

AminoViewer

Supporting Biochemistry Education with Augmented Reality

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ABSTRACT

AminoViewer is a didactic material, which uses the association of a booklet and an application (AminoViewer3D), to establish knowledge about the structure and function of amino acids, a subject covered in biochemistry disciplines in university courses. The booklet presents the 20 common amino acids, their two-dimensional structures, their chemical characteristics, their biological functions and their structural formula. For each amino acid, an image of its structural formula is presented. Using the AminoViewer3D application, each of the images leads to a three-dimensional visualization of the molecules, using augmented reality technology. With the use of augmented reality, the student can manipulate the molecule three-dimensionally, exploring its characteristics.

KEYWORDS

augmented reality, education technology, biochemistry.

1 Introduction

The area of biochemistry has been little addressed in the context of augmented reality applications. Previous works used cards with markers to visualize molecules [1-2] or simulated a laboratory with activities [3-4] in augmented reality. In none of the cases was there an association between the visualization in augmented reality and a specific teaching material related to the content, which required prior knowledge of the subject or the offer of visualization in a decontextualized way. Then, applications that make use of AR in the context of education in Biochemistry were conceived in such a way that they can be used independently of a physical reference material.

AminoViewer was conceived from a proposal of association between content and technology and started from a previous research that pointed out the students' difficulty in associating the two-dimensional representation of amino acids with their three-dimensional molecular shape [5].

Therefore, the material developed is composed of a booklet that contains the 20 amino acids present in nature, with their two-dimensional structures, their chemical characteristics, their biological functions and their structural formula. Images of amino acid structural formulas work as markers for an application called AminoViewer3D.

2 Objective

The project started with a survey carried out with students (n=25) from a structural biochemistry class that aimed to verify the students' opinion regarding the difficulties observed by them regarding the learning of the main contents of the discipline, as well as the possibility of use of technological resources for this purpose.

The results identified that students have technological devices (96%) and that they would like to be able to identify and better understand structural and spatial aspects related to the subject's content.

Based on this result, AminoViewer was proposed as a material composed of a handout and an application. In this case, the application was based on augmented reality to associate the content of the booklet with the visualization of amino acids.

The application was developed using the Unity3D engine and the VUFORIA library, both in their free versions.

The application's requirements were: it must be executed on a mobile device and it must be used both in the classroom, together with the teacher, as well as individually by the students.

3 Results

The didactic material was published as a booklet with ISBN and the application was made available on the GooglePlay platform. In both resources it is possible to find information about the complete material (booklet and application) (Figure 1).

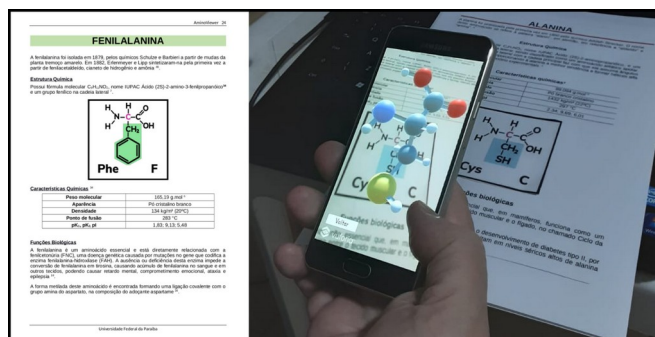


Figure 1. AminoViewer: Booklet + AminoViewer3D application.

In AminoViewer3D the markers are recognized and related to each molecule, allowing the user to visualize and interact with them [6]. Figure 2 presents an image of the application flowchart.

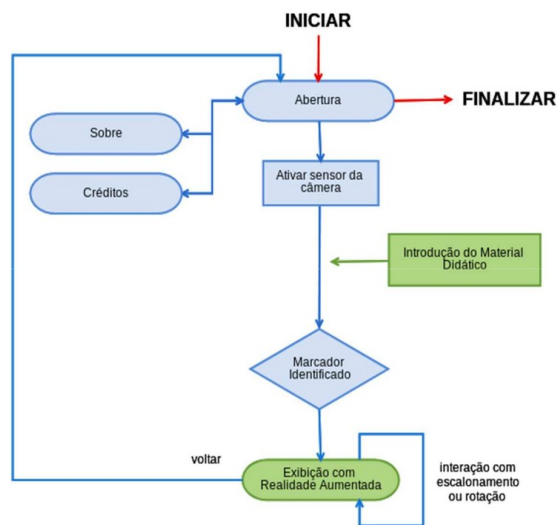


Figure 2: Flowchart of the AminoViewer3D application.

4 Conclusions

The material is freely available. The application, named AminoViewer3D, was registered at the National Institute of Industrial Property (INPI) and made available for free on the GooglePlay platform.

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