

Repair in Reality using Remont Application

M.Ganesan, P. Abinaya, N. Kavinaya, P. Kavitha, Smrite D. Nambiar



Abstract: In the real life, there are difficulties in fixing faults in appliances, vehicles and day-to-day used equipment's. Normally, for Set righting the false mechanics or service centers are approached. In nowadays troubleshooting are attempted even by self, in as far as minor repairs are concerned and, due to lack of knowledge the technologies are being hired for solving the defects. Augmented reality (AR) helps in sorting out the issues of minor repairing of appliances or vehicles in interactive and digitally manipulated real world problems. Information about the environment and its object are overlaid on the real-world environment with the help of Smartphone's to sort out the day-to-day issues. With the help of advanced AR technologies AR cameras are incorporated into the Smartphone application to interact with the information in the surrounding world of the user for digital manipulation. In AR, Unity game engine which supports more than 25 platforms is used for efficient and flexible workflow that enables to work confidently. Likewise, Blender an open sourced 3D graphics software tool used for creating animated films, 3D print modules, motion graphics, and interactive 3D application to help the user. A versatile language C# is used to handle user input manipulated objects for switching over to different scenes displayed for the user. Other software such as Vuforia, Android SDK, and Java JDK are also used for sending APK files to Smartphone's. The application starts with user interface where 3D objects are downloaded with the help of blender. It opens the troubleshooting guide to select car brand which have different repair techniques. This leads to view the video solution of repairs through AR cameras. Here troubleshooting techniques are revealed to the user for their self-attempt for repairing the minor faults.

Keywords: AR cameras, fault fixing, 3D objects, C#, JDK.

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* Correspondence Author

M.Ganesan*, Computer Science and Engineering, Sri Manakula Vinayagar Engineering College, Puducherry, India.

Email: cadganes@yahoo.com

P. Abinaya, Computer Science and Engineering, Sri Manakula Vinayagar Engineering College, Puducherry, India.

Email: abinayap286@gmail.com

N. Kaavinaya, Computer Science and Engineering, Sri Manakula Vinayagar Engineering College, Puducherry, India.

Email: kavinayadolly1998@gmail.com

P. Kavitha, Computer Science and Engineering, Sri Manakula Vinayagar Engineering College, Puducherry, India.

Email: kavithaperumal007@gmail.com

Smrite D. Nambiar, Computer Science and Engineering, Sri Manakula Vinayagar Engineering College, Puducherry, India.

Email: smritednambiar@gmail.com

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I. INTRODUCTION

Extended reality was introduced by Paul Milgram which changes the complete real-world environment into virtual reality environment. There are three main categories virtual reality, augmented reality, mixed reality. Virtual reality is not a modern technology, it was introduced in 1940 by savviest view master in 1960, the new technique HMD (Head Mount Display). It gives the characteristics of both artificial and 3D environment. Augmented reality was introduced by Tom Caudell in 1990 from USAF Armstrong's process lab. It is an interactive process that allows the virtual images to be projected into the real-world environment through computer-based information. In Augmented reality Smartphone's with camera and Google glass are used instead of headsets. Mixed reality is the combination of augmented reality and Virtual reality in which the objects get interacted with real world and virtual objects. Mixed reality uses Microsoft HoloLens [10].

II. AUGMENTED REALITY

Augmented Reality is an interactive process that allows the virtual images to be projected into the real-world environment through computer-based information. In Augmented reality Smartphone's with camera and Google glass are used instead of headsets.

A. Marker Based AR

In marker based AR we are using the Smartphone camera through which we can recognize multiple theme of different images, objects and so on, marker based augmented reality is using marker like QR marker or other type of marker in both object and the Smartphone Marker based AR would work through camera of the Smartphone's and by the way of focusing an object through camera it can recognize the object and produce an animated virtual image of the same.



Fig 1 Marker based AR

B. Markerless Based AR

Marker less is also using the augmented reality technology but it is more effective than marker-based AR, because of this uniqueness. The marker less AR also works through Smartphone of camera but it uses Global positioning system (GPS). Hence it doesn't need marker on the object. It can directly derive the object details through GPS and processed it and produce the animated virtual image of the same. Thus, it has easier and effective than its counterpart [3].



Fig 2 Markerless based AR

III. LITERATURE SURVEY

Dr.N. Thillaiarasu, N. Kamal Kumar, S. Amsarathinam, V. Kishan, Azhar Mohamed "Vehicle Tyre Strength Monitoring Using Augmented Reality", March 2019[1].

Augmented reality is a revolutionary technology which can save our precious life. In this context car safety has been a major issue which we are facing now Here TPMS (powered by AR) which enhance our safety and security. Tire pressure monitoring system (TPMS) comprises few sensors and equipment that are DUST BOOT, SECURITY LOCKING NUT WITH SENSOR AND LABELLING SENSOR. First, we need to fix this sensor on one of our car Tire. Specifically, we need to fix dust boot and security locking nut on Tire mouth and then we must tighten that after that we need ensure whether Tire air is leaking or not. By using specified foam and this foam need to be sprayed on the fixed setup. If the air is leaking it is not fixed properly and if it isn't leaking it is fixed properly. Likewise, we need to fix labeling sensor called TPMS on all four tires on our car and finally we need fix the labeling sensor. We need to fix the required air pressure on all tires. It may vary because we have different cars. If we fixed required air pressure, it will let you know on your head mounted display which we fixed along with TPMS in driving desk. TPMS will indicate you whether we have required amount or not by this way we can ensure our safety. If air pressure is increased, it leads to the bursting to the tire. In contrast to that, if the air pressure is decreased, it may lead to accidents. A scenario like in petrol bunk we may find difficulties regarding required air pressure on our car Tire. Here TPMS POWERED BY AR will play a greater role. We already fixed a AI ARTIFICIAL INTELLIGENCE powered camera in the petrol bunk where we have already stored data of different car Tire air pressure requirements in an Android powered TV and if a car comes it will automatically capture your car Tire images and processed your car tire pressure through captured image and send signal to your head mounted system through sensor whether

you have required air pressure or not. By this we can ensure our safety.

Akram M. Abdel-Rahman, Neeraj R. Gautama, Donald Eng "Augmented Reality Based Interactive Troubleshooting and Diagnostics for Vehicle" October 18, 2016[2].

About onboard diagnostics in car safety which can augment our car safety through many means of communication. It's first used in United States during 1988 and after it spread to many countries across world and now it made as a mandatory for car manufacturers across the globe.

Onboard diagnostics in car uses troubleshooting tools which contains all the details of major problem of the car and it would universally applicable because it uses different codes for different problems. If the car has problem in engine the onboard diagnostics troubleshooting tools diagnose the problem and send an alarm signal to the speedometer of the car.

Likewise, it has many tools for different problems and it can diagnose any problem automatically and send signal to the driver desk or speedometer. By this way the onboard diagnostics can help to enhance our safety and security of our car.

Anuroop Katiyar, Karan Kalra and Chetan Garg "Marker based Augmented Reality", April-June 2015[3].

Marker based augmented reality is a new type of technology which can make a virtual image on our Smartphone, Smart tv etc. by using augmented reality. Marker based augmented reality uses different types of marker like Pentagon, hexagon and cubical shaped marker which can be read by Smartphone cameras and it can show an animated virtual image and it can work on wide variety of devices as well.

If I using the marker with augmented reality in our mobile by using a specific application or app it can take a real view of the picture. For example, if I focus an elephant toy in my house through specific app in my Smartphone camera it will show the elephant has been moving like in real and it also shows shape, movement of everything in which marker augmented reality is installed.

It can effective work only in 10 diameters of distance. It must be unique in the sense that each marker must have unique details. It can work only where marker augmented reality has been installed or stored. It has limited applications in other field and it mostly used in Smartphone and other devices.

Kangdon Lee from University of Northern Colorado "Augmented Reality in Education and Training", March-April 2012[4].

Education and training have been increasing now days, but quality of education and outcomes with critical thinking is remain stagnant. In this context, AR would augment our quality and outcomes. Earlier and even now a day's education has been still occurring two way contact between teachers and students. It would compromise our quality. If a teacher teaching biology class, he or she can show an image of an autonomy of our body in only in one dimensional through Projector or TV. But AR powered Projector or TV would show 3D view of the same picture by this way it can make clearer and make students easily comprehend and ingest it easily. Likewise, in this context we introducing A technology called SMART (System of Augmented reality for Teaching) also Powered by AR which enhance our quality of education.

If a student couldn't come to school because of illness or some other reasons he or she may lose a day and it would affect his or her educational progress.

Here our SMART technique would play a role and solve this issue by recording the day activities and also helps the teacher to regularly monitor the student's presence and indicate through TV or projector.

Like this technique would be misused by student because it doesn't give warning or penalties to the students and it can make the students easily evade this technique.

But what we want is that we need combine both man and technology to give a better and quality education in our country. It paves a way for creative thinking of the students. And finally, this SMART TECHNIQUE is useful for education, but it can help in other areas in business administration, security monitoring and so on.

Eckhard Steinmeier, Munich, Ralf Rachholz, Munich, Birsen Goek, Munich, Martin Kulesa, Munich, Bernhard Hoess "Method and Device for Visualizing a Vehicle Repairing" August 28, 2007[5].

Method and device for visualizing a vehicle repairing is method or procedure by which we can find out entire problem of the car can be identified and also to be repaired by visualizing image. It can provide an image data for in a format of visualizing a defective part and also provide the repair process of the same.

This method comprises of digital data of two or more vehicle parts in a particular CAD or computer aided design data or any other visual data which is suitable for visualizing and digital data of similar vehicles are provided and make a comparison and find out the repair of the vehicle parts and processed it and provide the repair process of the same through visualizing image or data or through audio data.

If a car has a defected steering it would select the elements for repair provided in the plural data which is already stored in this method. After that image of the first repair operation process would be provided and after second stage of the first operation is provided from comparing the other car parts especially a perfect car. To reduce the translation cost of the repair process and along with cost effective procedure of the same.

IV. EXISTING SYSTEMS

The technology can play a greater role to enhance our day to day activities from education to repair of the car. It would immensely help in not only reducing the human errors as we usually faced but it also helps to solve the same in an efficient and effective way.[2] TPMS (powered by AR) which can work in a smart way to reduce the car safety.

It comprises of few sensors which can be fitted easily in a swift manner and make it as alert of safety and security of car by finding out of tire pressure in a fixed way through means of head mounted system in driving desk and so it would make your alert when you haven't required air pressure in your car . Education is prime importance of our society it would not only make a person empowered and it also helps to build a strong nation. However, the education needs quality. In this context, our AR powered SMART technology plays a crucial role in enhancing the quality of education and critical thinking of the students by the way of providing immense visual image of different subjects and monitor the student's attendance in an effective way [9]. Marker based AR also Play's a miracle role in our Smartphone world which can make unreal as real. This technology would use different

codes and markers for recognizing the image and processed it in smart way and provide a visual animated moving of the image which is fascinating one in the smart phone world. Further, it can revolutionize our business and can make us an edge over competitors.

Marker less AR also a technical miracle which can even enhance the deficiency of the marker-based AR. That's the way of using GPS it can recognize any objects or image through our Smartphone camera and make an animated virtual image of the same in a real manner.

Method and device for visualizing a vehicle repairing is also a smart method or procedure by which we can find out any repairs on not only our car but also in different types of car. It works in smart and swift way visualizing the defective part of the car and also provides the repair process of the same through visualized image or textual data or audio whatever our preferences by comparing the perfect car parts in anywhere near to you. It not only reduces our cost of repair translation and it also helps to do on our own without any mechanics.

V. PROPOSED SYSTEM

When the user needs support for fixing faults in their appliances/Vehicles etc. many users face difficulties in troubleshooting by themselves even for minor repairs due to lack of knowledge and guidance. Instead, they hire technicians to solve the defects who are not easy to find and also charge more money for some basic repairing process.

They need a solution for self-troubleshooting such as to identify what are the defects and how to resolve the defects. Then, it would be helping the user, even without the contact of technicians. The remont application is the troubleshooting guide that shows how to repair the defects that has occurred in the car.

The Remont application consist of the following tools: Vuforia SDK (Software Development Kit) platform is used inside the Unity game engine. We use C# as programming language and is used to guide the game object as how to behave. Blender is a tool which is used to create 3D applications. Using Blender, any 3D objects and sub-objects can be loaded to the unity and different animated action can be given to them. Java Development Kit (JDK) environment that helps in building applications. Since it provides long term support and it is the only platforms that support the unity. Android SDK software development kit is used to debug an android application. This android SDK plays a vital role in the conversion of our Unity project into an APK file. For example, to repair some basic faults in the car, an Augmented Reality is used for changing the battery or replacing the battery, removing and cleaning the Air Filter. How to change the engine oil, changing the spark plugs. Have an Augmented Reality knowledge base in the application which can acts as a step by step instruction guide to all the users. For example, for cleaning the air filter in car, the knowledge base steps should be removing the filter and vacuum the dry filter, wash a dry filter if desired, cleanse an oiled filter, re-oil a filter if applicable, clean out the canister and replace the filter. It will not only help in changing the wheel but also for a replacement of changing the wiper blade, car battery checking and also for the dead battery.

At last, the Remont application is guided through video display process which shows step by step instruction to repair the vehicles. Thus, it provides an efficient and time-consuming method.

VI. SYSTEM ARCHITECTURE

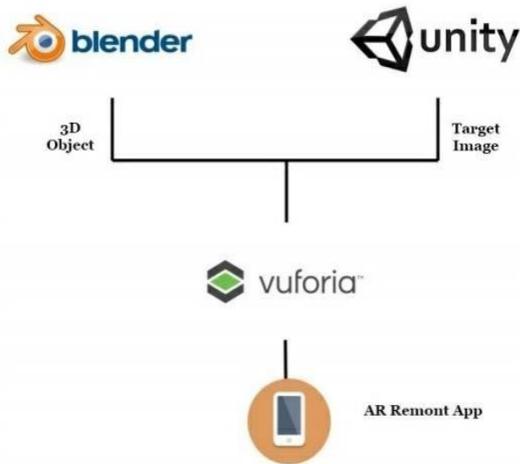


Fig 1 The Blender and Unity is used to create a 3D AR app

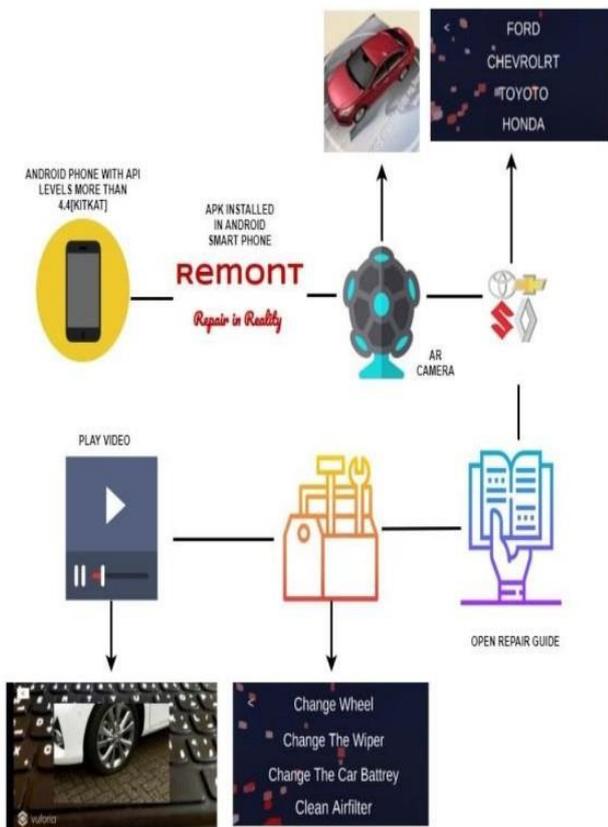


Fig 2 The High-level work flow of Remont

The user needed android mobile phone with an api level which is not less than 4.4, commonly called as Kitkat. We can install remont (repair in reality) apk files in our smart phones and we click, it opens the AR camera, window pops up which has to mobile rear camera and it examines the whole environment in grey scale in which marker is detected. The 3D object of the car that we have created with blender appeared with a button named as the select your car brand which helps to move to next page which shows the number of car brands, in that we can select the brand of the car. It

leads you to the respective guide where you can select the repair case such as changing the wheel, changing the wiper etc. This leads you to the next scene where the video explains you how to solve the repair case step by step for the convenience. We have provided the play pause buttons and gradient bars to move across timing video.

VII. RESULT

A. Scene 1

The starting user interface: The 3D car object is made with the help of blender. Then the 3D object is downloaded as .obj file. Then it is added to the assets and added as child to the image target. The position, rotation and scale co-ordinates are changed and then the scene is open for build.



Fig 1 User Interface

B. Scene 2

Select the brand of your car: Different car brands have different repair techniques. So, the different car brands are displayed in our User Interface in Which user can select the car brand of his choice. The buttons are aligned in canvas as child and text is changed according to car brand.



Fig 2 Car Brand

C. Scene 3

Open the trouble-shooting guide of your respective car: The trouble-shooting guide is set foreach car brand. So, this part requires many scenes which are open for build. The repair cases button is set which can be selected by the user for his repair case. The c# scripting is written for the buttons and then the button is linked to the corresponding scene.

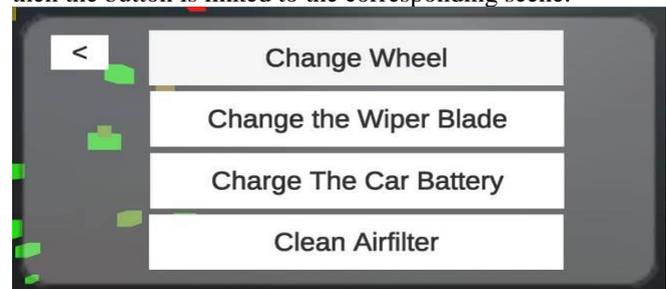


Fig 3 Trouble-Shooting Guide

D. Scene 4

View the video solution of your repair through AR camera: This part requires many scenes which are open to build. The video is set with raw image consisting of the video player as child. The video resolution and size of display is fixed by changing the co-ordinates. The sound is fixed to high. The play and pause buttons are fixed with timings.



Fig 4 Video Solution

VIII. FUTURE SCOPE

Many complicated test cases and videos are about to be included.

To reduce the storage space in your mobile, database is going to be included.

The repair guide for more appliances is to be added.

A. PROS

Our app can be used in offline and does not require any network connection.

It is user friendly.

It has a simple design, so that it is easily understandable.

B. CONS

Our app is more time consuming.

It has limited repair test cases.

Memory consumption is high.

IX. CONCLUSION

Using the remont application, the user can get a solution for their problems and can rectify it by themselves. This may reduce the unnecessary maintenance cost and help them in emergency situations. So, the augmented reality and extended reality has wide variety of applications from education and research, Marker based, marker less based and so on, in different areas to present it in the future. We must priorities our customer and market needs and can develop the AR and XR to have an edge over our competitor in this field. Finally, the technology which is used for fun can also be used to help others.

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AUTHORS PROFILE



M.Ganesan is pursuing his PhD in Computer Science and Engineering in Pondicherry University, Puducherry, India. His research interest includes internet of things, pervasive computing and cloud computing. He is presently working as an Assistant Professor in Sri Manakula Vinayagar Engineering College, Puducherry, India from 2008.



P. Abinaya is currently pursuing her Under Graduate Degree in Sri Manakula Vinayagar Engineering College, Puducherry in the Field of Computer Science and Engineering. Her current research work is on Augmented Reality.



N. Kavinaya is currently pursuing her Under Graduate Degree in Sri Manakula Vinayagar Engineering College, Puducherry in the Field of Computer Science and Engineering. Her current research work is on Augmented Reality.



P. Kavitha is currently pursuing her Under Graduate Degree in Sri Manakula Vinayagar Engineering College, Puducherry in the Field of Computer Science and Engineering. Her current research work is on Augmented Reality.



Smrite D. Nambiar is currently pursuing her Under Graduate Degree in Sri Manakula Vinayagar Engineering College, Puducherry in the Field of Computer Science and Engineering. Her current research work is on Augmented Reality.