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AR-APPLICATIONS BY MEANS OF UNITY AND C#

Костючко С., Кирилюк Л., Абрамович В., Бобилєв М., Петрук Б. AR-програми за допомогою Unity та C #. У даній роботі розглядаються та порівнюються різні гральні рушії. Виявляються їх переваги та недоліки і на основі зібраних даних робляться висновки у вигляді виділення, із списку порівнюваних рушіїв, найкращого. Також робиться короткий огляд існуючих рішень і методів роботи з доповненою реальністю.

Ключові слова: Unity, AR-applications, Marmalade, Corona, ShiVa3D, Flash.

Костючко С., Кирилюк Л., Абрамович В., Бобилєв М., Петрук Б. AR-applications by means of Unity and C#. В данной работе рассматриваются и сравниваются различные игровые движатели. Выявляются их преимущества и недостатки и на основе собранных данных делаются выводы в виде выделения из списка сравниваемых движателей, лучшего. Также делается краткий обзор существующих решений и методов работы с дополненной реальностью.

Ключевые слова: Unity, AR-applications, Marmalade, Corona, ShiVa3D, Flash.

Kostiuchko S., Kyryliuk L., Abramovych V., Bobylev M., Petruk B. AR-applications by means of Unity and C#. In this paper, different gaming engines are considered and compared. Their advantages and disadvantages are revealed and on the basis of the collected data conclusions are made in the form of selection, from the list of the compared engines, the best. There is also a brief overview of existing solutions and methods of working with augmented reality.

Keywords: Unity, AR-applications, Marmalade, Corona, ShiVa3D, Flash.

Introduction

The technology's development in the 21st century is indescribably fast. Every year at world technology conferences we see a huge number of new things. There are so many of them and their scale can be so large that humanity may simply not be ready to accept this or that technology. Due to the fact that people are not ready, and most importantly, developers are not ready, many bold decisions remain undisclosed to the end. That is why it is necessary to constantly improve the educational system so that it has time to train specialists worthy of their time. One such technology is Augmented Reality (AR). This technology has a direct vector for the future. Its application can be easily represented in navigation. For example, using a smartphone (equipped with a camera), you can easily find the right way, even if you have problems navigating the map. This result can be achieved through the synchronous operation of global positioning systems loaded on a smartphone, maps, and algorithms that can link data from the map to the image obtained from the smartphone's camera. As a result, we will be able to see a dedicated path (for example, a green line) that will be projected into reality and indicate the user's required path.

Review of game engines

Marmalade

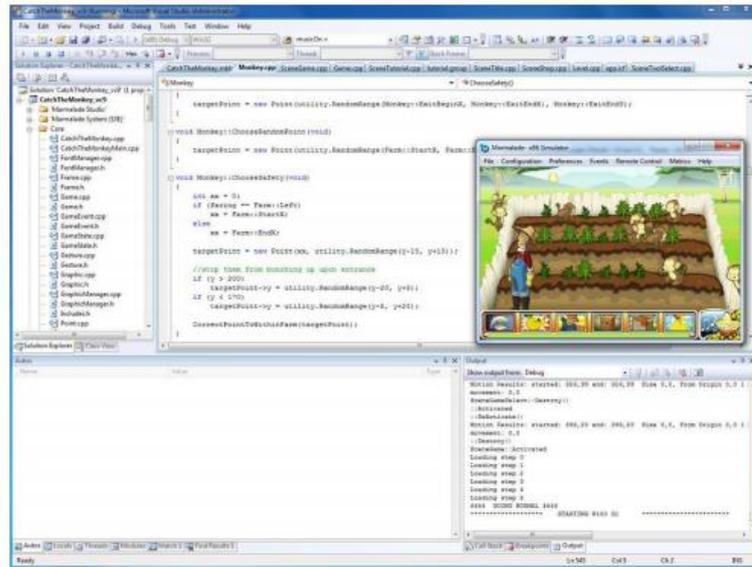


Fig.1 – Marmalade

Demo version: 90-day test copy available for non-commercial use. This game engine is a fairly professional tool for serious gaming. Marmalade has a rather complex interface (Figure 1), which emphasizes the need to have a high level of developer training. Among the games created on its basis are the following: Pro Evolution Soccer (PES) 2011 and Need for Speed Shift. Such examples are quite popular and high quality, from well-known companies that have used Marmalade, based on its professional qualities. However, Marmalade is not the engine, but the environment for creating their engines (example below). In addition, it allows you to use various C/C++ libraries available from the developer (or in the public domain).

Corona



Fig.2 – Corona

Corona is a 2D engine for creating simple games on mobile platforms in the spirit of Angry Birds. Corona has a simple interface (Figure 2), which greatly simplifies the game development process. An example is the Bubble Ball, written by a 14-year-old boy from America.

Corona has a fairly extensive API for all occasions, which will allow you to easily implement all the needs of the developer. However, everything in the API is impossible to predict and it is likely that sooner or later the developer will want to use some native (familiar to a particular platform) feature of Android or IOS. Disappointment will be waiting for the developer here - Corona does not have such opportunities. However, there is good news for flash developers. The creators of the engine claim that those who write flash games, it is not difficult to switch to Corona, so they are very similar.

Unity3d



Fig.3 – Unity3d

Unity3d also allows you to use its limited functionality for free for an unlimited time period. Unity3d has absorbed a bunch of different interesting technologies used in professional and well-known engines.

The engine has many built-in features, as well as a number of interesting third-party plugins that greatly expand the functionality. In addition, you can use libraries written in the native language of the platform (say Java for Android), which is very important for serious projects. Also in the arsenal of Unity3d is a visual editor with a huge number of various settings. The Unity3d interface is quite functional, although it remains intuitive, which greatly expands the range of user experience (Figure 3). The main advantage of Unity3d is its ability to easily create applications or games on multiple platforms.

ShiVa3D



Fig.4 – ShiVa3D

ShiVa3D is an engine with a built-in visual editor (as in Unity3d). To implement multiplatform, the engine uses Marmelade (see above). The engine has many built-in features: there are third-party plug-ins and the ability to use libraries written in the native language of the platform (say Java for Android).

Flash

Recently, there was a fresh version of AIR, which has the ability to develop for iOS, Android and BlackBerry PlayBook. The new version has brought more stability and performance. Although among the demonstration of the capabilities of the engine were listed only the usual programs (not games). It is also not yet possible to use native libraries. And the API itself is also very poor in capabilities.

After reviewing some well-known game engines, it was decided to use the Unity engine. This decision is based on the following criteria:

- Cost. Using Unity for their own purposes, the developer uses it for free;
- Programming languages. C# and JavaScript are fairly common uses.
- Functional. Because Unity supports the ability to download plugins, the functionality of this engine can be unlimited.
- Interface. The Unity interface is quite intuitive, which makes it easier to work with.
- Multiplatform.

Thanks to Unity, you can easily and efficiently create games and applications on a large number of well-known platforms.

Mobile augmented reality systems

Mobile augmented reality systems include mobile applications for phones. The use of mobile phones for augmented reality has both advantages and disadvantages. Most mobile devices are now equipped with cameras, which makes the mobile phone one of the most convenient platforms for the implementation of augmented reality systems. In addition, most modern phones have additional built-in sensors such as accelerometers, magnetometers and GPS receivers, which can improve the performance of AR applications. In mobile augmented reality (AR), users look at the direct image obtained from the camcorder on their mobile device and the scenes they see (ie the real world) are enriched (supplemented) by integrated three-dimensional virtual objects (ie augmented reality objects). This technology has a huge potential in such areas as advertising, navigation, entertainment, cultural and exhibition sphere, etc. If a virtual object is simply superimposed on a real image, and not integrated into it, then to create an augmented reality environment can be used additional sensors present in modern mobile devices, such as accelerometer, compass, GPS. Using location information, the user can navigate the world of augmented reality. If virtual objects have a direct connection to the real world, greater than just a global position, such as a virtual building built

on a real wasteland, then such augmented reality requires additional information, such as the boundaries of the wasteland and its size. Obtaining this additional information is usually achieved by means of special markers or by means of special recognition functions.

Such markers can be: an image that was prepared in advance, elementary three-dimensional shapes or objects that can be recognized by additional algorithms.

Overview of existing technologies for working with AR

OpenCV is a library of open source computer vision, image processing, and numerical algorithms. Implemented in C/C++, also developed for Python, Java, Ruby, Matlab, Lua and other languages. Can be used freely for academic and commercial purposes - distributed under the terms of the BSD license. Vuforia SDK is mobile software that allows you to create augmented reality applications. It uses computer vision technology to recognize and track flat images and simple 3D objects in real time. This image registration capability allows you to determine the location and orientation of virtual objects, such as 3D models, in the real world when viewed through a mobile camera. The position and orientation of a virtual object is tracked in real time, so that the viewer's point of view on the object is correlated with their point of view on the image, so that it seems that the virtual object is part of the real world scene. The Vuforia SDK supports a variety of 2D and 3D target types, including unmarked targets. Additional features of the SDK include localized occlusion detection using "virtual buttons, target selection images, and the ability to create and modify target sets programmatically at runtime. Vuforia provides APIs for C++, Java, Objective-C, and .Net languages. There is an extension to the Unity game engine, so the SDK supports both native iOS and Android languages, and allows you to develop augmented reality applications in Unity that can be easily ported to both platforms. That's why applications developed using Vuforia are compatible with a wide range of mobile devices, including iPhone, iPad, Android phones and tablets running Android version 2.2 or higher and ARMv6 or 7 processor with FPU ARToolkit is a computer tracking library for creating applications with augmented reality. For this purpose, it uses the capabilities video surveillance, calculation of the real state and orientation of the camera in relation to the square physical marker in the mode flax time. When the actual state of the camera is known, the virtual camera can be located at the same point and the 3D model is superimposed on the real marker. So ARToolKit solves two key problems in augmented reality: sight tracking and virtual interaction of objects. ARToolKit was originally developed by the Hirokazu Kato Nara Institute of Science and Technology in 1999 and was released at HIT University Laboratory, Washington. It currently operates as an open source project on SourceForge with a commercial license available from ARToolWorks. ARToolKit is very widely used (a library with more than 160,000 downloads since 2004). Metaio SDK is a ready-made library for creating augmented reality mobile applications. Uses OpenGL uses SLAM methods for more accurate operation 47 String - a library for creating mobile applications focused on iOS devices.

Conclusion.

A review of existing applications has shown the main trends in the development of augmented reality technology. This technology is developing very rapidly nowadays and can be used in many areas. Analysis of applications has shown that they are now mainly either entertaining or narrowly focused. The focus of such applications is on their capabilities when interacting with the environment and the user. Given this, we can conclude that the relevance of the dissemination of knowledge on the development of applications that use augmented reality, among students. A review of alternatives based on the most important criteria showed that the best environment for developing the system is Vuforia. Vuforia is a free library, constantly updated, allows you to work with both native applications and create cross-platform programs using a special game engine Unity.

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