

Advanced 3D industrial inspection system that applies machine vision to quality control

Summary

Profile type	Company's country	POD reference
Technology offer	Spain	TOES20230214025
Profile status	Type of partnership	Targeted countries
PUBLISHED	Commercial agreement with technical assistance	• World
Contact Person	Term of validity	Last update
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General Information

Short summary

A Spanish ICT research center offers an inspection system that applies machine vision to quality control. A solution easy to integrate in production processes, capturing images of an object while in free fall to detect any deviation by means of surface, volumetric and metrology tests. The system also classifies a mix of objects into expected and non-expected ones. They look for partners to establish license agreement, manufacturing agreement, or commercial agreement with technical assistance.

Full description

A Spanish ICT (Information & Communications Technologies) research center offers an inspection system that applies machine vision to quality control. Industrial inspection is a field where accurate and fast systems are important to achieve high quality without compromising the production speed. Today the process of verification of product quality is incomplete or requires mechanical handling, with the associated problems (hiding of some faces, increase of the inspection time, adaptation to each manufactured part, etc.), costs and delays. The 3D industrial inspection system offered proceeds in three simple steps:

1) Capture

The device contains a number of cameras distributed in a sphere. The special location of the cameras is optimized to

obtain the best reconstruction fidelity. It captures the objects without contact or manipulation, and without hidden surfaces: the part under inspection is dropped from the top, it falls freely and the images are captured simultaneously by all cameras, allowing the fast reconstruction of an accurate 3D model of the object.

2) Reconstruction

Once obtained all the images, a 3D reconstruction is performed. The techniques developed for this lead to a very efficient process that allows a very high throughput of the system.

3) Inspection

The tolerance is easily adjustable according to the quality parameters defined for each part or for each particular area of it, giving rise to the rejection of those objects that do not fit the required dimensional or surface standards.

The analysis of the production problems is made easier with an included application that, using a colour code, highlights the differences between the part and the reference model, allowing visualizing the errors that appear in an object. Different types of errors are shown in the user interface, in function of the kind of analysis performed. Thus, the complete set of results for an inspected object is a report composed with information on surface defect inspection, volumetric defect inspection and a checklist of geometric dimensions and tolerances (based upon GD&T standards).

Among the applications of the system, it can be highlighted: industrial inspection for quality control of products of any size, dimensional or surface control, fast acquisition of 3D measurements from real parts, etc., everything with low maintenance costs and high throughput.

There are many application sectors for the system such as plastic industry, food industry, packaging, electronics, automotive industry, pharmaceutical industry, ...

The research organization is mainly looking for industrial equipment manufacturers that can implement the product into industries. Different types of co-operation are possible: license agreement, manufacturing agreement or services agreement.

Manufacturing agreement: The Spanish centre will provide the software technology and the prototype to the collaborator, and will keep on improving it and its functionality. The collaborator will manufacture the physical part of the system (hardware). The collaborator will receive a % of the ownership of the final product.

License agreement: Once the product is industrialized, a collaborator is needed for the commercialisation and deployment of the system. This collaborator will charge to the client and the Spanish centre will receive a license fee for each deployment of the system. This license, and the potential exclusivity, will be negotiated with the partner, taking into account the market to be addressed. There is the possibility that the manufacture and commercialization is carried out by the same partner.

Commercial agreement with technical assistance: If the partner is interested in a specific analysis/inspection of a sample of products, the Spanish centre will perform a feasibility study before any other development/deployment project.

Advantages and innovations

3D inspection has several intrinsic problems related to the following issues:

- 3D parts of different size and shape.
- Need to control surfaces, volume, geometry, dimensions and tolerances.
- High manipulation costs.

Current solutions for 3D inspection could be classified into two categories:

- Active methods: fly time; structured light; modulated laser; conoscopic holography; CAT (computerized axial tomography).
- Passive methods: stereoscopy; photometry, unfocussing, etc.; outlines.

These current solutions have several problems:

- Inspection time / workload.
- Part positioning, which leads to mechanical manipulation.
- Uncompleted reconstruction.
- Cost and complexity.

The advanced 3D industrial inspection system offered by the Spanish ICT research center solves these limitations. Its main advantages are:

- Inspection of any object without manipulation, even parts that are now manually verified can be automatically inspected.
- Extra functionality of object classification, useful for separating a mixture of objects depending on their shape.
- Suitable for different part sizes (screws, springs, nuts, etc.)
- Models from CAD (computer-assisted design) design or self-learning (ML). It can control (2D and 3D) all object sides.
- Easily scalable solution.
- Adjustable tolerances: easy adaptation to particular size and precision needs.
- Adaptable design to configure useful volume and spatial resolution
- Fast process, the technology allows capturing as many objects as possible with the only restriction that no occlusions appear among them.
- Novel and unique patented acquisition device with a multi camera configuration.
- Novel and unique patented linear actuator for the feeding subsystem.
- Novel and unique patented optic and geometric calibration method for a multi-camera acquisition device (patent request already presented).

Technical specification or expertise sought

- Technology demonstrated in relevant environment with real parts from different tasks: classification, defect detection in engine parts and in dental prosthesis.
- Now working on the construction of a pre-industrial prototype to validate the technology in an operational/real environment.
- Looking for industrial partners to collaborate in the manufacturing, commercialization and maintenance, to reach end customers in the industrial sector.

Stage of development

Available for demonstration

Sustainable Development goals

• **Not relevant**

IPR Status

IPR granted

Partner Sought

Expected role of the partner

Type of partner sought: industrial equipment manufacturers from different application sectors such as: plastic industry, food industry, packaging, electronics, automotive industry, pharmaceutical industry, etc.

Activity of the partner: manufacturing of industrial equipments and their commercialization and deployment.

Role of the partner: implementation of the product into industries via:

- a manufacturing agreement, in which the collaborator will contribute to the final part of the industrialization process and the manufacturing of the physical part of the system (hardware) or
- a license agreement, in which after the product is industrialized it will be commercialized and deployed by the same or a different partner or
- a commercial agreement with technical assistance when the partner needs specific analysis/inspection of a sample of products. This can be carried out by the Spanish center in their facilities.

Type of partnership

Commercial agreement with technical assistance

Type and size of the partner

- **SME 50 - 249**
- **Big company**

Dissemination

Technology keywords

- **02003002 - Manufacturing plants networks**
- **01003015 - Knowledge Management, Process Management**
- **02003004 - Supply chain**
- **02003001 - Process automation**
- **01003001 - Advanced Systems Architecture**

Targeted countries

- **World**

Market keywords

- **08002005 - Machine vision software and systems**
- **02007003 - Operating systems and utilities**
- **08002003 - Process control equipment and systems**

Sector groups involved