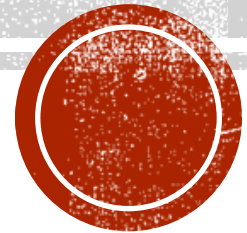


# **NURBS AND CAD MODELLING FOR VR VISUALIZATION OF CAR PARTS FUNCTIONALITIES**

Case study on Bachelor's Thesis

by

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# INTRODUCTION

- This project centers on the integration of Non-Uniform Rational B-Splines (NURBS) and Computer-Aided Design (CAD) techniques, strategically implemented to enhance Virtual Reality (VR) visualization of automobile functionalities.
- The primary objectives are to elevate user experience, improve design accuracy, and foster a holistic understanding of automotive products. By seamlessly combining NURBS for intricate surface modeling using Unity and Blender and CAD for precise design representation.
- This integration is poised to revolutionize how we conceptualize, design, and comprehend the functionalities of automobiles, promising a substantial advancement in user satisfaction and design precision.

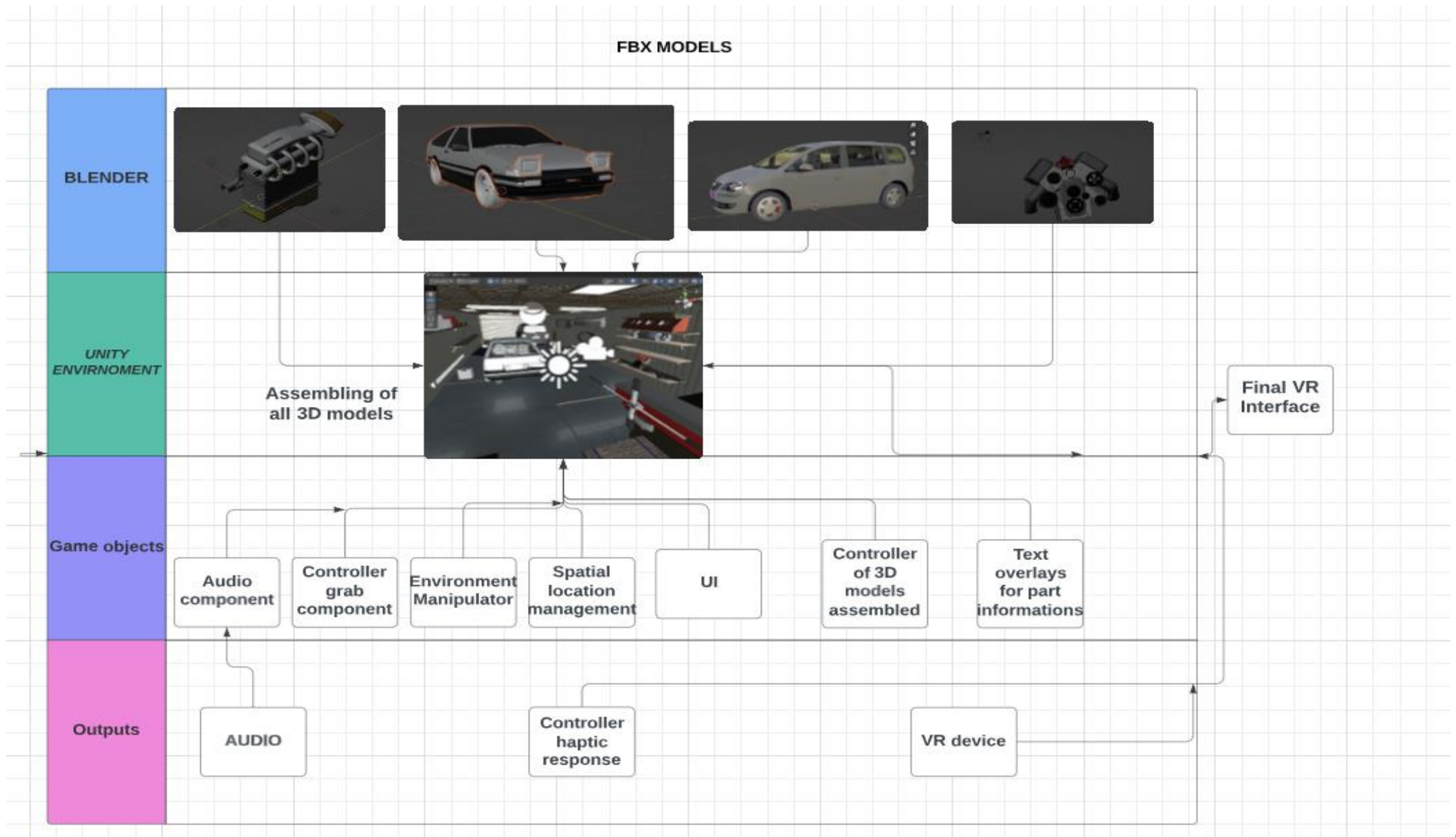


# SIGNIFICANCE

- The current landscape of automotive visualization faces challenges in providing an immersive and precise understanding of automobile functionalities. This limitation hampers user experience, design accuracy, and overall comprehension of automotive products. The absence of a cohesive system that effectively combines NURBS for intricate surface modeling, CAD for precise design representation, and VR for immersive visualization hinders the advancement of automotive engineering standards.
- Addressing these challenges requires the development of a comprehensive solution that bridges these technological gaps, providing a transformative platform for enhancing user engagement, achieving unparalleled design precision, and shaping the future of automotive visualization.
- Knowing the car well by means of this VR visualization techniques will get more people interested in the car(i.e attracting the customers). Thus it serves as a good business strategy to get more reach to the target audience.



# SYSTEM DIAGRAM



# IMPLEMENTATION

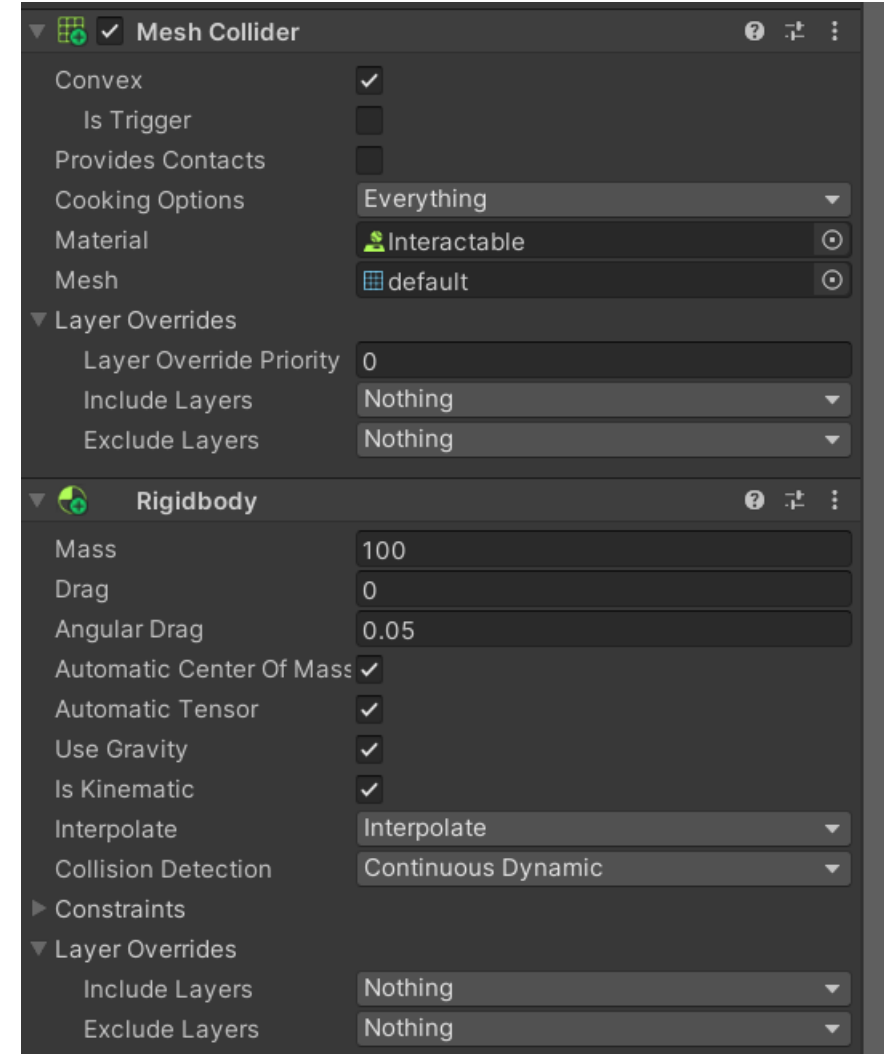
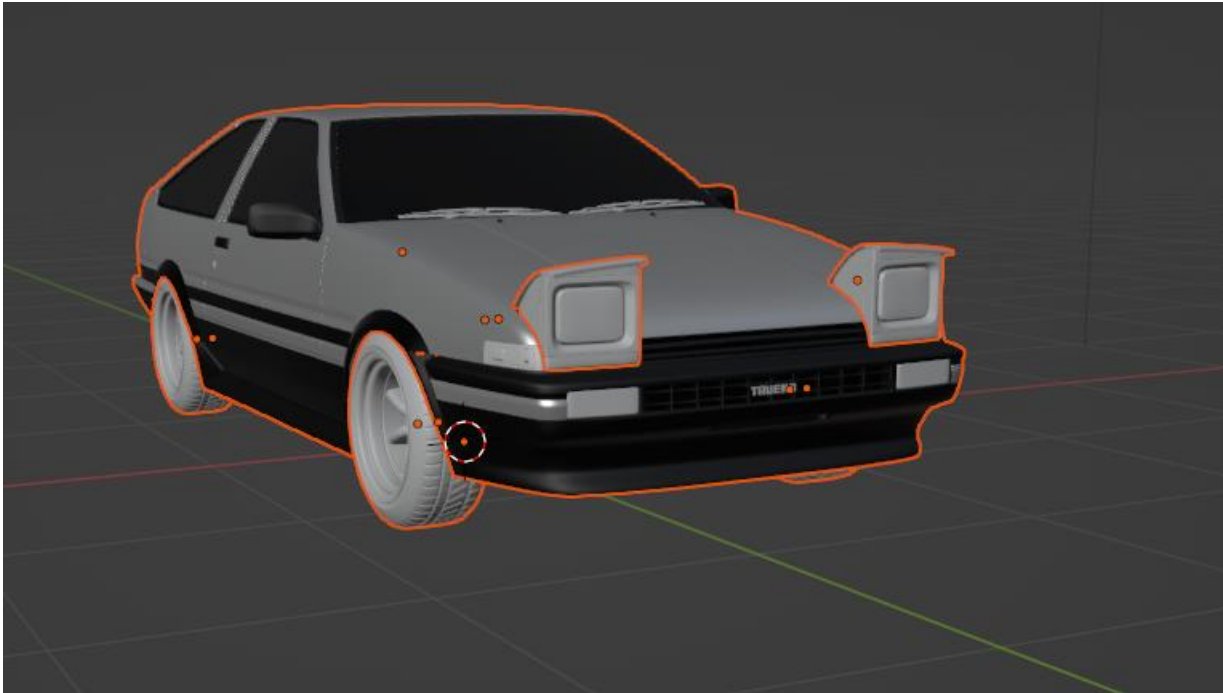
- In Blender, the Bezier Curve tool and Bsurfaces add-on are powerful tools used for NURBS (Non-Uniform Rational B-Spline) modeling and CAD (Computer-Aided Design) tasks.
- The Bezier Curve tool in Blender provides a straightforward interface for creating and editing curves.
- the way to import NURBS & CAD models into a Unity VR project is from the beginning of exporting your models from Blender at FBX or OBJ format.
- In this research project, the car model is disintegrated into around 30 different sub-components, each of which is accessible by using a VR controller inside the virtual world



- Furthermore, the corresponding boxes are superimposed to contain exhaustive textual explanations of the selected part to increase comprehension and participation. TTSMP3 system which is based on AI voice generation technology has been applied to transpose text-based contents into audible speeches.



# IMPLEMENTATION WITH RESULTS

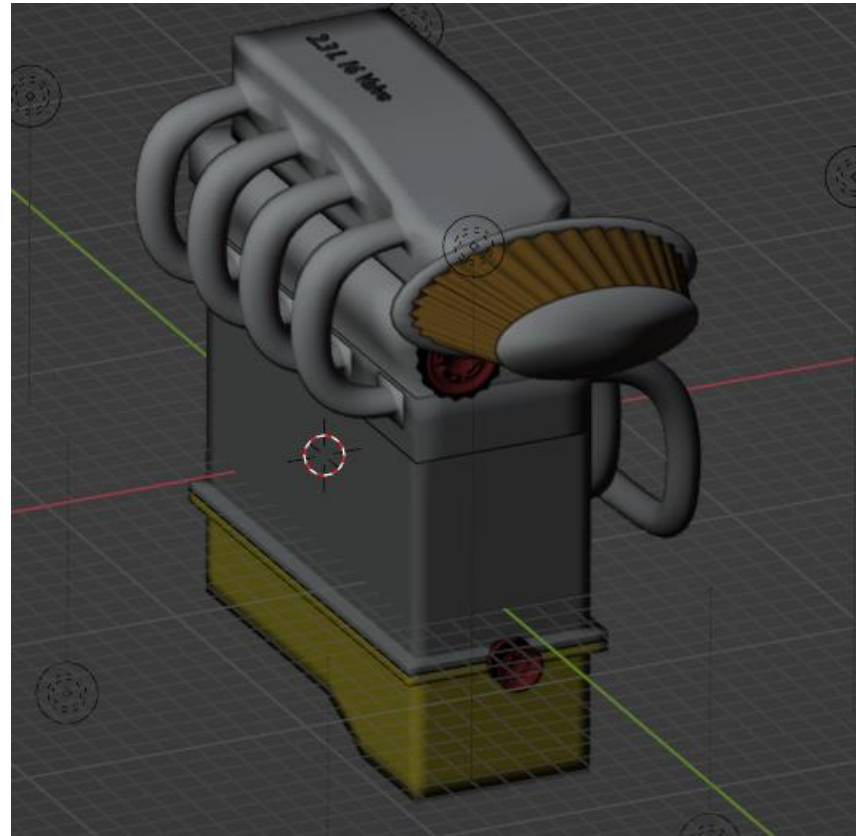


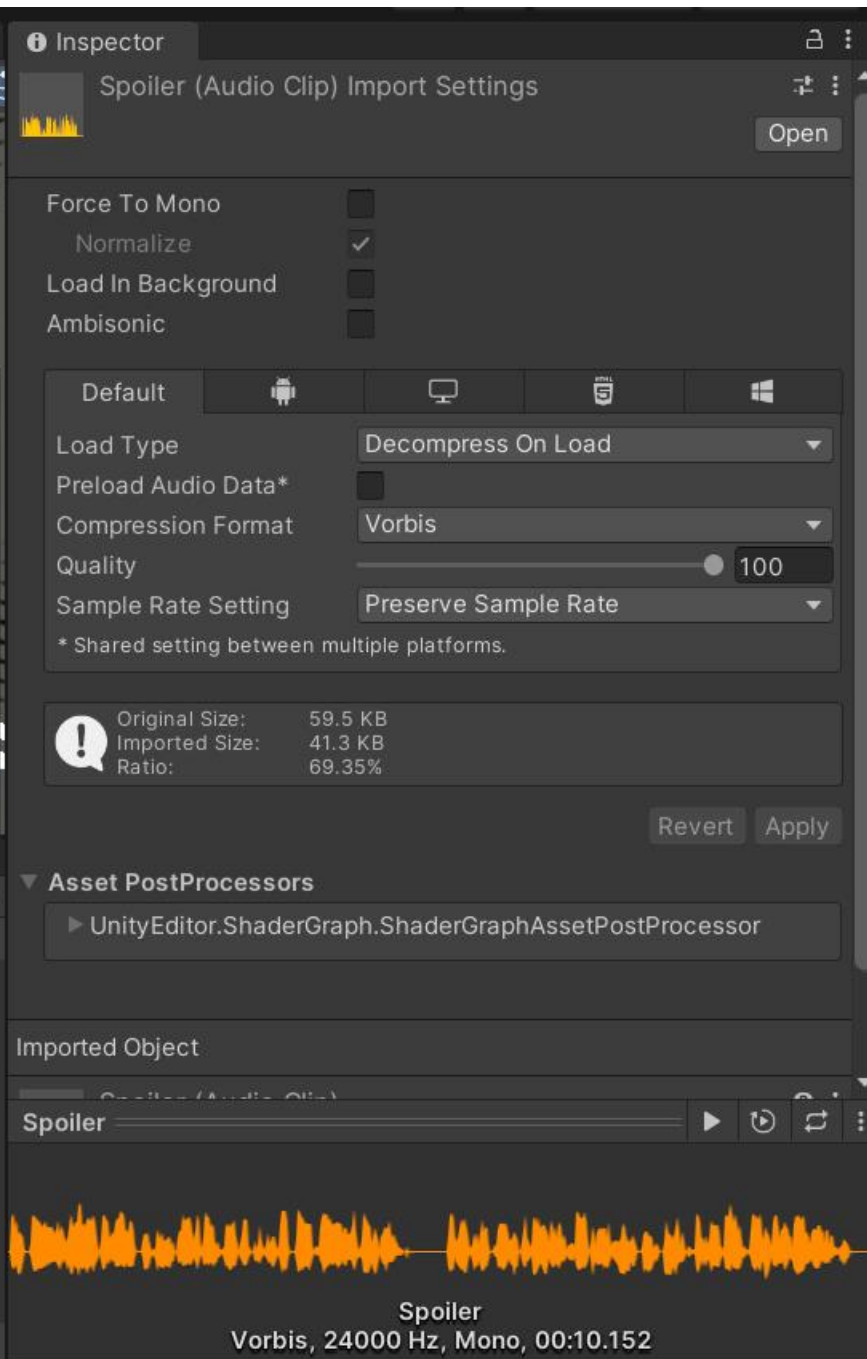
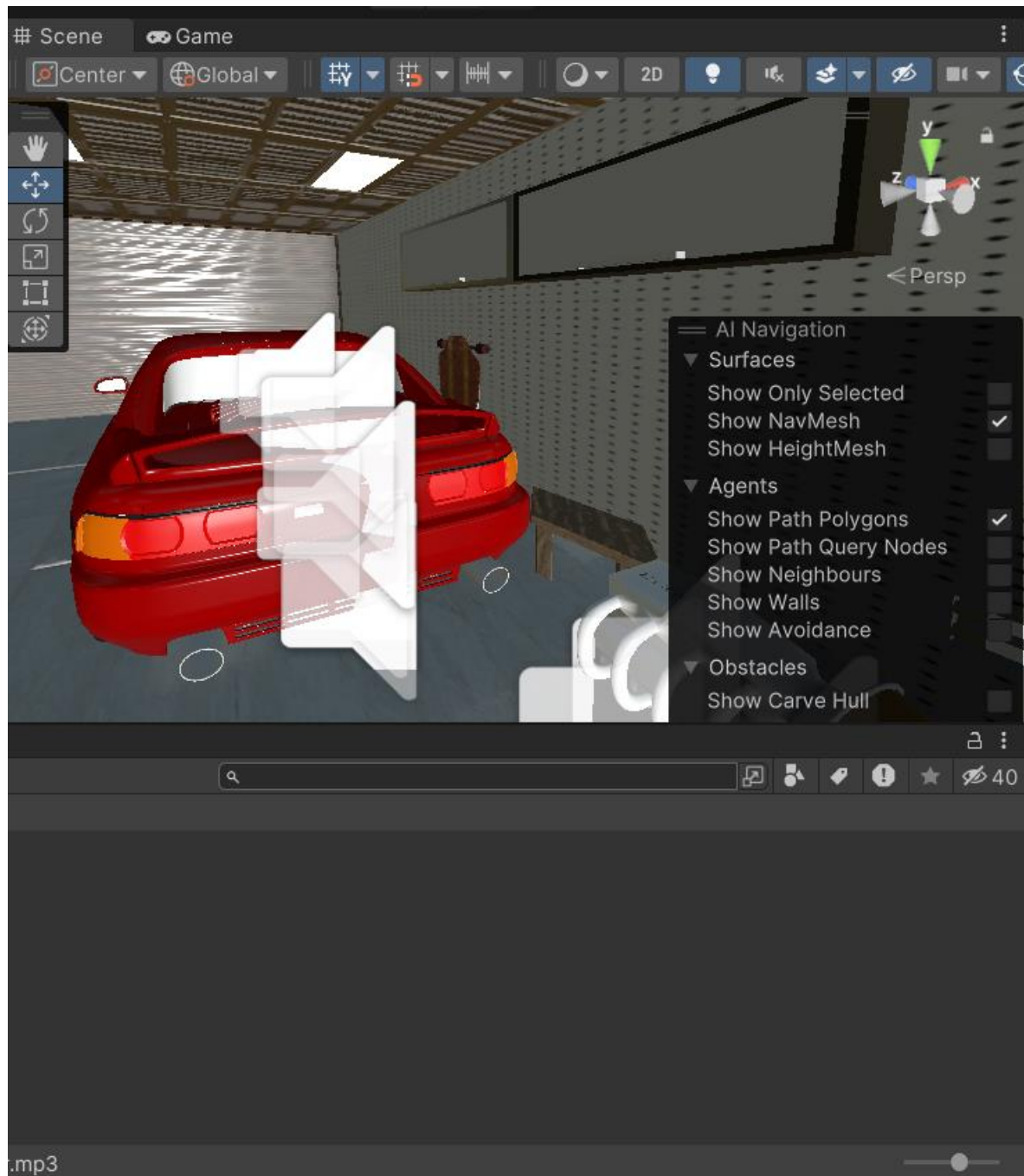


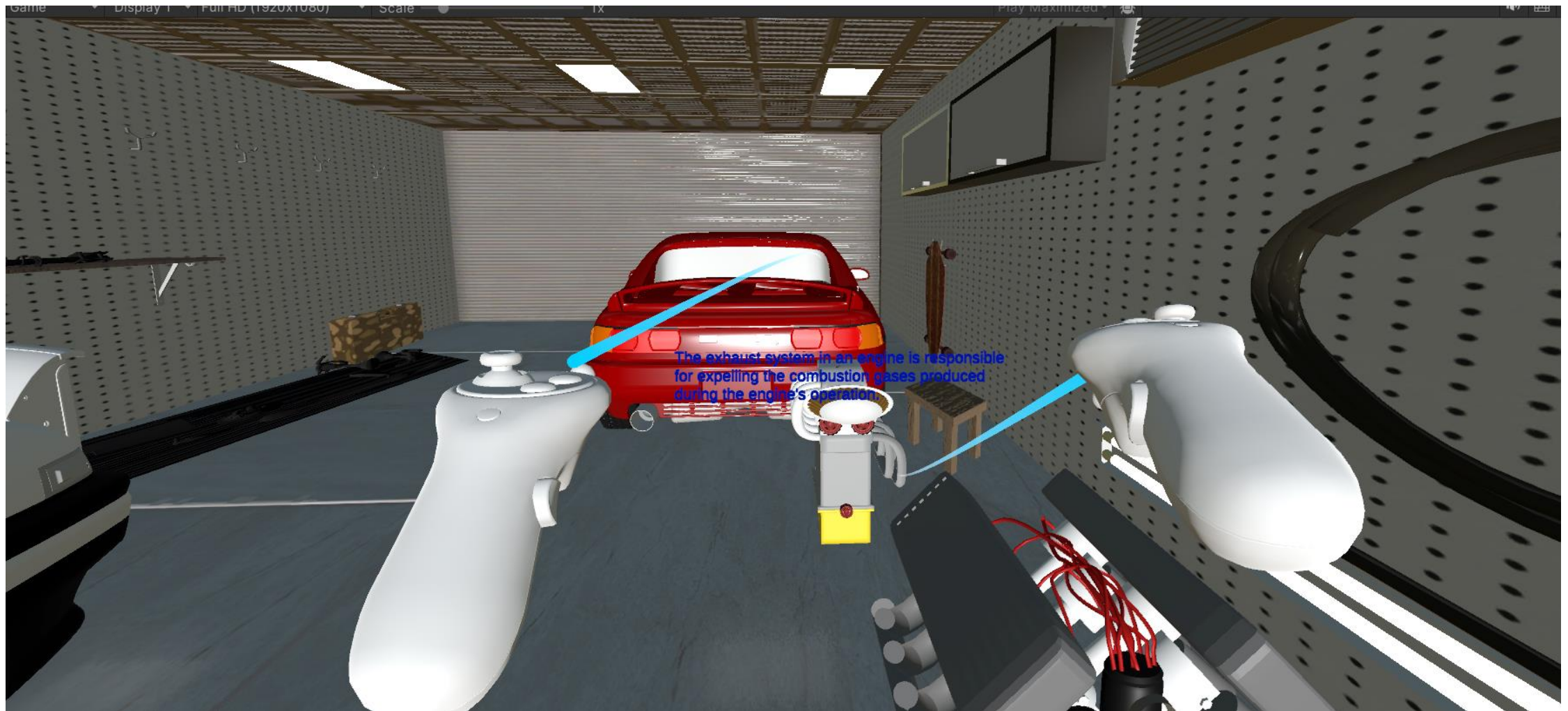




Car parts have been split into multiple separate objects to interact with multiple parts and also modelling simple piston gas engine and 2.3 16L valve engine. The overall design accuracy true to life has been tried and achieved to an extent. Further comparison will get us closer to enhancing the design and getting much more detail.









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