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# Using 3D Worlds in Prison: Driving, Learning and Escape

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## Abstract

Affordable hardware and increased processing power have resulted in a surge in the number and adoption of virtual reality applications and immersive virtual environments. These applications are able to immerse the user in an environment other than that of their immediate geographical location. The one population that is unable to move even within their own geographical location are prisoners. Prisoners are secluded away from the general population, unable to travel, attend education beyond the prison walls or interact with a wide variety of people. At least to a certain extent, these constraints are able to be overcome with the use of virtual reality and immersive virtual environments.

This paper briefly examines the constraints experienced by prisoners and the technical limitations of the prison environment. It explores the very few cases where these technologies are already used within the prison setting. A number of potential uses for virtual reality within prisons are proposed, including the justification for these approaches and a description of how these technologies are being used outside of the prison setting.



## 1. Introduction

It is over twenty years since futurist John C. Biggs heralded the arrival of virtual reality (VR), calling it perhaps one of the most significant technologies that could impact our futures. He imagined a world where VR would play a crucial role in many fields including arts, business, communication, design, education, engineering, and medicine among others (Biggs, 1996). He foresaw all sorts of application in architecture, business (why settle for boring balance sheets?), education, the military and even sex (Biggs, 1996). The anticipated development and adoption of VR technologies was slow to happen, with the cost of technologies, both the hardware and the cost associated with developing the environments, being prohibitively expensive. With the advent of low-cost proprietary headsets, development kits and opens source environments, VR is seeing a resurgence in popularity and some of Biggs' heady dreams are beginning to be realized (Neiger, 2016).

A prominent attraction of immersive virtual environments is that they locate the user somewhere other than where he or she is physically located (Farley, 2013). A student of history can walk the fields of a significant historical battle; a scientist can walk around a recreation of a biological structure (Farley & Steel, 2009). It is this ability of VR to transport the user to another place that has seen the widespread use of VR with aged people who are no longer fit to travel (for example, see Soledachef, 2017). Aged care facility residents can once more walk through a forest or punt along a peaceful river all without leaving their armchairs.

Though they are often overlooked when considering the applications of virtual reality, the cohort that is least able to travel, mix with other people and access services are prisoners (see Farley & Hopkins, 2016). As levels of overcrowding in prisons increase around the world (with the exception of some Northern European countries), movement becomes ever more restricted for prisoners (Mackay, 2015). Prisoners of different security classifications can never meet on walkways, and often additional resources are not deployed to cope with larger number of prisoners. As a result, prisoners spend longer and longer in their cells. In Australia, prisoners now spend on average nearly fourteen hours per day restricted to their cells (Australian Government Productivity Commission, 2018).

Though prisoners are very often not able to move in the physical world, certainly not beyond the narrow confines of what is allowed in prison, there is enormous potential to leverage the affordances of virtual reality to expand where prisoners can travel virtually. This paper will consider some of the potential applications of virtual reality and virtual worlds in the prison environment. These applications could include use in rehabilitation, driver training, role playing family situations and entertainment. It will look at those very few places where VR is already being used in the prison environment and consider what would be needed to facilitate its adoption more widely.

## 2. The Use of VR in Prisons

Though virtual reality is gaining considerable traction in the wider world (for example, see Gordon, 2017), there has been virtually no uptake in corrections. This is largely due to the fact that the corrections sector is extremely conservative when it comes to the adoption of digital technologies. Their reservations, which for the most part can be justified, are around maintaining prison security (Farley & Doyle, 2014). There have been a number of reports of prisoners misusing technology to criminal ends (for example, see Marchant & Roldan, 2017). Even so, there are few initiatives that see the use or planned use of VR in prisons.

Correctional consultants, Innovative Prison Solutions, have partnered with Virtual Rehab with a view to offering formal education, vocational job training, and psychological rehabilitation (Innovative Prison Systems, 2017). Rehabilitation programs include those for substance abuse, sex offending, and family violence. Accessed via a VR headset, the programs simulate the real world and

help therapists identify areas of risk for addicts and suggest treatment options. The program is powered by artificial intelligence and helps participants develop social skills and simulate triggers that allow them to confront their cravings. Physiological and psychological data are collected for use by therapists. Participants interact with a virtual world environment via VR handsets and role-play with AI bots in the roles of shop assistants and others that a participant may encounter in the outside world (<http://www.virtualrehab.co/>). Vocational education programs simulate the workplace of a profession, for example, a mechanic, so that the participant can familiarise his or herself with that environment and gain a feel for what it would be like working in that job (Howell, 2017). A prototype of a mechanic's workshop was launched in May 2017 but to date (VirtualRehab, 2017), these systems have not been deployed in prisons.

Corrections technology providers, GTL, known for their work with in-cell tablets for prisoners, are also offering virtual reality opportunities for prisoners. Among the possible uses suggested by GTL are education; alleviating feelings of isolation for those in solitary confinement; helping prisoners overcome phobias or even behavioral issues; role-play family situations; and for entertainment (GTL, 2017). Prisoners would access the virtual environment through proprietary VR goggles. Even so, there is no indication that the virtual environments have been developed or have been deployed in prisons.

There are a couple of instances where VR has been used in a custodial setting. In a project called *Back Home*, Chilean filmmaker Catalina Alarcón created videos of the families of twelve female prisoners at San Joaquín Women's Penitentiary in Chile. Over a six-month period, Alarcón arranged for a 360 degree camera to film inside the homes of the participating prisoners. Family members were included in the videos, often doing just everyday tasks such as cooking dinner. Towards the end of the project, Alarcón allowed the prisoners to watch the videos using VR headsets. The aim was to help these prisoners reconnect with the outside world. In the future, she hopes to be able to stream the footage from the 360 degree cameras to prisoners in real time (Knowles, 2017).

In 2017, prisoners in Fremont Correctional Facility in Colorado who had already served 20 years of their sentences and had been detained as juveniles, were entered into a program to prepare them for life on the outside (Dolven & Fidel, 2017). The program makes use of VR which the prisoners access via headsets and hand controllers. The program teaches them about money management and computer skills. Another benefit is the ability to show the prisoners how much the world has changed since their imprisonment. For example, they are able to learn how to use a self-checkout at a supermarket (Dolven & Fidel, 2017).

Though there are only a very few examples of VR being developed or deployed in the correctional context, they do show that it is possible to overcome the security concerns and design challenges to successfully develop and deploy VR solutions into prisons.

### **3. Why 3D Environments in Prison?**

Prisons are extremely challenging environments when thinking about the introduction of new technologies. For the most part, prisons are primarily designed and built with custodial security as the overriding priority. In addition, they are often built without any provision for additional cabling for prisoner technologies. Except for in a very few jurisdictions such as in the ACT in Australia, there is no prisoner access to the internet (Farley & Doyle, 2014). Given that VR can be very reliant on internet access in order to access virtual environments (for example, see Freedman, Dayan, Kimelman, Weissman, & Eitan, 2015), this can be a significant hurdle to overcome. Even so, there are significant benefits to be gained if these challenges can be surmounted. For example, successfully educating and rehabilitating prisoners will decrease recidivism rates and ultimately provide significant cost savings while integrating prisoners back into society (Zoukis, 2016).

## 4. Possible Uses of VR in Prison

Any prison population consists of men or women of a variety of ages, ethnicities and social classes. They have committed a wide range of offences from driving infringements to domestic violence, drug charges and sexual offending. Further, prisoners are often drawn from society's most vulnerable populations. For example, some 28 per cent of Australia's prison population are Aboriginal and Torres Strait Islander Australians (Australian Bureau of Statistics, 2015) and people with severe mental illness are overrepresented in the prison system (Fazel & Seewald, 2012). Virtual reality could be used to facilitate rehabilitation, education, address physical and mental challenges, and provide an outlet for entertainment for this diverse cohort. It could be used to familiarise prisoners with courtroom settings and to allow them to practice interactions with those outside of the prison system. Some of these uses are explored in greater detail below.

### 4.1. For Driving and Driving Offences

In some jurisdictions, many of those in prison have committed driving offences. These may range from excessively exceeding the speed limit to driving under the influence, driving while unlicensed or driving causing death or injury. In some regional and remote areas, the rate of driving offences is quite high. This is the case in Western Australia and the Northern Territory where many Aboriginal and Torres Strait Islander Australians drive while unlicensed because it is difficult to get to driver testing centres which may be located far away and public transport may be non-existent so they drive unlicensed (Anthony & Blagg, 2012).

Virtual reality driving simulations could enable prisoners incarcerated for driving offences to learn to drive safely, follow road rules and learn to operate cars or machinery in a safe and secure environment. In addition to rehabilitating problem drivers, VR driving simulations could help prisoners to learn about operating trucks or machinery. Though it is unlikely that prisoners could gain driving qualifications in this way, this may become feasible in the future.

Already there is a considerable amount of work being done on virtual reality driving simulations. Daniel J. Cox and his colleagues looked at the feasibility of using a VR driving simulation to help military personnel to overcome traumatic brain injury in order to learn to drive again. The results were promising (Cox et al., 2010). A similar simulation was used to discern whether youth with autism spectrum disorder could improve their driving performance. The simulation involved the use of a driving console and a virtual world environment to provide targeted interventions for learner drivers (Cox et al., 2017). Numerous other studies have evaluated the efficacy of VR driving simulations to improve driver performance, improved visual search for hazards and collision avoidance (Cox et al., 2017). Given the demonstrated efficacy of VR driving simulations and the large number of prisoners incarcerated for driving offences, it would be advantageous to deploy similar simulations in the prison setting.

### 4.2. Programs and Role Play

Prisoners often have impulse control or anger issues which may have precipitated the crime for which they are incarcerated (Honorato, Caltabiano, & Clough, 2016). An increased public awareness and a corresponding change in legislation in some jurisdictions has also led to increasing numbers of men being incarcerated for domestic violence-related offences (Jeffries & Bond, 2015). There are many approaches to dealing with these complex and difficult behaviors but one approach that is commonly employed involves the use of role-play (for example, see Heard, Mutch, & Fitzgerald, 2017). Virtual reality and other immersive virtual environments could be used to good effect across a range of appropriate programs in prisons (Zoukis, 2016).

Already virtual reality role-play is being used to address various behavioral issues outside of the prison environment. Tibor Bosse and colleagues developed an intelligent system to be used for de-escalation training. Simulated intelligent agents or ‘bots’ acted aggressively while trainee customer service operators worked to de-escalate the encounters with these bots. The system was able to provide feedback on the trainee’s performance (Bosse, Gerritsen, & de Man, 2016). Virtual reality can also accommodate multi-user role-play. This approach may particularly suit an environment where connectivity is an issue. Studies in religion students at an Australian university were able to role-play religious rituals in the virtual world of Second Life. The exercises increased their empathy and understanding of the different religions that were the focus of the role-plays (Farley, 2011).

Virtual reality and other immersive virtual environments enable users to adopt different identities which may help them to become more ‘in character’ than when participating in a role-play in a classroom setting. These characters can then act in an appropriate virtual environment which more closely resembles the real life context where the corresponding interactions would take place. Given the enormous variety of environments it is possible to create and identities that can be simulated, it is easy to imagine how virtual reality could leverage the power of role-plays in a number of programs addressing various behavioral issues among prisoners.

### **4.3. Vocational Education**

It has long been recognized that one of the most effective ways of reducing reoffending upon release from custody is to secure employment (Visser, Winterfield, & Coggeshall, 2005). As a consequence, there is a marked emphasis on vocational education in prison settings (Bouffard, Mackenzie, & Hickman, 2000). There are very often key performance indicators for correctional jurisdictions around participation in vocational education (for example, see Australian Government Productivity Commission, 2018). Using VR, prisoners engaged in vocational education could visit a virtual construction site or commercial kitchen (Zoukis, 2016). They could role-play a vocation such as being a mechanic or shop assistant, and familiarise themselves with the environment in a way it would be otherwise impossible to do within a prison. Without leaving their cells, they could learn safety and handling procedures such that when they leave prison, they are job ready.

Virtual reality has been used extensively for vocational education outside of the prison environment. The Hong Kong Institute of Vocational Education developed a VR system which simulated the workplaces for a number of vocations in the area of engineering including operations and maintenance training in electrical and mechanical services. The system was shown to support the effective development of skills among users (Cheung & Liu, 2016). García and colleagues described a virtual reality environment that was used to train workers involved in the maintenance and operation of high-voltage overhead power lines in Mexico. This occupation involves a great deal of danger so it was important to familiarise workers with the environment in order to ensure their safety. A total of 31 skill sets across three different skill levels were taught using VR technologies. The virtual reality system proved to be very effective in facilitating the acquisition of the requisite skill sets by the workers, enabled their effective accreditation and provided considerable cost savings over more traditional methods of instruction (Garcia, Bodabilla, Figueroa, Ramírez, & Román, 2016).

### **4.4. Language and Culture**

With increasing globalization and the resultant increase in immigration, many correctional jurisdictions are experiencing a growing population of prisoners whose first language is other than that of the country in which they are incarcerated (Ugelvik, 2015). Many Aboriginal and Torres Strait Islander Australians may only have English as a second, third or even fourth language (Lee,

Farley, Cox, & Seymour, 2017). In addition, many Aboriginal and Torres Strait Islander prisoners are incarcerated away from their homes and country which has a significant impact on their well-being given the enormous importance of land in this culture (Rynne & Cassematis, 2015).

The highly visual nature of immersive virtual environments would be appealing to these prisoners who struggle with text-based materials (Zoukis, 2016), especially if they are unable to read in the language the materials are presented in (Farley, Hopkins, Cox, & Seymour, 2015). In addition, prisoners away from their home or region of their birth, experience feelings of isolation and loneliness which can significantly impact their well-being (Grant, 2016). Virtual reality environments which simulate the home environment could help to alleviate these feelings as discussed earlier in the case of the female inmates of San Joaquin Women's Penitentiary in Chile (Knowles, 2017).

Outside of the prison environment, there has been much use of immersive virtual environments to simulate specific geographical locations (Farley, 2015). Tomas Trescak and his colleagues from Western Sydney University created an interactive virtual reality environment using motion capture and artificial intelligence. Users were able to play games based on Aboriginal activities and games (Trescak, Williams, Bogdanovych, & Sloan, 2017). In another simulation, some of these researchers created an environment that evoked the Darug tribe of the Paramatta Basin (Trescak, Bogdanovych, Simoff, Williams, & Sloan, 2016).

While the number of Aboriginal and Torres Strait Islander prisoner deaths due to suicide remains stubbornly high (Heffernan, Andersen, Davidson, & Kinner, 2015), it behooves correctional jurisdictions to find more effective ways to alleviate the isolation and pain felt by these prisoners. Immersive cultural experiences, mediated by virtual reality, could be one of the answers.

#### **4.5. The Limitations of Virtual Reality in Prisons**

Though the implementation of virtual reality in prisons offers great promise across a range of contexts, the limitations of these technologies must be acknowledged. The virtual environment experienced by the users will only ever be a simulation. For the most part, streaming media and synchronous action with other participants will not be possible because of the inability to access the internet (for example, see Zyda, 2005). Social interaction simulations and role plays will mostly be mediated by 'bots' driven by artificial intelligence (AI) and using speech recognition. Even so, these AI agents will only be as sophisticated as the programming used to create them with only a limited range of responses and actions available. In addition, there may be unintended consequences associated with these interactions, and it may be difficult to adequately prepare for these eventualities (Sheridan, 2016).

Another limitation of virtual reality lies in the limited haptic feedback that most VR provides. It will be difficult, for example, for those using a driving simulation to get adequate haptic feedback to truly simulate driving a vehicle and enable the acquisition of transferable physical skills (Farley & Steel, 2009). Those controllers that do provide haptic feedback are expensive and tend to be limited in the degree and range of feedback they provide. Similarly, users of immersive virtual environments tend to underestimate the perceived distance in comparison to real environment (Morel, Bideau, Lardy & Kulpa, 2015). This could have disastrous consequences if the ex-offender, trained in the driving simulation while in prison, misperceives distances while driving. However, VR may remain useful to teach road rules or familiarise the user with driving conditions. When planning a VR program for prisoner use in the correctional setting, careful attention must be paid to ensure that it is fit-for-purpose.

Though the use of the internet by prisoners is unusual in nearly all correctional jurisdictions (Farley & Doyle, 2014), it may be possible to allow some access to facilitate the use of VR in



prisons. Restrictions around the use of the internet by prisoners are in response to security concerns such access could afford such as cyberstalking, intimidation via email or social media, grooming of potential victims or fraud. These concerns could be mitigated, at least to a certain extent, by 'whitelisting' allowed sites (Lychev, Schapira & Goldberg, 2016).

## 5. Conclusion

As virtual reality hardware becomes more affordable (Rodriguez, 2016), there has been an explosion in the number and type of applications using it. It has the capacity to take the user away from the mundaneness of their everyday lives and transport them into new environments where they can learn, play and interact. The one population that has an enforced immobility that does not allow them to move from the confines of their immediate environment are prisoners. Often coming from disadvantaged backgrounds and vulnerable populations, prisoners frequently have higher rates of mental illness, substance abuse issues, socio-economic disadvantage and difficult experiences with formal education as compared to the non-incarcerated population. If the security and connectivity issues can be overcome, virtual reality applications have the potential to help prisoners overcome these multiple layers of disadvantage and enable them to learn, interact and develop skills in an immersive virtual environment.

This paper has provided a brief description of the characteristics of both the prison environment and the prisoners that inhabit it. It highlights the very few areas where virtual reality is already being used in the prison environment. Though the number is small, there is room for some optimism. If the enormous obstacles can be overcome in these few cases without any breach of security or adverse consequences, it must be possible more broadly.

Though not an exhaustive list, this paper explores a number of potential applications of virtual reality in the prison environment, the rationale for their use and how these applications are being used outside of custody. These applications include driver training, vocational education, role-play, and providing language and cultural support. As prison populations continue to grow in most correctional jurisdictions around the world, administrators will need to find innovative and secure ways to deliver programs, support well-being alleviate prisoner feelings of isolation and hopelessness. At least in part, virtual reality could be one of the cost-effective tools for doing just that.

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