# Web-based AR Advertising & Branding for Proton Company

Arash Habibi Lashkari

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**Ashraf Abbas M. Al-Modwahi[1], Behrang Parhizkar[2], Arash Habibi Lashkari[3]**

**[1]Faculty of Information and Communication Technology, LIMKOKWING University Cyberjaya, Selangor, Malaysia**

**[2]Faculty of Information and Communication Technology, LIMKOKWING University Cyberjaya, Selangor, Malaysia**

**[3]Faculty of Information and Communication Technology, LIMKOKWING University Cyberjaya, Selangor, Malaysia**

## Abstract

Advertising and branding are so important in our business world.Web-based AR Advertising & Branding (ARAB) system is going to be developed using web-based augmented reality technology to make advertising and branding more attractive. Augmented reality (AR) is no. 3 of the top 10 technologies in this age, it supports the real environment with synthetic environment to give more details and meaning to the objects in the real word, it takes a real object or space as the foundation and incorporates technologies that add contextual data to deepen a person's understanding of the object.

## 1. Introduction

Businesses need advertising at some point or another, whether it's word of mouth or a TV ads more than likely you will find any number of businesses advertising. A business needs to consider advertising, most is when sales are slow or when new product or sevice is available. Advertising and branding are so important in our business world, according to study has been done by (Ashkan, 2007) states that web advertisements would surpass TV advertisements by 2021, the new way of advertising for companies is through web digital promotions. Augmented reality (AR) is no. 3 of the top 10 technologies in this age, it supports the real environment with synthetic environment to give more details and meaning to the objects in the real word, it takes a real object or space as the foundation and incorporates technologies that add contextual data to deepen a person's understanding of the object [1].

According to the (Survey of Web-based AR Applications, 2011) using augmented reality in various fields is power, precisely in marketing. AR supports marketing to make a new attractive way of advertising which is needed in the business world. Using Web-based AR can make advertising and branding more effective and attractive. In terms of cost, it doesn't cost too much as the television advertisements and other expensive mediums. This system is easy to use due to its mobility, customers can access the net anytime anywhere and start watching and interact with the objects of the ads [2].

## 2. Related work

There are various types of applications based on AR on the World Wide Web.Most of them are web-base applications.

### 1.1. Web-based AR in education

#### *a. MARIE*

(Fotis Liarokapis et al., 2002) presented their application for engineering education, which is an interactive multimedia augmented reality interface for e-learning (MARIE). It developed in order to enhance traditional teaching and learning methods, MARIE is equally applicable to other areas. The authors have developed and implemented a user-friendly interface to experimentally explore the potential of AR by superimposing virtual multimedia content (VMC) information in an AR tabletop environment, such as a student desk workspace.Users can interact with the VMC, which is composed of three dimensional objects, images, animations, text (ASCII or 3D) and sound [3].

#### *b. Scimorph*

Scimorph is a web-base AR education application for children. Scimorph is a central character who can journey through a series of activities in a virtual science environment based around the curriculum for primary aged children. Scimorph can be used at school or in the home to build on knowledge and understanding of the world. He has some human characteristics and attributes though he has not

developed fully because of his lack of understanding about the world. Scimorph provides opportunities to discuss and solve scientific based problems, take part in discussions around the activities and delve deeper into the topic by means of interactive tools and use of web based materials [4].

### *c. LearnAR*

LearnAR is an AR web-based application for e-learning , it is a powerful learning tool that brings investigative, interactive and independent learning to life using AR . It is a pack of ten curriculum resources for teachers and students to explore by combining the real world with virtual content using a webcam. The resource pack consists of interactive learning activities across English, maths, science, RE, physical education and languages that bring a wonderful factor to the curriculum [5].

## 1.2. Web-based AR in medicine

### *a. Surgical AR system*

(J. Fischer et al., 2004) propose in their paper an alternative approach of building a surgical AR system by harnessing existing, commercially available equipment for image guided surgery(IGS). They provide a detailed report of the prototype of an augmented reality application, which receives all the important information from a device for intraoperative navigation [6].

### *b. Anatomy AR learning system*

(Chien-Huan Chien et al., 2010) examined in there study the possibility of using AR to create an interactive learning system, which help medical students to understand and memorize the 3D anatomy structure easily with tangible augmented reality support. They speculate that by working directly with 3D skull model with visual support and tangible manipulate. The complex anatomy structure can be learned faster and better with thier system [7].

### *c. AR system for medical training*

(Felix G. Hamza-Lup, 2009) presents a distributed medical training prototype designed to train medical practitioners' hand-eye coordination when performing endotracheal intubations. It accomplishes this task with the help of AR paradigms. By employing deformable medical models an extension of this prototype is possible [8].

## 1.3. Web-based AR in game

(Christiane Ulbricht and Dieter Schmalstieg, 2003) attempt to demonstrate that tangible augmented reality is a highly effective environment for specific types of multiplayer computer games.They presented their prototype system through both theoretical argumentation and presentation to show how the usefulness of this user interaction paradigm.Also they evaluated several variants of the interaction techniques necessary for the game during the development [9].

Tangible Augmented Reality (TAR) is a combination of an Augmented Reality System and a Tangible User Interface [10]. A user interacts with virtual objects by manipulating real objects. A tangible user interface (TUI) uses objects of the natural enviroment as an interface instead of the computer interface [11].

TUI can be used by several persons because it is not restricted to one screen or one keyboard,

Christiane and Dieter found some advantages of using TUI during experiment their tabletop game, the following are the advantages :

- Virtual objects become tangible.
- It is a wireless interaction.
- The amount of available input devices increases.

### *a. AR photography game*

(Cody Watts and Ehud Sharlin, 2008) presented a photography-based AR game, it's a game that involves two players , each player use a physical handheld camera device to take pictures of floating virtual ghosts. Players must creep, sneak, and maneuver themselves through physical space in order to approach their ghostly subjects and snap a picure using their paranormal camera [12].

### *b. AR racing game*

(Fotis Liarokapis et al., 2009) present a pervasive AR serious game that can be used to make better entertainment using a multimodal tracking interface. The main purpose of their research is to design and implement generic pervasive interface that are user-friendly and can be used by a side range of users including people with disabilities [13].

## 2.1 AR in marketing

As marketers are constantly faced with technological innovations, it is important to understand how to utilize these marketing mediums in new and meaningful ways (Sean Dickson et al.,2010) [14].

Augmented reality In marketing whether it is with an online game, a functional application or mobile app, marketers are using augmented reality to promote their products. Augmented reality can help consumers visualize a product in a new and exciting way and encourage interaction with the brand. Marketers have found augmented reality to be an exciting way to combine traditional media and digital media.

### 2.1.1 AR in advertising & branding

Marketing communications consisting of sales promotion, public relations, direct marketing, and advertising comprise an important component of e-commerce strategy (Strauss and Frost, 2001) [15]. E-marketers use these tools to create brand awareness, preference, and selection. Internet advertising is an especially important part of e-communications strategy because of the vast sums spent by firms and because of the crucial role advertising plays in informing and persuading consumers.

Web advertising can be viewed as consisting of two components:

- Offline traditional media advertising (TV, radio, magazines, newspapers, and outdoor/other).
- Online advertising (paid for spaces on a Web site or e-mail, such as banner advertisements, skyscraper advertisements, dynamic media, buttons, interstitials, pop-ups, etc.).

Web advertising has generated a great deal of discussion in which three themes can be discerned:

- No universally agreed upon way has appeared to evaluate its effectiveness (Chen and Wells, 1999) [16].
- Widespread doubts have been raised regarding its effectiveness (Green and Elgin, 2001; Vranica, 2001) [17].
- While there are ample site visit data, there has been little systematic study of specific dimensions of its effectiveness.

#### *a. Ray-ban*

Rayban has launched an advertisement using augmented reality in its website, which gives users the ability to try the glasses instead of going to the shops and spend much time for chosing and trying them [18].

#### *b. Adidas*

Chris Barbour, head of digital marketing for Adidas Originals says, "That's what we have done. We have taken a real world item and added a fantastic virtual world on top of that " [19].

Adidas launched an AR advertisement in its website, users have to hold up their new shoes to Adidas' website in order to access this magical fantasy world via a code embedded in the trainer's tongue.Users hen use their flashy sneaker as a controller to navigate their way around this world. To get started download a special code from adidas website for a sneak peek into the adidas neighborhood. If the users are wanting more, can head into any champs sports store and pick up a special code that will give them access to and exclusive star wars game [20].

#### *c. Nike*

Nike launched an AR advertisement which is an AR application that can be downloaded from nike website to enjoy watching its products [21].

#### *d. Tissot*

Tissot creates an AR advertisement in its website, which makes users experience the Tissot Touch collection on their own wrist instead of going to shops and spend a lot of time for chosing the desired watch [22].

#### *e. Mini-cooper*

MINI uses augmented reality technology to create a truly interactive media piece out of a 2-dimensional magazine ad. Using augmented reality tracking technology, as users hold the ad up to their computer's web cam, they'll see a 3-D model of a MINI Cooper convertible that moves as they turn and move the sheet of paper around It looks as if they are actually holding the MINI Cooper car in thier hands [23].

#### *f. BMW*

BMW initiated an online augmented reality campaign to promote the launch of the BMW Z4. Inition worked with dare to create a unique interactive online brand experience supporting the TV campaign in which a roadster is steered across a blank canvas with the tires providing paint trails and colourful [24].

#### *g. Toyota*

Toyota have used augmented reality to create 3D a interactive experience of the new iQ car which users can download from toyota website. Toyota iQ is a radical new small car and augmented reality technology allows you to interact with the car to discover its agility and interior space [25].

#### *h. Nissan*

Nissan Australia have launched a very cool 370Z augmented reality website created by Tequila. Potential buyers have been sent a cool DM piece, complete with a steering wheel cut-out that becomes the receptor for the new *Nissan 370Z augmented reality* application (or users can just print one). All you need is a web cam, the steering wheel and visit Nissan website [26].

#### *i. Volvo*

Adv.pl is an advertisement company that is just implementing the first in Poland augmented reality project in the automotive industry . This project supports launching of new Volvo S60. They were responsible for creating augmented reality technology for interactive booklet showing greatest merits on the new Volvo S60 model. Each of four booklet pages uses other capabilities of augmented reality: 3D presentation of the new car, virtual simulation of vehicle colours available in the market and a film presenting operation of Pedestrian Detection security system that consists in recognizing moving objects on car route. The agency created a realistic 3D video

model of a new car on the basis of photos and available visualizations [27].

#### 2.1.2 Proton

Proton actually comes from PeRusahaan OTOmobil Nasional which roughly translates to National Automobile Enterprise in Malaysian. Proton is a Malaysian car manufacturer which first started out in 1983, following the wishes of former Prime Minister Tun Mahathir Mohamad[28].

## 3 Development Methodology

The development methodology for this research is followed Repetitive-Simulative Software Development Life Cycle Methodology (R-SSDLC). In order to develop augmented reality system using R-SSDLC, there is a need for planning in terms of design and development approach to make researchers understand the augmented reality technology as well as the utility of this technology in various areas or environments. Web-base AR advertising and branding application will be designed to deliver the concept of making the advertisement available anytime and anywhere. Thus, the R-SSDLC model for Web-base AR advertising and branding application which can be observed in Figure 2 will be developed and applied in this research. The System Development Life Cycle is including main four phases which are Analysis Software Requirement Specification, System Design, Development & Testing, and Implementation & Evaluation. The development of Web-base AR advertising and branding application will process through SDLC as only part of the total life cycle. Because after the prototype designed and developed, the system will be evaluated by users and marketers again. Therefore, the process of evaluation is needed to improve the effectiveness and efficiency of application as a final result to be applicable for marketers in Proton Corporation.

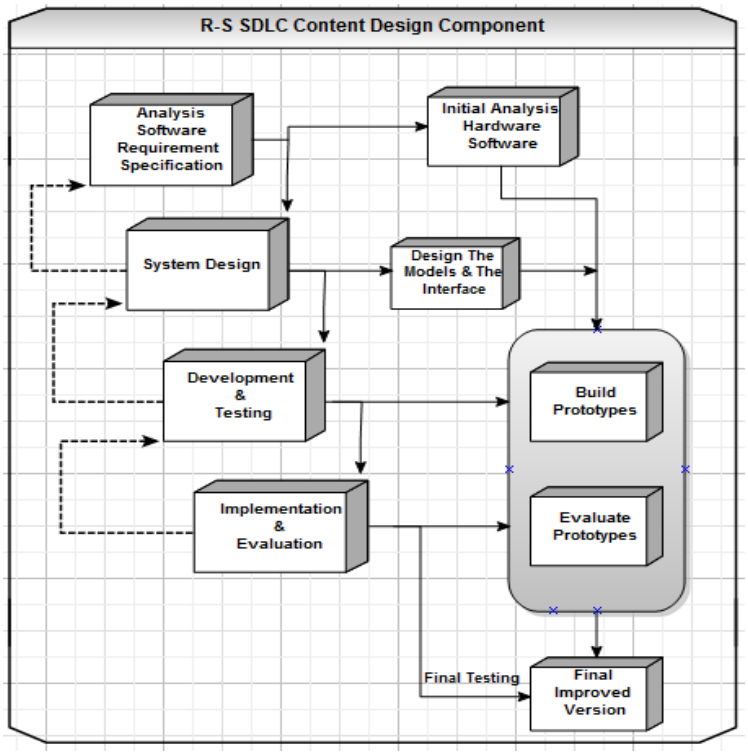


Fig 2: Repetitive -Simulative software Development Life Cycle Methodology.

### Phase I: Analysis Software Requirement Specifications (SRS)

In the Analysis Phase the SRS applied to determine the scope of analysis. In order to do this, various elements needed to consider which are such as:

- Scope of users
- Contents of object
- Information of Proton market
- Contents of Proton car(s).
- Suitable equipments (Video capture device, laptop etc)

The above issues are very important. We have to consider the scope of our users because they are from different age as well as level of knowledge, so it is needed to consider the users. For this purpose, the contents of one car will be selected for modeling. In addition, the information of Proton needed to be collected. The contents of Proton car(s) also needed to be scanned and digitized for the purpose of modeling to be used as 3D objects. Regarding of analysis for the SRS, the good camera, laptop and scanner need to be used to implement the application.

### Phase II: System Design & Architecture

The result of the Analysis Phase is the input of Design Phase. This phase involved the design of six different contents which are; 3D objects, 3D animation, mouse interaction, finger interaction, voice and video. Design Phase included three sub-phases which are designing of contents, designing of interface and designing of animation.

### Phase III: Development & Testing Phase

This phase involved the development of the prototypes for the Proton ads. This phase also involved the storyboard of prototype for the application. The development of prototypes of this stage are involved five sub-phases; plan, design, compose, approval and testing as an important approach in most development of application to ensure that Software Requirement Specification (SRS) met with the storyboard.

### Phase IV: Implementation & Evaluation

This phase is the most important phase in software development, because in this phase the output and result of all the previous phases will be appeared. Before the implementation process is executed, the evaluation phase is conducted. The evaluation phase involved in the initial testing of application, revision, user training, user experience, feedback and functionality.

## 4 Implementation

Two sample prototypes of the ARAB system will be developed; one with motion detection to allow the user using the motion of his/her finger to control the video part of the system and the other using mouse and keyboard instead.

### 4.1 Video Capturing

A video capturing device such as webcam has been used as a capture device for this research. FlarToolkit library was used in order to acquire the input data from the webcam. FLARToolKit recognize the marker from the input image and calculate its orientation and position in the 3D world, see Figure 3.


Fig 3: simulating the video capturing process

When there are more than one capture device, the library will enumerate the first device according to the setting of the computer system. Therefore, the other capture devices need to be disabled so that the target capture device can be enumerated.

### 4.2 Image Processing

An image file contained 2-dimensional data. Each data of the image in pixel form consisted of red, green, and blue. Image processing was applied to the image data in real-time detection. Greyscale transformation function was written in the image library. The coding of the marker detection is as shown in below source code.

FLARToolKit recognize the marker from the input image. And calculate its orientation and position in the 3D world.

```
public function FLARSquidderMarkerDetector(i_param:FLARParam,i_code:Array,
                                           i_marker_width:Array,i_number_of_code:int)
    {
        _resultsArray = new Array  ;
        const scr_size:FLARIntSize = i_param.getScreenSize();
        this._square_detect = new FLARSquareDetector(i_param.getDistortionFactor(),scr_size);
        this._transmat = new FLARTransMat(i_param);
        this._codes = i_code;
        const cw:int = i_code[0].getWidth();
        const ch:int = i_code[0].getHeight();
        for (var i:int = 1; i < i_number_of_code; i++)
        {
            if (cw != i_code[i].getWidth() || ch != i_code[i].getHeight())
            {
                throw new FLARException  ;
            }
        }
        var borderWidth:Number = 100 - i_code[0].markerPercentWidth / 20;
        var borderHeight:Number = 100 - i_code[0].markerPercentHeight / 20;
        this._patt = new FLARDynamicRatioColorPatt_O3(i_code[0].getWidth(),
                                                      i_code[0].getHeight(),borderWidth,borderHeight);
        this._number_of_code = i_number_of_code;
        this._marker_width = i_marker_width;
        this._match_patt = new FLARMatchPatt_Color_WITHOUT_PCA  ;
        this._bin_raster = new FLARRaster_BitmapData(scr_size.w,scr_size.h);}
```

### 4.3 Modeling the Augmented objects

3Ds Max 2011 has been used for the modeling phase of ARAB system. The augmented objects are the concept model of Proton savvy car 2013 and the gallery images of a collection of Proton cars.

#### 4.3.1 Concept Model of savvy 2013

The modelling is based on sketch technique in which models are interactively designed by drawing their 2D silhouettes from a different view. The main idea of this technique is to limit the input to 2D silhouettes, removing the need to explicitly create or position 3D elements. The complicated models can be constructed by dividing them into parts defined by their silhouettes, which can be combined using constructive solid geometry (CSG) as shown in Figure 4.

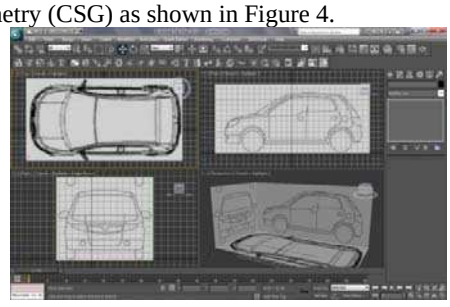

Fig 4: Screen shot of the 2D silhouettes.

It is possible to just add each image to the background of the appropriate viewport, but problems can arise in trying to match the scale and position of each image. It is often more flexible, but slightly more time consuming, to add the images to a plane primitive in each viewport as described above.

- ***Creating car's body***

Creating the body of the car by adding more polygons and matching vertexes with the blueprint. This concept illustrated in Figure 5.

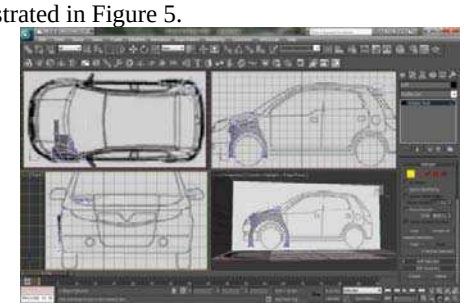

Fig 5: Screen shot of creating the body.

- ***Finishing the Body***

Doing some adjustment on the vertexes, and then mirror the half of the body, connect the two sides, and do more adjustment on vertexes again to get the expected result.

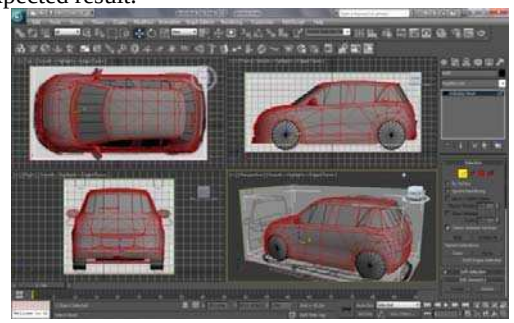

Fig 6: Screen shot of finishing the body.

- ***Checking the model***

By choosing wireframe mode, check the model going to be easy.

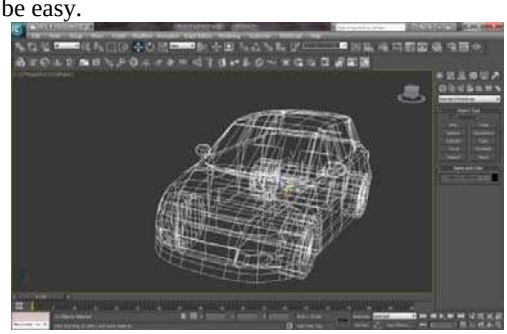

Fig 7: Screen shot of the model.

- ***Creating textures***

First we create a real image with the use of uvw mapping modifier to apply the image as a texture to the body of the car.

By using Photoshop software, the color variety of image to another by replacing the part of the car in the bitmap image with another color. See Figure 8.

Fig 8: Screen shot of the textures.

- ***Interactivity***

In this application there are two types of interaction which are mouse interaction and finger interaction.

Mouse Interaction

Using mouse as an interaction tools is one of the most common tools in the computer and multimedia application. Mouse is easy to handle and easy to apply in order of clicking and running a function.


Fig 9: Mouse interaction

### *a) Finger Interaction*

Another type of interaction used in this application called finger interaction or natural element interaction. In this part, user can use his/her finger to interact directly with the augmented object.

Motion detection is a procedure of confirming a movement of an object relative to its surroundings or the change in the surroundings relative to an object. The algorithm for this motion detection technique is done by a webcam compares the current image frame with a reference image frame and counts the number of different pixels. Till now, this is the first time that we are using our new finger detection technique in the web-based AR applicarion in the world.


Figure 10: Finger interaction

```
        private function loop(e:Event):void {
            olddata.draw(newdata);
            newdata.draw(video);
            newdata.applyFilter(newdata,newdata.rect,new Point(0,0),bf);
            diffdata.draw(display);
            diffdata.applyFilter(diffdata,diffdata.rect,new Point(0,0),bf);
            diffdata.applyFilter(diffdata,diffdata.rect,new Point(0,0),cmf);
            detectionbmd.draw(diffbm);
            thresholdbmd.threshold(detectionbmd,detectionbmd.rect,new Point(0,0),
                                   '<',0xCCCCCC,0x000000,0xFFCC00,true);
            detectionRect = thresholdbmd.getColorBoundsRect(0xFFFFFF,0xFFFFFF,true);
            draw();
        }
        private function draw():void{
            if (detectionRect.width>10 && detectionRect.height>10) {
                if(enableDrawing){
                    detection.graphics.clear();
                    detection.graphics.lineStyle(rectThickness,rectColor);
                    detection.graphics.drawRect(detectionRect.x,detectionRect.y,
                                                detectionRect.width,detectionRect.height);
                }
                dispatchEvent(new DetectionEvent(DetectionEvent.DETECT,detectionRect));
            }

    }
```

## 5 Discussion

After reviewing AR applications according to the Survey of Web-based AR Applications , a comparison applyed among the applications including ARAB system, in terms of the following:

### *a. Quality*

The quality of an application measures how well appliction is designed, and how well the application conforms to that design.

### *b. Simplicity*

Simplicity is a more qualitative word connected to simple. It is a property, condition, or quality which things can be judged to have. It usually relates to the burden which a thing puts on someone trying to explain or understand it. Something which is easy to understand or explain is simple, in contrast to something complicated. In some uses, simplicity can be used to imply beauty, purity or clarity.

### *c. Usability*

Human-Computer-Interaction (HCI) is the area where usability emerged. Several books or papers about HCI present a definition or characterization of usability. For instance,(Hix & Hartson,1993) consider that usability is related to the interface efficacy and efficiency and to user reaction to the interface. In this project we devided the usability to two major parts namely mouse inteaction and finger interaction.

### *d. Efficiency*

The ratio of the output to the input of any system.It also refers to skillfulness in avoiding wasted time and effort.

### *e. Availability*

The degree to which a system, subsystem, or equipment is operable and in a committable state at the start of a mission, when the mission is called for at an unknown, availability is the proportion of time a system is in a functioning condition.

## 6 Conclusion

This paper explained about AR, the development of ARAB system for proton and how AR can benfit the user in various fields such as business and advertisment.This paper observed AR web-based applications and compared among them including our ARAB System. According to the table above the best current applictions are Ray-ban, Tissot, BMW, but as you can see they did not cover the motion detection or finger interaction in their application. Our proposed ARAB system for proton, not only covered all necessary attributes but also has covered the motion detection technique. In the future, one of the best additional properties for the next generation systems will be Haptic, it means we can control the augmented objects with the human senses.

Table 1: Comparison table among AR applications

| | Quality | Simplicity | Usability | Efficiency | Availability |
|---|---|---|---|---|---|
| MARIE | | √ | | | |
| Scimorph | √ | | | √ | √ |
| LearnAR | √ | | √ | √ | |
| Surgical AR system | | √ | | | |
| Anatomy AR learning system | | √ | √ | | |
| AR system for medical training | √ | | √ | | |
| AR photography game | √ | | √ | √ | |
| AR racing game | | √ | | | |
| Ray-ban | √ | √ | √ | √ | √ |
| *Adidas* | | √ | | | √ |
| Nike | | √ | | | √ |
| *Tissot* | √ | √ | √ | √ | √ |
| Mini-cooper | √ | √ | | | |
| BMW | √ | √ | √ | √ | √ |
| Toyota | √ | √ | √ | | √ |
| Nissan | | √ | √ | | √ |
| Volvo | | √ | | | √ |
| ARAB system for proton | √ | √ | √ | √ | √ |

## Acknowledgement

The special thank goes to our advisors Dr. Arash Habibi Lashkari for his supervision and guidance in the progression of our project.

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