information and contents is, in fact, much more similar to what happened in the early stages of the Internet, when the net was essentially a worldwide platform supporting computer-mediated communication and cooperation between individuals. As a consequence, in the Web2.0 paradigm, the users collective intelligence is potentially able to foster inclusion (in all of its many forms), harnessing the wisdom of many to reach innovation and information sharing. Consistently with sociologist characterization of postmodernity (see, e.g. Maffesoli, 1996, Bauman, 1991), we observe a renewal in the need for sociality: people rediscover bonds created through shared interest (both on and offline) that coalesces in different types of tribes (see e.g., Cova & Cova, 2002; Cova, 1999) and social networks.

This push toward social aggregation takes many forms and exploits every opportunity offered by Internet applications. Hence, not only well-known experiences such as discussion groups, community networks, and blogs become the arena for social interaction, but also software applications commonly thought for other uses. As an example, more than five million active subscribers participate worldwide in Massively Multiplayer Online Games (MMOGs), but a significant part of their experience consists of “meta-gaming” (in-game communication between gamers including any type of social interaction not necessarily related to the game development, such as talking, dating, trading, etc. – Ludlow & Wallace, 2007).

In this vein, one of the most advanced expression of the Web2.0 paradigm can be envisaged in the diffusion of sophisticated social environments generally known as “virtual worlds” (Castranova, 2005).

2.1 MUDs, MMORPGs, MUVEs, and Other Synthetic Worlds

Thanks to the wide distribution of Internet availability, broadband technologies, advanced hardware platforms and the increasing popularity of the Web2.0 paradigm, online social networks and communities have started to exploit communicative opportunities derived from the combination of virtual reality and text-based chat environments. The result has been the creation of new multimedia, online, collaborative (3-Dimensional) graphic environments supporting ongoing social interactions. Among them, Multi User Virtual Environments (MUVEs) – and Second Life (SL) in particular – are undergoing a skyrocketing development and diffusion. In MUVEs users interact in a synthetic environment (the “virtual world”), where social
interaction plays a central role in user-to-user exchange (Ludlow & Wallace, 2007; Ripamonti, Di Loreto & Maggiorini, 2008).

The acronym MUVE has been used until recently essentially to refer to the evolution of more traditional chats, Multi-User Dungeons/Domains/Dimensions (MUDs), MOOs Object Oriented and Massively Multiplayer Online Role-Playing Games (MMORPGs). MUVEs, in general, do not necessarily present the same set of characteristics of a game: they have no specific goals to reach, nor scores. They were commonly referred to as virtual worlds, whereas, because of the unfortunate history of the “virtual reality” scientific research paradigm, the “virtual” tag was opposed to the “real” one. This is the main reason for which we prefer to define MUVEs as “synthetic worlds” (Castranova, 2005, De Cindio, Ripamonti & Di Loreto, 2008): it conveys the idea not of a different and detached “other” reality (often also connoted with negative meanings), but of something perhaps unnatural, but nonetheless bounded to our everyday life.

MUVEs are online persistent synthetic worlds represented using 3D isometric/third-person graphics and allowing a large number of simultaneous remote users to interact. They are always social environments, inhabited by avatars (usually two or three-dimensional graphical humanoids representations of the users), that may have “demigod” abilities, such as being able to fly and change their appearance at will. Among the more known MUVEs we can list Second Life, There and Active Worlds, in addition, there is also a number of intriguing research projects going on, such as Croquet and Harvard’s Rivercity Project.

MUVEs are not simply the last ring of the online social environments evolutionary chain: some of them (namely SL) have some evident – and some more implicit – characteristics that pave the way to an unforeseen possible convergence with the Internet (and the web) communicative potentialities (Ludlow & Wallace, 2007). Both MUVEs and the Web2.0 effectively couple content diffusion and social interaction, supported by a more intuitive and effective interface. SL presents very particular characteristics, since that it has been conceived and designed in order for its contents to be completely and collaboratively built and provided by its users (Ondrejka, 2004; Lessig, 2001). This has strong implications on community building and social interaction.

2.2 MUVEs as an augmentation of communities’ actual life

The rampaging diffusion of ICT-based environment supporting interaction in social networks (O’Reilly, 2005) has tickled the interest of scholars belonging to a wide range of disciplines (psychology, computer science, sociology, economy, architecture, etc.), that are actively investigating this complex phenomenon from many points of view and for different purposes (see e.g., Aurigi and Graham, 2000; Castells, 2002; Lastowka and Hunter, 2004; Soukup, 2006; Turkle, 1995).

An exhaustive analysis of each of the aforementioned research branches is almost impossible (for a brief summary, see: De Cindio, Ripamonti & Di Loreto, 2008); nevertheless, within each of them, some key features naturally emerge denoting particular or remarkable facets of the complex relation which binds together synthetic and actual worlds. In particular, the key concepts of identity, relationship, and place have emerged as central to this field. The analysis of the literature focusing on the
linkages holding together their actual and virtual versions, buds three major observations (see Tab. 1), that lead us to verify (Ripamonti, Di Loreto & Maggiorini, 2008) that synthetic and actual worlds overlap, intersect and interact to “augment” each other (Mitchell, 2003; Wellman & Haythornthwaite, 2002), instead of being counterpoised (see Fig. 2), as traditionally supposed by the Cyberculture framework (see i.e., Markham 1998; McKenna and Bargh 1998).

<table>
<thead>
<tr>
<th>Observation 1</th>
<th>online identity is an extension of personal actual identity, which is socio-culturally constructed and evolves over time both in the actual and in the synthetic worlds</th>
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<tr>
<td>Observation 2</td>
<td>online social networks emerge, in the space of possibilities created by the Internet, as extensions of actual ones; in this process “online identities” can be involved as well</td>
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<tr>
<td>Observation 3</td>
<td>synthetic places are the extension of actual, public and private spaces. They augment people’s possibility to interact in online social networks and, at the same time, are affected and shaped by social interactions</td>
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Table 1 - Observations about linkages between actual and virtual identity, relationships and places

This has at least three major implications:

1. online identity, relations and places can interact to effectively augment people actual social life and networks

2. online communities can be a mean for augmenting people actual life (De Cindio, Ripamonti & Di Loreto, 2008),

3. this is particularly true when the environment supporting ongoing interaction in social networks takes place in synthetic worlds like SL (Ripamonti, Di Loreto & Maggiorini, 2008), that are becoming more and more an extension of people everyday life. SL does not provide its users with an alternate reality, but augment and add “value” (which should be implicit in the notion of augmentation) to their actual life.

Figure 2 - Relation between actual and virtual worlds (Ripamonti, Di Loreto & Maggiorini, 2008)
Thanks to augmentation, the value perceived by SL residents is increased not only along each dimension, but also by their mutual interplay. In Fig. 2 we sketched the superimposed interactions that take place, on the one hand among identity, relations and place, and on the other hand between their actual and synthetic expression. Online identity, relation and place extend their offline counterparts; similarly, rules which regulate their interactions behave in the same way for both the synthetic and the virtual worlds. This double circular interaction can support people’s actions in both worlds in an effective way by creating a technology-enabled environment which is appropriate for augmenting social interaction.

Last but not least, it is worth underling that, while the majority of “social software applications” could be seen as means to augment actual life, it is our convincement that SL, beside being among the most renown and used synthetic worlds, present several specificities making it more effective (see Ripamonti, Di Loreto & Maggiorini, 2008 for a detailed discussion).

3. Opportunities offered by SL to gap social exclusion in areas subject to the global digital divide

Anthropologists and philosophers have always recognized the richness of community life and sense of community in African cultures (Hicks, 2003). Actually, the idea of mutual interdependence among people is fundamental in many African tribal cultures, which recognize the existence of any individual as meaningful only in relation to the community to which she belongs. Kinship rituals (related to pregnancy, birth, adolescence, marriage, death, etc.) in Central African villages, for instance (van Binsbergen, 1992, Turner, 1968, Van Velsen 1971), are instruments to change biological human individuals into competent social persons with a marked identity founded on the local community (van Binsbergen, 1981). Although the reality of African cultures is variegated, we dare say that emphasis on social relations seems to be a common trait gathering a large number of African ethnic groups, similarly to what happens for common traits flooding across European, American, or Asian populations.

It is noticeable that, when radical social changes irrupt in the society, the sense of community survives nevertheless. As an example, throughout the twentieth century, rural populations of Africa have struggled through numerous organizational, ideological and productive innovations, combining local practices with outside borrowings to reconstruct a new sense of community in an attempt to revitalize, complement, or replace the collapsing village community in its viable nineteenth century form (van Binsbergen, 1998). As a consequence, several authors underline that: “healthy and genuine development policies in Africa must be founded upon the principles and patterns of African civilization. The greatest cause of distortion in African development policies is the fact that policy makers have crafted development policies for Africa out of the principles and patterns of Western civilization” (Vilakazi, 2002). This strong emphasis on the necessity to take into account local civilization – that is based on the sense of community life – in any attempt to craft development projects, leads us to suppose that technological solutions aimed to
supporting and augmenting social networks and communities could be of help in introducing digital innovations in African Countries.

To verify under which conditions this thesis could be viable, in the next paragraphs we will dig into possible benefits of MUVEs diffusion in Africa, counterpoising them to technical constraints that may obstacle their adoption.

### 3.1 Third sector and other social realities in SL: practical examples of possible benefits for developing Countries

Since its creation, SL have always been a place were mutual help and sense of community have been developed and nurtured (Rymaszewski et al., 2007). This is true in general, and not only for the third sector. For example it has always existed in SL volunteers lending a helping hand to confused and disoriented new residents. They usually are veterans residents welcoming newbies and offering round-the-clock (SL inhabitants trespass the whole set of time zones) suggestions and classes about how to use the client software and how to exploit SL resources. Long before many people outside the synthetic world realized the potential of SL as a tool for social change and non-profit fundraising, veteran residents did. Fundraising for Red Cross, American Cancer Society, etc. are the norm in SL since 2004 (that is to say only one year after its inauguration), leading, in the case of the American Cancer Society in 2006, to raise more than 40,000 US$.

Non-governmental organizations (NGOs) are also represented in SL: an entire island (Nonprofit Commons) hosts the Non-Profit Global Network, with the aim to raise awareness and to help creating synergies and networks of collaboration around specific problems. In the same vein, campaigning is well represented: an enlightening example is the protest set up during autumn 2007 to support Myanmar monks protest against the repressive government (Fig. 3). Supporting the monks into SL had the result to raise the attention of media worldwide on the solidarity movement across the nations.

Intriguing experiments of social inclusion have been (and still are) carried on in the health sector: SL have been used to help, e.g., survivors to stroke and autistic people in (re)creating social interactions. Anyway, actions aimed to foster social inclusion through SL are so many, and ranging different scale and scopes, that it is quite impossible to list them all. We will now devote our attention to two case-studies related to the global digital divide in Africa.

![Figure 3 - Campaign to support Myanmar monks (Autumn 2007)](image)
3.1.1 The Harambee Gwassi-Kenya project and SL

The Harambee Gwassi-Kenya project has been promoted by the Brownsea Foundation, which, since 1983, with the support of the World Scout Bureau Africa Regional Office, has set up a cooperative program for self-development, called Italian Kenyan Scout Development Project (IKSDP). The Harambee Gwassi-Kenya project is aimed at fostering socio-economic development in the peninsula of Nyandiwa, on the Victoria Lake, in the Gwassi region (that suffers from serious problems of social exclusion) not through mere financial assistance, but by promoting cooperation and local involvement (“harambee” stands for “working together” in Gwassi idiom).

The Harambee Gwassi-Kenya project and the Italian “Rete delle scuole SIT” (SIT Schools network) have in place a collaboration to support the diffusion of multimedia e-learning systems in the primary and middle schools of the Gwassi area. The main purpose of this collaboration is to collect and share didactical materials and to create linkages between teachers and pupils of the two Countries. The SIT network belongs to the European Network of Innovative Schools (ENIS), a network of European and Italian schools, sharing the goal to adopt new ICTs-based solutions to innovate schools and education by integrating in the educational curricula, activities aimed at achieving skills to exploit digital technologies in new and creative ways.

Starting from December 2007, the joint Harambee-SIT project has moved its first steps in the synthetic landscape of SL. During Christmas holidays a small “charity market”, hosted on the virtual land of the Laboratory of Community Informatics (LIC) of the Department of Communication and Information of the Università degli Studi di Milano, opened in SL, with a double goal: raising funds and – mainly – raising attention and awareness by promoting several initiatives related, e.g., to the digital divide problem and to the achievements gained in the Gwassi region (Fig. 4). In that framework took place a number of events: coordination meetings among teachers of schools belonging to the SIT network – but scattered across the Italian territory –, joint SIT-Harambee workshops about the digital divide in Africa, fund raising, etc.
Figure 4 - Debating about social inclusion
3.1.2 Uthango and Virtual Africa in SL

Uthango Social Investments is an NGO company located in Cape Town, South Africa, that is positioned on the meso-level between the corporate sector, development agencies, governments and the actual communities they serve (Uthango is a Nguni term indicating the traditional circular kraal where families protect their livestock, encourage dialogue, and make important decisions). Uthango has a long-date experience in the area of social entrepreneurship and community development, and they have been awarded by Impumelelo, recognizing that sustainability, innovation and accountability are the key principles in their approach.

Uthango is greatly interested in transferring knowledge from Western to African societies by using the latest ICT-based media and by partnering with research institutions, focusing in particular on practical application of academic research for finding workable solutions to poverty-related issues. In their fight to the lack of economic freedom, they try to “translate” the corporate social investment ideas of companies into sustainable, well-monitored public-benefit programmes. In these actions they seek the involvement of local communities, in order to truly understand the local poverty-related challenges and taking ”information poverty” as serious as any other kind of poverty.

Figure 5 - Uthango offices and their Virtual Africa in SL
During 2007, Uthango Social Investments started exploring the opportunities offered by SL. They became the first African-based company in SL (Fig. 5) and soon organized a meeting with the CEO of Linden Labs in order to share their project: using SL to create awareness around their programmes and to establish linkages and partnerships. They organize meetings and conferences in SL to raise attention of companies on the problems of connectivity and access to ICTs for Africans and to bridge a part of the digital divide by ensuring a place for Africa in the evolution of 3D worlds achieving strategic experience in developing effective and productive 3D interactive environments.

4. Possible benefits of SL and constraints to its diffusion in Africa

According to our experiences with the Harambee project and with the outcomes of the workshops organized by Uthango, it seems that several possible benefits deriving from the adoption of SL could be envisaged (Tab. 2). SL can be used not only as a tool to amplify campaigning, fund raising, and to focus attention on immediate problems, but – since it is a place able to effectively augment communities and social networks –, it could be exploited to diffuse and mingle different cultures and to create social networks spanning worldwide, thus bypassing “quite easily” economic, technical, and/or political barriers. Clearly, the strategy should not be to “create an avatar for each person in Africa”, this would be meaningless and of no use. The real advantage can be envisaged in supplying a media able to bridge the distance existing between individuals, create opportunities, and connect people and communities with the rest of the world (exactly as proposed by Uthango). The creation of Virtual Africa paves the way to the diffusion of information about African culture directly from African sources (not mediated by Western cultures, since SL allows people of different Countries to interact directly) through an environment essentially based on real-time social interaction. This could reach more meaningful results in creating attention and linkages, than more traditional communication ways. Moreover, creating and diffusing skills about frontier technologies and applications, able to match with cultural traits characteristics of indigenous cultures – instead of trying relentlessly to fill the skill gap on consolidated solutions –, may be of help in generating virtuous circles capable to create new employment opportunities.

Unfortunately, there are many constraints (Tab.2) preventing SL from being widely available. There is a general lack of technical skills, connectivity may be unaffordable even for medium-sized companies; and the already deployed infrastructure might not be sufficient to manage the required service level. Moreover, in some cases, there is also a political resistance from governments to permit the use of applications not allowing a direct control on the information flow.

Non-technical constraints may vary consistently among different Countries and requires a highly contextualized analysis, which goes beyond the purpose of this work. For this reason, we stick to the analysis of pure technical constraints.
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<th>MAJOR EXISTING CONSTRAINTS</th>
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<td><strong>TECHNICAL CONSTRAINTS</strong></td>
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<td>1. Computer penetration rate</td>
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<td>2. Internet connection penetration rate</td>
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<td>3. Performance of deployed hardware</td>
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<td>4. Capabilities of existing infrastructure</td>
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<th>MAJOR POSSIBLE BENEFITS</th>
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<td>8. Bypass of political barriers</td>
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<td>9. Diffusion of indigenous culture</td>
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<td>10. Creation/development of (international) social networks</td>
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<td>11. Creation of working, commercial and business opportunities</td>
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<td>12. (more effective) fund raising</td>
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Table 2 – Possible benefits and constraints related to the adoption of SL in disadvantaged Countries

4.1 Technical constraints to the diffusion of SL

SL is a distributed environment where advanced graphical clients get connected to a grid-like infrastructure. Every node of the grid runs a software module (a simulator, or *sim*) managing a section of the synthetic world. The infrastructure as a whole is responsible to make content available to each connected client. Content can be divided into two kinds: local (to the sim) and global (to the grid). Local content is managed by each sim and includes local policies and all geometric primitives composing the environment. Global content, which is managed by a centralized server (asset server), includes all system-wide information shared from all nodes, like accounts data and global resources such as textures. When a user connects to the infrastructure her client communicates directly with the sim where the avatar is located. The hosting sim will take care to send all information and resources regarding avatar’s surroundings in a streaming-like fashion, thus sending them over the network like a continuous flow. From a technical standpoint the grid can be seen as a huge distributed database continuously providing environmental information to 3D visualization clients. This organization has the advantage to improve scalability, but is pushing all complexity to the edge of the infrastructure (the clients).

4.1.1 Platform technical requirements

For the present work the server side is of limited interest (since owned and managed by Linden Lab): hence, we will examine only the client side of the architecture.

Resource requirements on the SL client side are mostly related to the hardware platform and the network connectivity. From the hardware point of view, requirements focus mainly on graphic card and CPU performance. While the latter can be fulfilled even with a three or four years old desktop PC, the former is
extremely demanding and can severely affect the user experience. This is due to the fact that all the burden of 3D visualization sits on the client. It is also true that very little manipulation is needed for the streaming content, but for some encryption and decompression, explaining lower CPU requirements. The network constraints, despite the fact Linden Lab specifies only a generic broadband connection (cable or DSL), proved to be the most critical point. For the user experience to be satisfactory, the network connection have to provide large bandwidth, expose a low latency, and be reliable in term of packet loss. If the available bandwidth is low, the streaming system will take too long to let the client build the environment, and, even so, texture coming from the asset server might get delayed, drawing an environment made of gray blocks. A low end-to-end transmission delay is required in order to obtain reasonable interaction and communication. In a network with high transmission delay point-and-click interaction may not be reliable, because other avatars or objects may have moved, text messages between avatars will be no guarantee to be kept in the right order, and voice conversations will not be understandable (acceptable delay values for this kind of applications are typically between 20 and 100 milliseconds). The SL client application makes a mixed use of TCP and UDP protocols; UDP does not provide data retransmission and is a typical choice for real-time media diffusion (i.e., voice), while the TCP protocol provides a byte-stream connection using retransmission. If the network reliability is low and a lot of packets are discarded on the way to the client UDP will be missing of many information causing voice conversations not to be comprehensible and the TCP data transfer will use an extremely reduced share of the available bandwidth due to its congestion control policy.

4.1.2 Technical constraints limiting the diffusion of SL in poorer Countries

Developing Countries are generally characterized by lack of both state-of-the-art technical equipment and communication infrastructure. In order to better understand the technological issues in Africa, the continent can be split into three regions homogeneous for the level of digital opportunity (see ITU 2006): south, north, and center (Fig 6). The Digital Opportunity Index (DOI) has been devised by the International Telecommunication Union (ITU), and is based on 11 ICT indicators grouped in 3 clusters: opportunity, infrastructure and utilization. These indicators benchmark the Information Society with the purpose to estimate how accessible digital communication is for the population in a specific Country. DOI values range between 1 and 0, where 1 implies a complete digital opportunity.

Slightly obsolete Desktop PCs are available all over the continent at prices somewhat higher that Europe and US standards. Generally, this hardware is powerful enough for SL. Anyway, while the retail price is almost constant overall the three regions (due to the lack of internal production and tax on imports), salaries in some areas can be extremely low dropping below 250 US$ per year. As a result, owning a PC for private use is often unaffordable. Moreover, especially in the center region, hardware is subject to adverse environmental conditions (dust, water, heat), suffering from excessive degradation.
Figure 6 - Digital opportunity index for African Countries

From the point of view of network communication infrastructures the situation varies a lot across the three regions. The southern region is the most advanced by far, also thanks to the sub-marine cable (SAT-3) skirting the west coast from Portugal to Republic of South Africa. Dial-up technology is available to households but connection fees are not affordable for middle and lower classes. DSL technology is available in big cities as well as HFC cable connection, which is also deployed in suburbs. Connection fees are quite expensive, due to SAT-3 being under monopoly of the government. From a technical standpoint DSL and Cable connections support the minimum requirements to use SL, dial-up, being limited to 54 Kbps could be used in theory (client bandwidth can be limited to 50 Kbps). Anyway, using SL with dial-up is a frustrating experience: the time required to display an environment will be in the range of minutes. Some Countries of the north region, thanks to its closeness to Europe, have access to DSL and dial-up; nevertheless the deployment is not as wide as in the south when compared to the population density, for lack of pre-existing
infrastructures. The center region, finally, has nearly no access to the mentioned broadband technologies.

Wireless technologies are worth a separate discussion: wireless networks, due to the reduced infrastructure requirements are the preferred solution, especially where few users are spread across a wide geographical area. In Africa mobile phones outnumber landlines by 5 to 1 and the ratio is consistently higher in the sub-Saharan region. The wide availability of mobile technology is leading to a strange phenomenon where dial-up via GSM is less expensive than landline. Unfortunately, GSM bandwidth is only limited to 9.6 Kbps, making it unusable for SL. GSM is not the only wireless technology available: satellite phones have been widely used in the past. A satellite phone connects to orbiting satellites and provide a connection speed ranging from 60 to 512 kbps, even if connection parameters are adequate for SL, connection fees have always been extremely high, making their adoption impractical. Satellite dish technology, instead, is proving to be an interesting solution to connect rural areas to the Internet and has been adopted by the Harambee Gwassi-Kenya project in Nyandiwa. Provisioned bandwidth can be extremely high but, unfortunately, transmission delay can vary from 500 to 900 milliseconds, and the channel reliability will be very poor if the dishes are not perfectly aligned, making the use of SL quite difficult. Despite these limitations, Nyandiwa proved to be an interesting case study: while in Western Countries there is a strong correlation between urbanization and availability of broadband services, in Nyandiwa the opposite phenomenon have been observed: availability of broadband connection led to an increment of the local population and urbanization, increasing quality of life in the surroundings. Thanks to this result the Brownsea Foundation is planning to extend the network from Nyandiwa to nearby villages using hiperlan technology.

In Africa, terrestrial broadband wireless is available via long-range WiFi connections, but its availability right now is limited to big cities and suburbs, thus, not giving a real advancement when compared to DSL and Cable. Reportedly, other wireless broadband technologies are in the works: WiMAX deployment has already been envisioned in 2005 and Orange (former Telecom France) announced in December 2007 the launch of a WiMAX network in the Central African Republic (Fellah 2005, Garza 2007); UMTS deployment have already been addressed, also in 2005, by ITU and the African Telecommunication Union (ATU) (UMTS forum 2005). Despite this, to the best of our knowledge, currently they are not yet available for residential access. The prominent cause is that there is a significant diversity in the regulation of unlicensed bands across the continent (Neto, Best & Gillett 2005; Lee, 2007) and between the different Countries we can observe a wide range of licensing requirements, power supply, service restrictions, and equipment certification requirements.

As a final remark, even if technologies currently available in Africa seem not yet ready to accommodate enough resources for SL and make them available to the mass, the forecast of Uthango is that, with the already planned deployment of three more backbone cables, bandwidth limitation will be overcome in the next 3 or 4 years, diverting the problem to hardware, accessibility, and appropriate content.
5. Conclusions and future work

In this paper we have tackled the problem of global digital divide in African Countries from the perspective of the opportunities offered by Web2.0 paradigm as a mean for exploiting local cultural specificities to foster development. In particular we have focused on Second Life, that – being among the most evolved expression of support to communities life and social interaction – prospectively has the characteristics to become a viable media to diminish the digital gap between Western and African Countries. Despite the fact that SL characteristics seems to match so well with several African cultural specificities (namely the value attached to the sense of community) our assessment of the technical situation in Africa has outlined a number of technical and organizational constraints limiting SL diffusion. Our feeling, shared by Uthango, is that MUVEs – and SL in particular –, as a way to distribute African culture without mediation of Western ones, could play a key role in the coming years, only if the network infrastructure will grow up, thanks to the efforts of NPOs and ITU (like the Africa 2008 ITU conference).

Beside this first exploratory work prominently focused on connection issues, we think further study will be necessary to better understand and define viable ways to exploit SL for social inclusion. Actually, being SL a “new” media endowed with its own interaction characteristics, the opportunities it offers are still largely unexplored and misunderstood even in Western Countries. Moreover, if we hope to effectively couple SL with African culture, an assessment of SL interface usability (especially with low profile hardware equipment) in all its specificities (e.g., cultural issues, language problems, etc.) will be needed.

References


Markham, A. N. (1998), Life Online: Researching Real Experience in Virtual Space (Walnut Creek, CA: AltaMira).


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**Useful slurls**

