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Mémoire de Master

Projet Startup

Rapid Manufacturing and Reverse Engineering: Case Study and Design of Mold for The Fairing of a Scooter made in Algeria.

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Abstract:

The goal of our project is to design a plastic injection mold for the fairing parts of a scooter produced at the CYCMA plant in Guelma, so that it can be produced locally and allow to increase the integration rate of the scooter.

Our reverse engineering work will encompass the entire design process that begins with:

- Dimension of the model by 3d scan.
- Reconstruction of the digital model.
- Preparation of the functional specifications.
- Design of production tools.

Keywords: Rapid manufacturing, Prototyping, Reverse engineering, Mold, Plastic injection, CAD, 3D scan

Résumé :

Le but de de notre projet est de concevoir un moule d'injection plastique pour les pièces de carénage d'un scooter produit à l'usine CYCMA de Guelma afin qu'il puisse être produit localement et permettre d'augmenter le taux d'intégration du scooter.

Notre travail de retro ingénierie englobera tout le processus de conception qui commence par :

- Prise de dimension du modèle par scan 3d.
- Reconstruction du modèle numérique.
- Etablissement du cahier de charge.
- Conception de l'outillage de production.

Les mots clés : Fabrication rapide, Prototypage, Rétro-ingénierie, Moule, Injection plastique, CAO, Scan 3d

ملخص :

الهدف من مشروعنا هو تصميم قالب حقن البلاستيك لأجزاء هيكل دراجة يتم إنتاجها في مصنع CYCMA في قالمة, من أجل أن يمكن إنتاجها محليًا والسماح بزيادة معدل تكاملها.

سيشمل عملنا بالهندسة العكسية عملية التصميم بأكملها التي تبدأ بـ:

- تحديد قياسات النموذج بالمسح ثلاثي الأبعاد.

- إعادة بناء النموذج الرقمي.

- وضع دفتر الشروط.

- تصميم أدوات الإنتاج.

الكلمات المفتاحية : التصنيع السريع، النماذج الأولية، الهندسة العكسية، القالب، الحقن البلاستيكي، CAD، المسح ثلاثي الأبعاد

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General Introduction:

The content country Algeria is trying to grow up and develop its production and technology. One of its industries is motorcycle factory CYCMA in Guelma. Cycma is the offshoot of the National Mechanical Engineering Society, Sonacome. The role of this company Cycma consists in the production, distribution and development of two-wheelers, motorized and bicycles, and tricycles, for the Algerian market. General management and production were installed in Guelma, with five points of sale spread across the country. The center in Guelma was built by a German company and finally received in 1978 [1]. One of their projects is a scooter and all parts of the fairing are imports from China. They decide to increase the integration rate of the scooter. so, they contracted with the ministry of higher education which contacted our university setif-1 Ferhat Abbas to design a plastic injection mold for the scooter fairing to start produce it locally here in Algeria.

The motorcycle factory CYCMA doesn't have the numerical model, that means, there is a need to obtain the 3d model using reverse engineering, which allowed us to have our final model where we followed the steps: acquisition and preparation of point cloud, creation of the mesh, treatment of surfaces, filling holes, creating missing edges, creating 3D feature model. The 3D scanning process is carried out in mechanical research center in Constantine, which has the necessary equipment (3D measuring arm and Polyworks processing software).

The second part of our work consists of designing the mold of the model that was scanned. And the mold was designed according to the conditions set out in the functional specifications.

This thesis is divided into four chapters, where the first is covered the definition of the reverse engineering technique and the specifics of the 3d scanners with the different softwares adding the steps of treating scan data until obtain CAD model. Next, the second chapter detail rapid manufacturing and its types and application, then in the third chapter of plastic manufacturing processes, which talk about the different processes and the most using and focused on plastic injection molding. On the end, last chapter includes all the steps of exporting the digital model from the scan data and also all the steps of mold design up to the technical files which are detailed in the appendix.

Our project, is within the framework 1275 of the PFE-Startup Program under the name of rapid manufacturing and reverse engineering, which is a mechanical service special for creating custom parts and offer various mechanical services such as reverse engineering, mechanical design and more.