

Piloting Virtual Reality for Official Statistics

Keywords: Virtual Reality, Statistical Literacy, Official Statistics, Big Data, Data Visualisation, Gamification.

1. INTRODUCTION

Virtual Reality (VR) is defined as the computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.[1] The recent advancements in technology have been progressively reducing the cost and the quantity of hardware needed to recreate a full VR environment (e.g. ‘caves’, ‘hyperwalls’, etc.). The third dimension offered by VR seems to be highly useful for statistics, which are quintessentially multidimensional. This is demonstrated by many recent technical solutions¹ developed precisely for VR visualisation of descriptive statistics.

Given its characteristics, VR can thus be an interesting asset in a data scientist’s toolbox to tackle challenges of big data visualisations [2] [3]. At the same time VR technology has proved to be appreciated for storytelling and in the game industry [4], and could therefore be used to communicate statistics in a playful and immersive way to a younger audience.

Within the project for Digital communication, User analytics and Innovative products (**DIGICOM**), Eurostat and the ESS partners have tried to answer the research question – *How can VR support official statistics?* – in a first-of-a-kind effort, which is described in this paper, to bring together VR and official statistics.

2. METHODS

The VR-related work conducted within two DIGICOM work packages focused on (i) gamification and (ii) communication of official statistics, leading to two main outlets:

- **Virtual Reality for Official Statistics (ViROS) game app:** a VR game app letting students discover European statistics in a playful way.
- **VR for Analytics (Eurobase in 3D):** a VR application targeting experienced statisticians interested in complex visualisations of European statistics.

Eurostat manages the development of these products, which is carried out by external contractors mobilised by the Publications Office of the European Union.

3. RESULTS

3.1. ViROS (Virtual Reality for Official Statistics) – Mass market virtual reality visualisation for official statistics for the purpose of gamification

The ViROS app mixes gamification, immersive data visualisation and storytelling techniques to engage the audience in discovering European statistics. Story elements and

¹ E.g. <https://looker.com/platform/blocks/embedded/lookvr>, <https://www.virtualitics.com/>, <https://badvr.com/> and many others.

narratives (i.e. fictional characters, personas), together with VR technologies, are expected to improve the immersiveness and provide an entertaining experience (Figure 1).

Non-specialist statistics users of official statistics, and in particular ‘students about to enter the labour market’, are ViROS’ main target audience. Indeed, the app is built around three different scenarios with young Europeans as protagonists: *Nora*, a young girl passionate about the environment; *Barend*, a recent graduate; and *Ana and João*, a young couple looking for a good work-life balance.

The player’s mission is to help the characters in choosing the European country (or countries) that could best satisfy their needs. While playing a specific scenario, the user is able to select one or more countries to “visit” and learn about. Once a country is selected, the point of view of the user is moved inside the country itself, where a set of statistics relevant to the scenario are shown. After visiting several countries, the player should be able to identify and select for evaluation the most promising countries that could satisfy the protagonists of the story. Finally, the player’s choice is rated, based on a comparison of the statistics of the selected countries against the EU average.

From a technical point of view, ViROS is a game app for mobile devices. It can be played on a smartphone with the use of passive VR goggles or on a dedicated VR standalone device (i.e. Oculus Go). The data shown are extracted real-time via [Eurobase](#) API calls (with a static dataset embedded in the app itself to allow offline playing).

In 2019, when ViROS was presented at the [DIGICOM Final Event](#), colleagues from European NSIs warmly welcomed the app. This has given rise to a collaborative translation effort by NSIs to make the app available in more languages, and as a result, ViROS is now available in 12 official languages of the European Union.

The ViROS app is currently featured in the [games section](#) of the [Eurostat education corner](#). It is available for download from different app stores: Google Play store ([Daydream](#) and [Cardboard](#) versions), [App Store](#) (for iPhone), [Oculus App Store](#) (for Oculus Go and Gear VR). Concerning the uptake of the app, Figure 2 shows the number of downloads of the ViROS app since its release in November 2019.

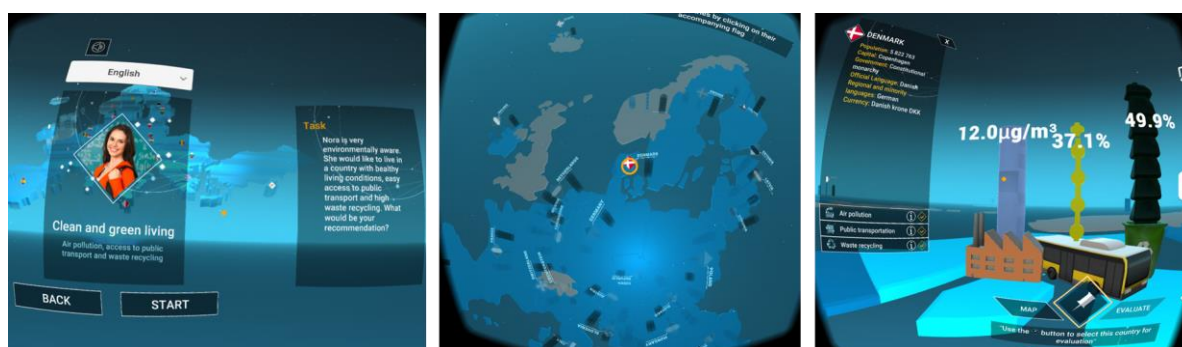


Figure 1: Screenshots from the ViROS app user interface. From left to right: selection of the scenarios, map overview, country specific statistics.

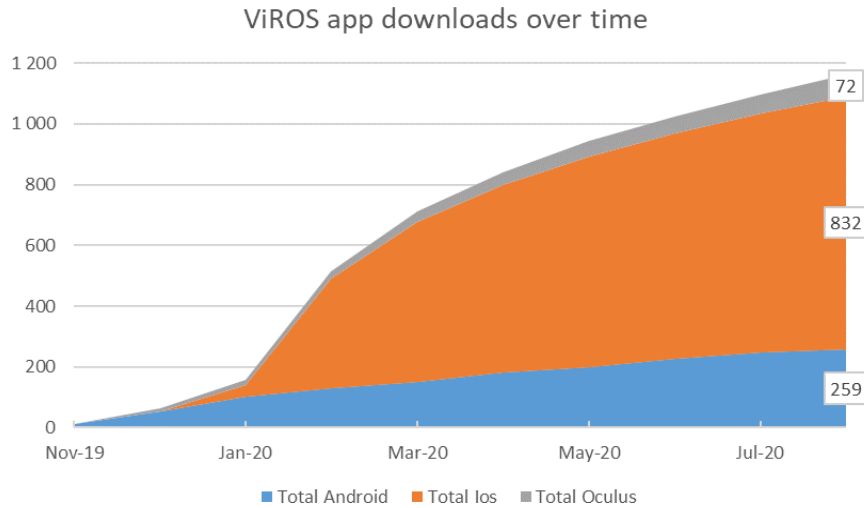


Figure 2: ViROS app downloads over time (cumulative until August 2020).

3.2. Virtual Reality for Analytics: Eurobase in 3D – High-end virtual reality visualisation for official statistics for the purpose of analytics

The idea behind the VR application for analytics was to provide a tool to a specific category of advanced statistics users and producers for exploring and processing statistical data. The ‘target audience’ are specialist users of official statistics, as well as official statisticians themselves.

The general idea is that 3D visualisation can help data analysts and official statistics producers in their task to process the data/information underlying official statistics. As well as visualisation, the possibility of naturally moving around, exploring the data from different angles and using human-natural interactions should improve readability and understanding of data. For these reasons, multidimensional visualisation is at the core of the application as show in Figure 3.

Currently, the application is still in the development phase, yet to reach the beta stage. The application runs on a dedicated laptop PC with a set of VR goggles and controllers.

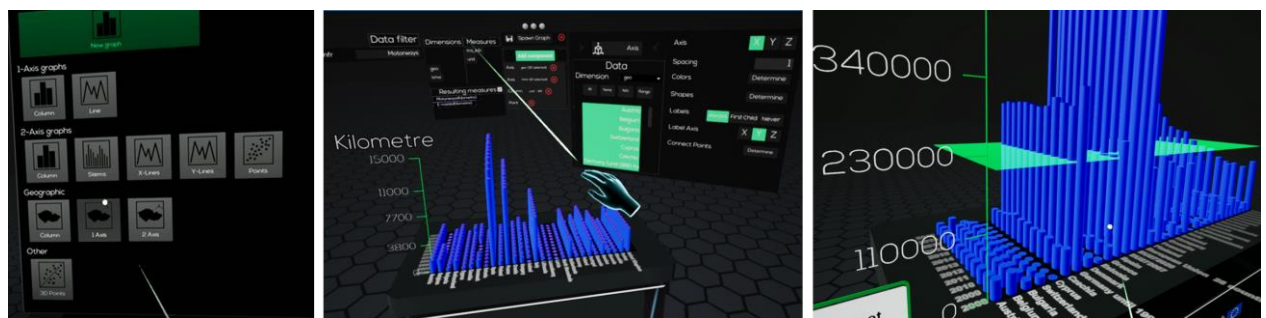


Figure 3: Screenshots for the *Eurobase in 3D* application. From left to right: graph type selection, 3D bar chart with configuration panes, 3D bar chart detail.

4. DISCUSSION

4.1. Improvements and Future Work

The ViROS app has received a few direct feedbacks for user that highlights the main areas of improvement. Firstly, the app could be extended by adding new scenarios to the

gameplay (currently limited to three stories). On top of this, the general perception is that the user needs to have a minimum background knowledge about the performances of European countries in the specific domains.

To date, the VR application for analytics has only been alpha-tested within Eurostat. The scope is wider and the level of complexity higher than the ViROS game. Besides the improvement of the current applications, future directions of work might include: (i) *improved interaction* (e.g. voice control, gesture); (ii) *collaborative mode* (i.e. social-like collaboration experiences to contribute significantly to the collective understanding of data); (iii) *analytics functions* (i.e. bringing advanced analytics functions on top of three-dimensional visualisation); (iv) *dataset combination* (i.e. allow to combine data from different dataset in the same visualisation).

4.2. Conclusions

In the past, VR has fallen short of the commercial promise that many believed it would have. As a matter of fact, VR technology has been around for some time but it is still far from a mass adoption. This can be attributed to a series of reasons such as accessibility (i.e. market penetration – even of low-cost VR devices – is far lower than of smartphones), motion sickness or a general difficulty to endure longer immersive sessions and a technological barrier in developing VR products.

To increase the impact of the ViROS game by improving its accessibility, Eurostat has acquired [Cardboard](#) devices for distribution via the ESS NSIs to the national winners of the [European Statistics Competition](#) (ESC). While the distribution has been suspended due to the COVID outbreak, it is hoped that it will be possible to resume it in time for the national finals of the 2021 edition of the ESC.

Despite these barriers, it is easy to see the potential of VR in game developments and in complex visualisation tasks where several variables can be shown at the same time. Both VR applications presented in this paper share the concerns that affect VR technologies in general. Nonetheless, they show examples of how VR technologies can be useful to the statistical community.

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