

## SUMMARY

Building a self-driving car requires multidisciplinary collaboration from mechanical to software engineers. Test bench development purpose is to contribute to the project's final goals to create a digital twin of ISEAUTO. With the digital twin of the propulsion drive, it will be much easier to test the performance of the vehicle with different loads and conditions.

The set goal for creating a spatial model of propulsion drive is achieved in my opinion. The modelling process of the propulsion drive was divided into five parts. As four different part's of drive: motor, reducer, frame and bridge girder was scanned, tasks were to extract their geometries one by one. The fifth part was to model the supporting part and assemble them accordingly.

Most of the work was done using scanned parts' STL files. This file format represents the mesh of the scanned object as the connection of the triangles, tessellations. Two points doted during the scanning are connected in line, two lines then creating surfaces, from which whole mesh is created, engulfing the whole geometry of the object. The parts are modelled using these surface by extracting the coincident planes and shapes.

STL files usually contain a lot of errors, missed out areas or patches. As the scanning and post-processing are not yet absolute, neither are the modelled parts. The final assembly of the propulsion drive is not 100% accurate and precise, but it is in the most attainable vicinity. Deviation analysis of each part shows that the errors are no greater than 10mm. For analytical analysis and further educational purposes, I hope it will still be sufficient.

It was quite a challenge to work on mesh files using SOLIDWORKS, as it is by far not the best tool for reverse engineering. Geomagic software was the finest and most effective discovery while working and researching the field. It was without exception vast learning experience and thorough practice of old and new methods of 3D modelling.

For further development of the project, the next step will be to convert the existing model into a suitable format file for importing in the UNITY environment. For which Blender software are set to be used as the most accessible and easy medium. After what it will be possible to integrate it into the virtually created campus environment and will be available for testing. The final aim is to apply gathered results in improving Digital Twin of propulsion drive of ISEAUTO, as well to use the model for educational purposes.