

# Mechy-Maintenance of Car Engine Using Augmented Reality

Ron George Valiyaveetil<sup>\*</sup>, Maju Joseph<sup>2</sup>, Nikhil Josy<sup>3</sup>, V. Vishnudas<sup>4</sup>, Smitha Jacob<sup>5</sup>

<sup>1,2,3,4</sup>Student, Department of Computer Science and Engineering, St. Joseph's College of Engineering and Technology, Palai, India

<sup>5</sup>Professor, Department of Computer Science and Engineering, St. Joseph's College of Engineering and Technology, Palai, India

\*Corresponding author: ron2george@gmail.com

**Abstract:** The automotive industry is home to some of the most impressive and exciting technological advancements of the last century. But with each new feature and enhancement, the owner's manual grows in size and complexity. And if you're not a car enthusiast, even the simplest of car maintenance tasks can be very overwhelming. Mechy is an innovative app that can make any car owner a mechanic. Instead of thumbing through a dense instruction manual, users can simply point their phone at their car and view the overlaid digital information. This can help them perform simple maintenance tasks such as oil changes or filling up windshield fluid simply place the mobile camera in front of your car engine to let the app identify all the parts. Identified parts will be shown in real-time. Once you have understood the way to perform a task you can keep your hands free and solve the problem.

**Keywords:** Augmented reality.

## 1. Introduction

The automobile industry has now evolved to be an unavoidable part of our life. It is used in many other sectors of the economy making it one of the most beneficial factors of human life. As a result, there are many maintenance workshops opened up for the same. But we know we must be self-sufficient always and must be ready to face any situation.

The study by Fox News [1] tested the knowledge of car users on their cars. This study stated that almost 36 percent of people do not even know how to fix a flat tyre.

In another survey conducted by Cooper tires, they found out that nearly half of the car owners in America are not sure if they would be able to change the engine oil. A similar other survey showed that people are also not aware of the type of oil needed for their cars and some don't even know how to jump-start the car battery.

Also in a survey conducted by the Fox News [1], it showed the mentality of the people towards car maintenance. It shows over 54 percent of people feel uneasy when they are dealing with a car mechanic. Four in ten Americans refuse to take a car to mechanic thinking about the huge deal of money for even small maintenance.

Some other results of the survey are shown below:

- 47 percent are extremely confident they could jump-start a car.
- 48 percent are extremely confident they could replace their windshield wipers.
- 39 percent are extremely confident they could fix a flat tyre.
- 37 percent are extremely confident they could replace their car's air filter.
- 37 percent are extremely confident they could replace a fuse.
- 33 percent are extremely confident they could change their car's oil.

These surveys show that in the modern world, one must know the basics of everything to survive. If not one can be easily tricked. Even for a car user, he must know the basics of the car if he wants it to be in a good condition and if he does not want to be tricked. The mechanic can trick the car users by mentioning any amount for the car maintenance if the car user does not know the basic operations. This is where the car user manual comes to the role. It is now necessary that a man must know the basics of the car if he wants to cope through any extreme situation. Even if the car broke down he must, to an extent, be able to do the basics that must be done to keep the vehicle on the run. But as we know the car user manual is tiresome work. It takes up both time and effort to a great extent. That is where our app takes up the role.

The main objective of our project is to make the car user self-sufficient and to help them overcome the emergency. Our app has a digitalized car user manual which helps them to get to the part more easily and faster. We have a real-time display of the basic operations that a car user must be aware of such as how to change the engine oil, how to change windshield fluid etc. These are done in real-time so that the user can get a clear view of how the operations are done.

## 2. Related Works

The BMW Augmented reality car repair [2] is an AR Smart glass that allows the user to see through the engine of BMW

and parts of it will be highlighted so that you can spot common mechanical problems. The main problem with this product was that we needed to have additional equipment. We have Hyundai Virtual Guide [3] is a mobile application that helps to detect the parts easily. This reduces the problem of the BMW Augmented reality car repair as it is a mobile application. In the application, instead of going through the dense manual the user can just point their mobile to the car and get a view of the overlaid digital information. This app is also useful for the interior of the car. We have the I-Mechanic [4] app which is similar to the Hyundai Virtual Guide. It pinpoints out the important aspects of maintenance. The Genesis AR Manual [5] helps the users in much more simple operations such as how to connect the phone to the Bluetooth of the car, what warning indications mean etc. Meanwhile, the AR capabilities allow the user to point their smartphone or tablet at the engine and receive step-by-step instructions to help check the oil level or top up washer fluid.

### 3. Proposed Method

As we have seen above there are many existing solutions but they all have drawbacks at the same time. Existing systems are either costly or they would need an additional tool. When a common man needs help these apps would help only if the man is equipped with certain tools the apps require? So it is unreasonable to carry these tools around all the time. So our system helps in reducing that burden. The main function of the feature “Scan” of the proposed app is depicted below:

#### A. Engine identification

Scanning is done by the user when he needs to know the parts of the engine. The user uses the app and mobile phone camera to identify the engine and the parts. The user just has to point the camera to the engine of the car. After recognizing the engine and the engine parts using augmented reality 3d objects are superimposed on the camera view of the user.

#### B. Display of instructions

The user can tap on the 3d objects to see the options they have with the indicated engine parts. By selecting the desired option or maintenance task the user can view the instructions by 3d animation and text display in the real-time camera view. This helps the user to understand the procedure for the maintenance task better.

#### C. Video

If the user is still not satisfied with the service he can view a video demonstration of the selected maintenance task overlaid on the camera view from an Internet source or early download videos where a clear description of the solution will be given. Now, this makes it easier for the user.

#### D. Additional options

In the additional option, a user can find the nearest workshops from his current location can be viewed. This helps the person to quickly find the nearest one and reach there.

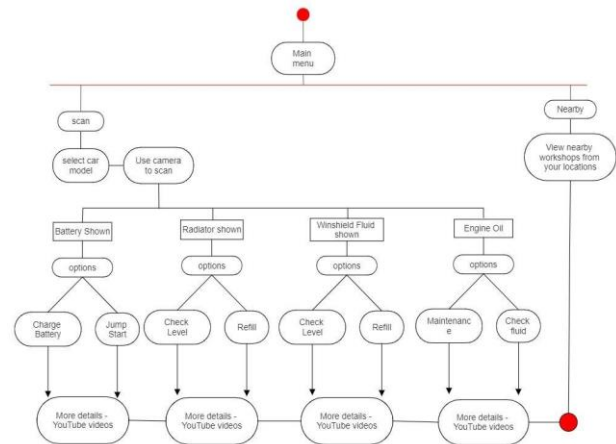


Fig. 1. System design

Fig. 1 shows the overall design of the project. There is a main menu that has the options scan, nearby, and cancels. The cancel options exit out of the main screen. The nearby options show the location of the nearest petrol pumps and the nearest workshops. The Scan module uses the camera to scan the engine part of the car. The user has to just point the mobile camera at the car engine and the engine parts will be labelled real-time. Here there are mainly four parts labelled. Battery, Radiator, Windshield fluid, and engine oil. Now there are options under each engine part. Selecting these parts gives us a detailed step by step procedure to do the task. Now if you are not satisfied with this there is another option to get more details which is a YouTube link that helps in understanding it better.

### 4. Software Implementation

Image Recognition is used to identify the engine and engine parts. For this objective, we are using Sense 4.0 SDK from Easy AR. The Sense 4.0 SDK is bundled with the app. Therefore, the image recognition is done on the device which is running the app so there is no need for an Internet connection or any other devices, users just have to open the scan screen and point the camera to the vehicle engine. Also, all the engines of a particular model of a car look the same, so we don't need pictures of thousands of engine and engine parts to train the image recognition model. This makes our app easily expandable since we can add more models of the car without the large time and computation consumption.

After the image is recognized, the parts will be indicated by real-time Augmented Reality labelling on the user's smartphone screen. This feature is implemented with the help of sense 4.0 SDK and Unity Game Engine. Unity provides powerful tools to make rich, deeply engaging AR experiences that intelligently interact with the real world [6]. The possible maintenance tasks are shown using real-time 3D object animation with the help of the unity engine.

After labelling parts, the user can select a part to know about the maintenance tasks that can be performed on it. The instructions are already pre-defined and can be shown

repeatedly. The instructions used are the same as the instructions given in the company user manual.

The nearby mechanic workshops to the user's current location are shown with the help of google maps and the GPS sensor of the phone.

### 5. Result

The presentation model deals with the specification of the visual forms of UI objects and their layout as a whole. To establish a presentation model of a complex UI with multiple constituents, space needs to be divided into smaller rectangle areas to accommodate particular presentation objects. Here, mainly Augmented Reality (AR) is being applied which is all about superimposing the computer-generated images on top of the view of reality, thus creating a composite view that augments the real world.

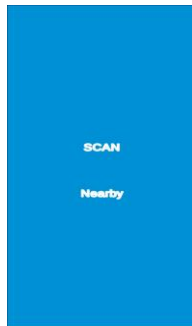


Fig. 2. Home page

Fig. 2 shows the first interface of the app, with the two main modules being shown first which are - the SCAN module and the NEARBY module.



Fig. 3. Labelled engine parts

Fig. 3 shows the important engine parts being pointed out by using the mobile phone camera. The important components include car battery, engine oil compartment, windshield fluid compartment, and the radiator. The phone camera is turned on only when selecting the SCAN option.

Fig. 4 shows the instructions for each component. These instructions appear only after selecting the required engine part to be repaired on. Then these instructions can be viewed step by step in accordance with the user's convenience. At the end of displaying the instructions, YouTube video links are provided for more reference.



Fig. 4. Instruction on the selected part

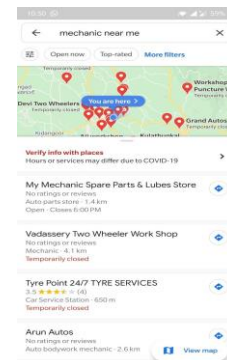


Fig. 5. Nearby petrol and workshops have shown

Figure 4 shows the second module - NEARBY module. On selecting this option, it directs to the google maps interface to view the nearest workshops or service stations from the user's location with the help of the GPS sensor present in the mobile phone.

### 6. Conclusion

Today's modern world is in search of any technology that can be readily available beforehand to satisfy their daily requirements, be it in case of food, shelter, transportation, and others. In the transportation sector, people mostly prefer or depend on their motor cars to travel. But in case of breakdowns (major and minor), it becomes much difficult for them to travel or to depend on someone else for their vehicles. In these situations, our idea gives a huge benefit for the car owners to fix their vehicles by themselves even if one has little knowledge about vehicle maintenance. The car owners only need to use their mobile phones and install the software and scan their car engine using a mobile phone camera. The software provides the basic set of instructions for the maintenance of important car components which can be easily performed by the car users. The car users also find it beneficial as different car models are added to the software and instructions are given specifically of each car model. The car owners are also provided different videos for further understanding of the operations needed to be

performed. This app is also much user service friendly by providing the nearest locations of all mechanic stations or workshops with the help of GPS service. Altogether, this app provides a much easier, digitalized, time-efficient, cost-efficient access to a car owner's manual and the automobile sector would be benefited by the services provided for each car user as today's people are much faster and busier to perform their daily activities.

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