USING EXTENDED REALITY TECHNOLOGIES IN DISTRIBUTED COMPUTER SYSTEMS

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Over the past few decades, web technologies have proven to be a fast, convenient and easy-to-access tool for retrieving information and sharing a large amount of heterogeneous data. The technologies used there, and in particular the HTML technology, have played a major role in the development of the Internet as it is. This is all due to the standardization and creation of a single tool to create network content. The goal of this work is to create a standard and a language for developing extended reality applications and interfaces built into existing applications. With this language, developers who are familiar with web technologies can quickly and with minimal effort move on to a new technology and fill it with content, the lack of which is now the main problem of all extended reality technologies. With usage of the developed system it will be possible to combine the formed community of web developers and perspective technology on the basis of a standardized set of tools that will positively affect both developers and the pace of technology development. In the future that technology can be used in different spheres, like education, business, advertisement, etc. Also it can be used in the global distributed computer systems, that will give an ability to make a global network of virtual objects referred to a real-life points.

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1. Concept

Today there is a set of technologies for expansion of the real world by virtual objects or its full replacement. Reality can be expanded as two-dimensional and three-dimensional virtual objects and have their own user interfaces. Virtual objects can be associated with real-world objects or can be linked to a specific location.

Meanwhile, all of these technologies are developing without communication and have no standard practices and approaches. So, now, we can observe a stagnation of chosen sphere and lack of qualitative leaps in its development.

We propose to develop a universal standard for description of interfaces inside three-dimensional spaces. The proposed way is to make it similar to web standards in order to ensure an easier start for new developers.

The relevance of this work is that with the help of the developed system it will be possible to unite the formed community of web developers and promising technology on the basis of a standardized set of tools.

Development of a standardized system for creating universal user interfaces in various augmented reality systems based on created markup language will have a positive impact on both the convenience of developers and the pace of technology development. Every year the technology of augmented reality penetrate into new areas of our lives and there is a problem of standardization of developed solutions.

2. Positioning system

The simplest problems can be the most challenging. Faced with a 360-degree canvas, one might find it difficult to know where to begin. It turns out that UX and UI designers only need to focus on a certain portion of the total space [2].

Before the start of developing any interface specification it is needed to decide how to dispose an elements on the screen. Usually positioning system is used for that. In described case, system must be intuitive for maximal amount of developers and satisfy all requirements produced to interfaces inside three-dimensional spaces.

Unified system of objects location will allow the interface elements to be displayed identically regardless of used hardware, development platform and screen resolution of the device. Transmitting parameters directly from the markup give an ability to split interface description and rendering system.

To develop such a positioning system we needed to research existing interface types and how it can be displayed inside the device.

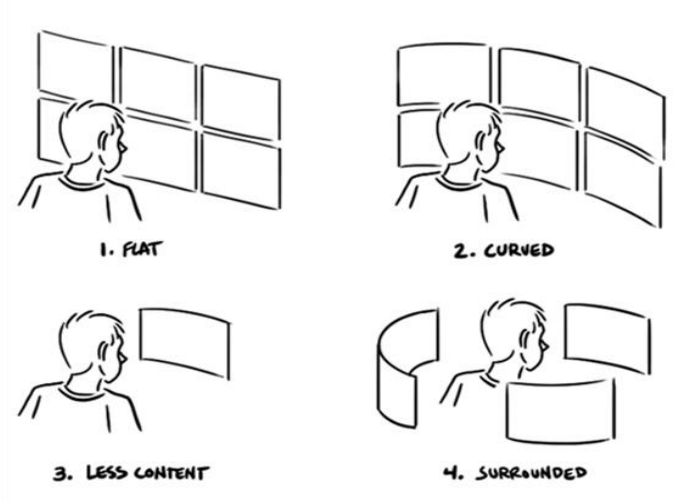

Figure 1. Interface types in extended reality

After analysis of different applications, it became obviously that interfaces can be even spherical or spatial. Also physiological characteristics of human behavior within three-dimensional space were studied (Figure 2).

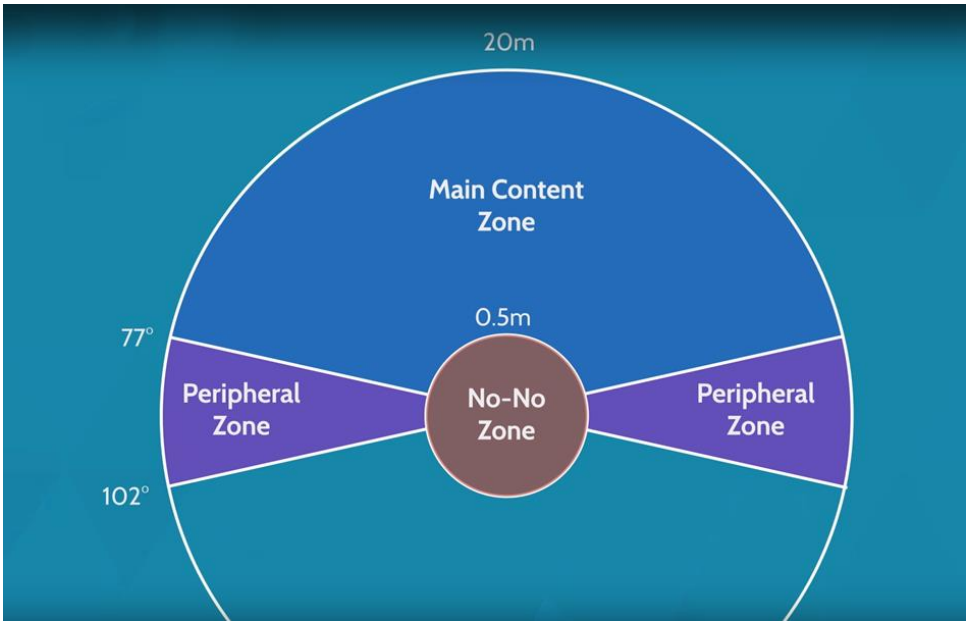

Figure 2. Human view angles [1]

On the basis of that research, a positioning system concept was developed, covering the maximum range of viewed tasks.

It was decided to build system based on spherical cords. It gives an ability to make system universal and independent from device and renderer.

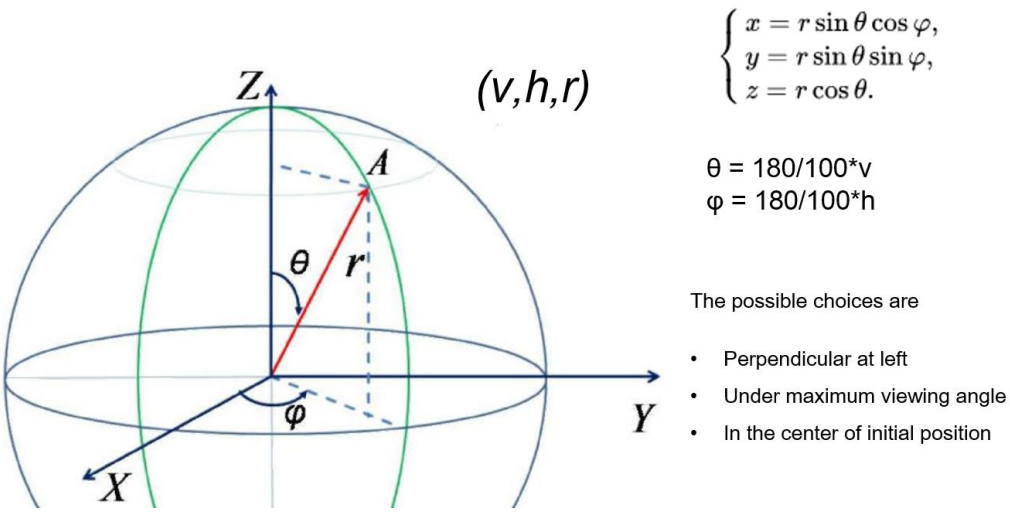

Figure 3. Coordinates translation

Developers will have an access to three parameters: vertical, horizontal, radius. These parameters are virtual and converted to spherical cords by the rules represented in the Figure 3. After that the system converts it to the target coordinate system of the rendering engine, for example, Cartesian. User parameters are limited by human rotation angles and fetched to percentage gradation.

3. Markup language

Today, web developer's community is one of the biggest in the IT world and its main technology HTML is wide used and popular. The task of the project is to make a simple and universal system, that will be very similar to HTML concept. So, it was decided to use SGML syntax as a base for a new extended reality interfaces markup language. It is structured and good for describing well formalized objects.

SGML (Standard Generalized Markup Language) is a standard for how to specify a document markup language or tag set. It provides a clear structure and an unlimited number of attributes on objects. It is the basis of the HTML language. This will allow to decrease an entry barrier of developed markup language.

ERML (Extended Reality Markup Language) – Markup language to create interfaces in augmented, mixed and virtual reality applications.

4. Globalization

As statistics shows, a modern man needs to process more and more information every year. This entails the need to improve and modernize existing ways of information obtaining.

Existing methods of obtaining information reached their limits and can't cope with the existing amount of data needed by a person. People spend more than 10 hours daily in front of the screens of computers, smartphones and other devices.

Meanwhile, all the time that they spend walking through the streets, buildings, and doing everyday activities, they could receive useful information in a more structured and pre-processed form, using the latest science achievements and technology in the field of visualization and intellectual data processing. Augmented and virtual reality technologies can solve this task. In the future such technologies can be used in different spheres, like education, business, advertisement, etc. But now, it's no solutions to synchronize and unify objects and interfaces between devices and networks.

In our everyday life there is a lot of applications of such a standard, like making embedded subsystems in 3D applications or making user-friendly plugin-oriented system. Developed technology can be used in global distributed computer systems, that will give a possibility to make a global network of virtual objects referred to real-life points.

5. Conclusion

Now there are about 4.5 billion mobile devices in the world and half of them have a built-in camera and mobile Internet connection. These figures clearly demonstrate the huge number of people who can use the technology of augmented reality.

With usage of the developed system it will be possible to combine the formed community of web developers and perspective technology on the basis of a standardized set of tools that will positively affect both developers and the pace of technology development.

In the future, that technology or it's concept can be used as a basis to build a distributed internet-like visualization system for virtual or augmented reality.

References

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