

# Application of Compound Bonding Based On Augmented Reality

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**Abstract.** Augmented reality technology is very important in visualizing real objects or concepts. The advancement of computing equipment enables 3D modelling to be performed virtually with relatively easy processes. The appearance of 3D models in virtual is very interesting because it can be combined with interactive multimedia applications so that users can control the course of the application as needed. This augmented reality application has been through process testing, system testing on different mobile devices, and marker testing. The results of process testing indicate that every process on the application goes according to existing model design. Test results show that applications created using the library vuforia and Unity can run well. High school students show that as many as 84.6% who agree with using this application is more interesting than the usual method of learning so as to be able to recognize compound bonding using this application well.

## 1 Introduction

The development of science and technology more rapidly, it can be seen and we feel around us directly. These developments are impacting on all aspects of human life. Augmented Reality is one example of reversible technological developments in the field of chemical education. Augmented Reality is a technology where the virtual world is brought into the real world for a specific purpose. In the field of education, can be made markers combined with AR technology, so that the possibility of the emergence of 3D objects based on images or markers. With the implementation of AR technology implemented can be obtained interesting and interactive learning.

Augmented Reality (AR) is a variation of Virtual Environment (VE), or better known as Virtual Reality [1]. Virtual Reality technology makes the user incorporated in a virtual environment as a whole. With the help of augmented reality technology, the real environment around will be able to interact in digital (virtual).

Chemical learning about compound bonding is usually boring by children. This is because children only know the theory of books and teacher explanations only. Therefore, with the creation of applications that utilize Augmented Reality, children are expected to be more interested and enthusiastic to learn compound bonding because with applications that utilize Augmented Reality children can see 3D models of these chemical elements and also see the merger between elements.

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## **2 Applications Theory**

### **2.1 Augmented Reality**

Augmented Reality (AR) technology can incorporate 3D objects into real environment using webcam media. Unlike Virtual Reality that completely replaces reality, Augmented Reality only adds or complements reality. Virtual objects that are merged into the real environment serve to display information that can't be received by man directly. This makes Augmented Reality useful as a tool to help the user's perception and interaction with the real world. The information displayed by the displayed object helps the user perform activities in the real world. There are three principles of Augmented Reality, the first of which is the combination of the real world and the vitality, the second runs interactively in real time, and the third is the integration between objects in three dimensions, virtual objects integrated in the real world. [2].

### **2.2 Android Programming**

In general, application of "Compound Bonding" is used to introduce chemical engineering using mobile learning technology. This application is designed to facilitate the introduction of compound bonding, aimed at students and people to provide information to users. In building this application program using Android [3]. Android is an operating system developed by Google, which promises openness, affordability, open source, and quality framework, to meet the needs of the operating system that supports standard and publishing APIs and can be utilized as a whole with low cost. [4]. Android provides an open platform for developers to create their own applications. Initially developed by Android Inc., a firm new comers who make software for mobile phones which was later purchased by Google Inc. For its development, formed the Open Handset Alliance (OHA), a consortium of 34 hardware companies, software companies, and telecommunications, including Google, HTC, Intel, Motorola, Qualcomm, T-Mobile, and NVIDIA. [5]. The open nature of Android that has made a large number of communities have sprung up application developers to use Android as the basis for the project of making applications, by adding new features for Android on the devices officially released by using another operating system. [6]. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. [7]

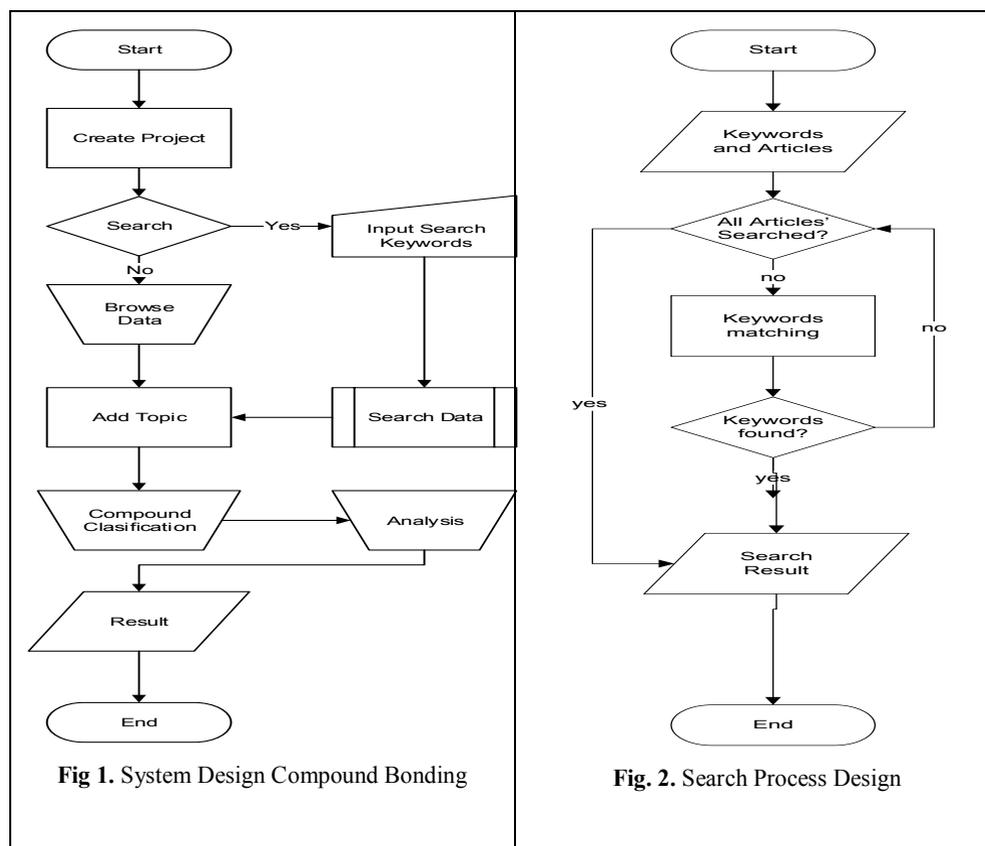
### **2.3 AJAX**

AJAX is a technique to make the display more quickly and dynamically. AJAX allows the display can perform updates by exchanging small amounts of data. The advantage of using AJAX is able to reload a section on the display without having to refresh the entire page. The goal is to move most of the interaction on a computer web surfer, to exchange data with the server behind the scenes, so that the web page does not have to be read as a whole every time a user makes a change. This will increase interactivity, speed, and usability. [8].

## **3 Design Methods**

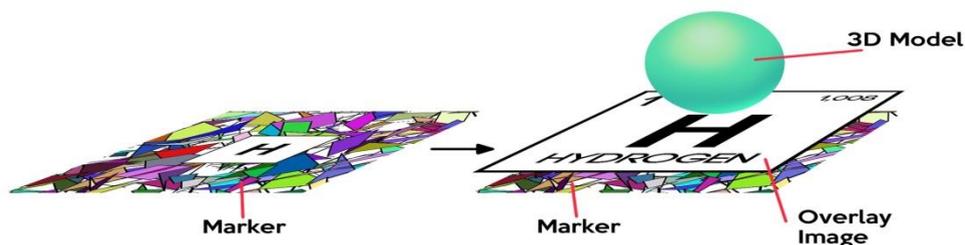
The design for the system will be divided into 2 (two) parts, the overall system design, search process design and tabulation process design. Overall system design describe the design

throughout the system, as in Figure 1. Design of the search process describes the steps taken by the system in searching and finding the desired data chemical. The schematic of search process design can be seen in Figure 2.



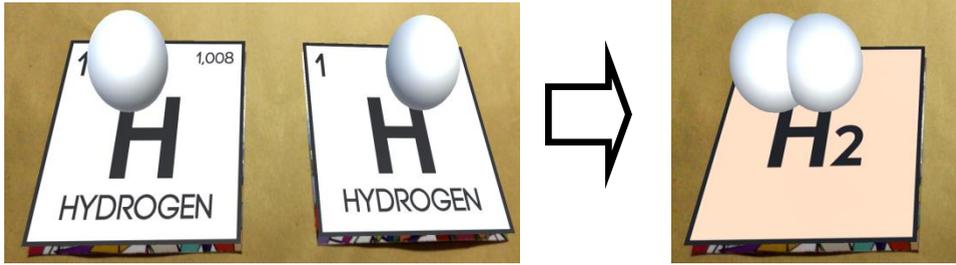
## 4 Implementation System

The Marker has been identified, an overlay image and a 3D model will appear, corresponding to the name of the element, the illustration of Augmented Reality implementation can be seen Figure 3.



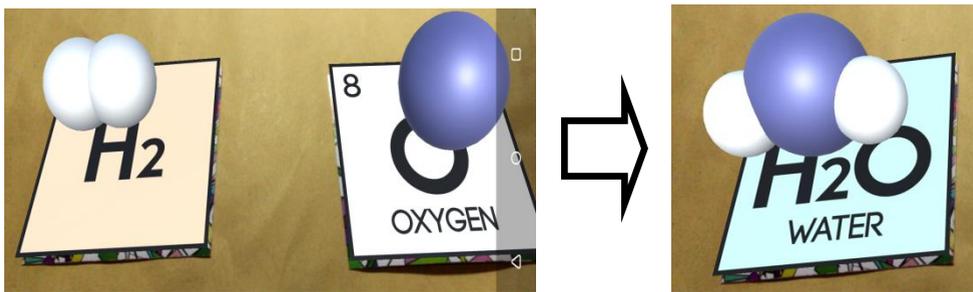
**Fig 3.** The Illustration of Augmented Reality Implementation

It appears that Marker is recognizable by software, so Overlay Image and 3D models can be placed just above the Marker. Closing 2 Hydrogen objects will produce  $H_2$ . The result of combining elements ( $H_2$ ) can be seen in the figure 4.



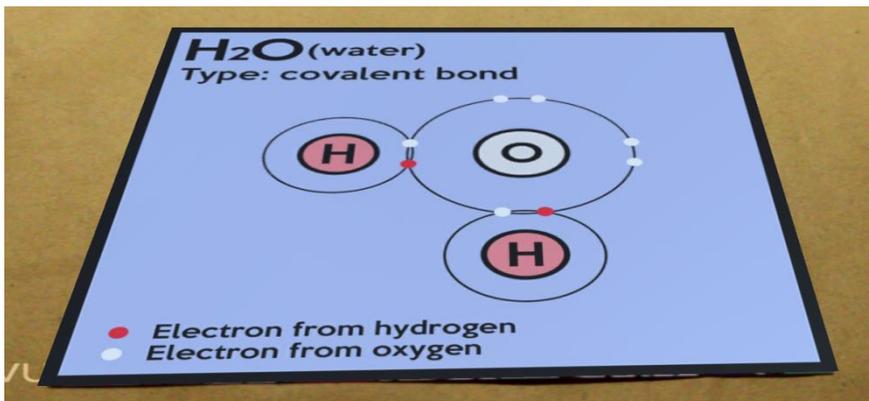
**Fig 4.** The Combining Elements  $H_2$

If the result of element  $H_2$  is added with oxygen ( $O_2$ ) will produce  $H_2O$ . The result of combining elements ( $H_2O$ ) can be seen in the figure 5.



**Fig 5.** The Combining Elements  $H_2O$

A covalent bond, also called a molecular bond, is a chemical bond that involves the sharing of electron pairs between atoms. These electron pairs are known as shared pairs or bonding pairs, and the stable balance of attractive and repulsive forces between atoms, when they share electrons, is known as covalent bonding. The following is the result of compound bonding can be seen on Figure 6.



**Fig 6.** The Compound Bonding  $H_2O$

## 5 Conclusion

At the end of the design and development of application program for the compound bonding application, some conclusions can be drawn through the test :

- Marker's detection by mobile camera are already work well. Marker can be detected and the application can shown the 3D object.
- Chemical reaction process is already well for combination 2 and 3 elements.
- Transformation 3D object is already work well, it can be enlarged, reduced, and rotated.

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