European Project Semester

PROJECT OUTLINE

Project dates: March 2023– June 2023

Title: Printed horse saddle tree

Project activity areas:
Mechanical design, CAD Surface design, 3D Scan, 3D Printing, Simulation, Mechanical tests

Keywords:
Horse saddle tree, mechanical design for 3D printing, Onshape CAD, 3D printing

Tutor's name and coordinates
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Project origin
Response to a request from "Bien en selle"

Project technical background:

A horse saddle is composed of a seat and an interface with the horse called "Saddle tree" The function of this part is to spread the static and dynamic loads on the horses back. Different techniques are traditionally used to manufacture saddle trees:

- Wood tree: the frame is machined from a layered wood block. This tree can be customized to a certain extent, therefore they are used for custom saddles. Unfortunately, they are heavy, expensive, and the manufacturing process is not widespread. The seat is built afterwards by the saddler from an assembly of longitudinal and transverse straps stapled on the tree.

- Plastic tree: the tree is molded and the seat is included. This tree is cheap, light and rigid. The process allows mass production and low costs. The drawbacks are the bad comfort of the seat and impossibility to customize. The number of options is limited (usually to seat size) due to the cost of each new mold.

- Strapped seat plastic tree: the tree is molded without the seat, which from straps stapled on the tree (same as wood tree). This tree is lighter and more flexible than the previous one, more comfortable due to the strapped seat, but has the same drawbacks as the previous one in terms of customization. Every new version requires an expensive mold.

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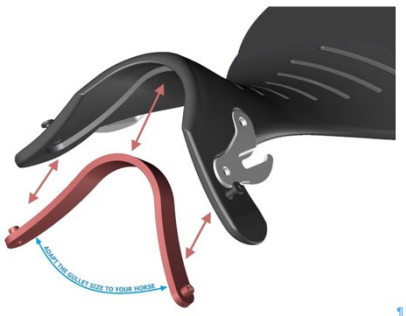
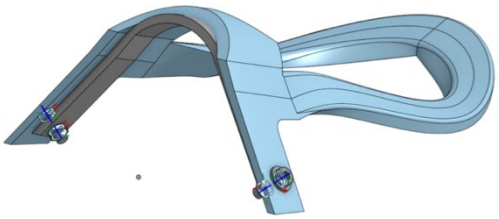
This last type of tree is the reference of the proposed work, the one we will try to replicate with new manufacturing techniques (3D Printing)

The front part of the tree, called the gullet, which lays just behind the horses shoulders, is a V or U shaped metal part which can be changed to fit the horses characteristics. This has to be possible with the new trees, which means flexibility in the front part to accept this change of angle.



The main driver of this study is to obtain a plastic tree from additive manufacturing to keep the interesting characteristics of the last one (weight, comfort) with a full range of customization possibilities (length, width, shape, angles etc) respecting the criteria of mechanical resistance and fatigue. . The idea would be to manufacture a tree which matches the horses and riders characteristics, then build the saddle from it.

Last semester, an EPS group worked on the subject and created a first digital model and carried out tests on printed parts. A first set of encouraging results regarding the compatibility of 3D printing materials with the manufacturing of a tree and the use of staples to attach straps and leather. This project is therefore the continuation of this work.



Studied topics:

- Needs study of this new project
- Carry out a critical study of the CAD model
- Design on “Onshape CAD” a new parametric tree The minimum set of parameters will have to be determined, and the design will have to be adapted to both the material used and the manufacturing technique (adaptation of thickness for example)
- Evaluate the mechanical characteristics of the new tree, by simulation
- Evaluate the mechanical characteristics of the new tree compared to the reference
- Prototype one or more trees using additive manufacturing to validate and test the concept