



NON-CONTACT DATA TECHNIQUE

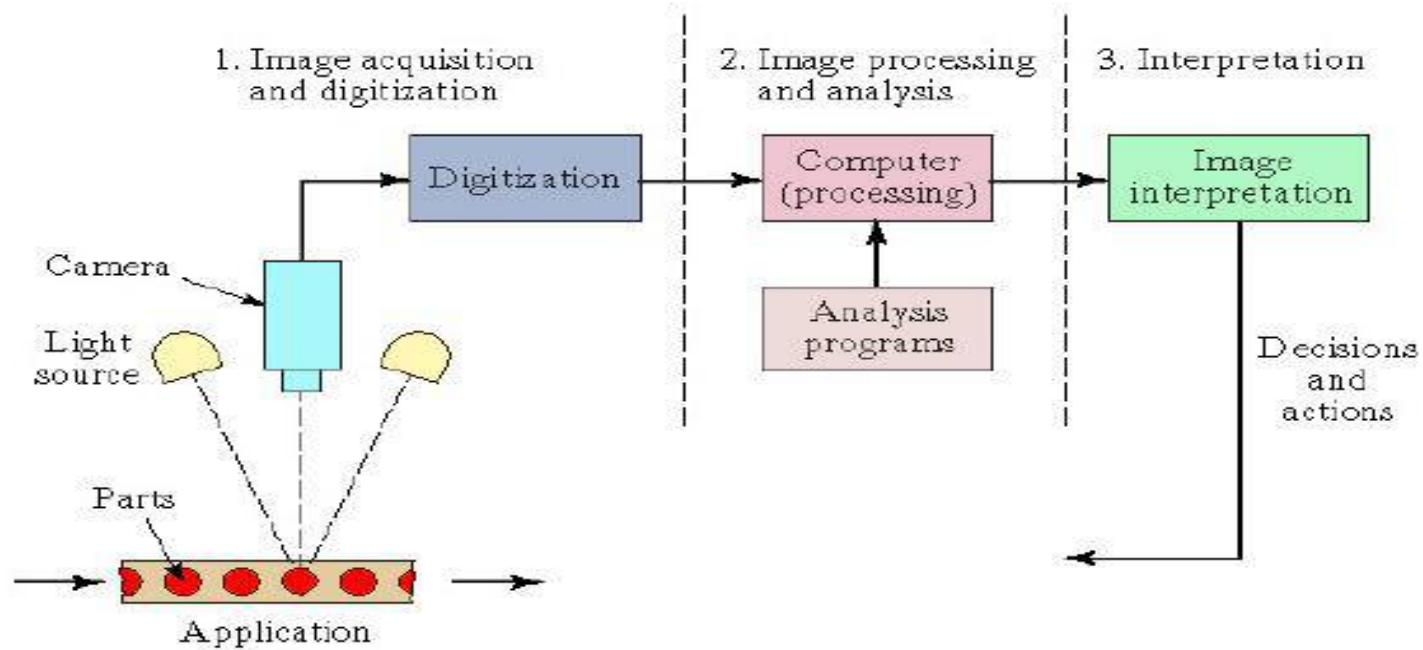
- Non-Contact data acquisition technology uses an energy source, such as laser, white light, microwave, radar, and ultrasonic sound, to obtain 3D data of an object without touching the surface of objects in the measurement.
- Two categories:
 - **Optical** uses light to finish the inspection
 - **Non optical** uses energy form other than light



OPTICAL INSPECTION METHOD MACHINE VISION

- It is **the creation of image** and the **collection of data derived from the image** and **subsequent processing and interpretation of data by a computer** from useful application.
- It is also known as **computer vision**
- **Machine vision has 3 functions:**
 - Image acquisition and digitization
 - Image processing and analysis
 - Interpretation

OPTICAL INSPECTION METHOD MACHINE VISION





TYPES OF NON CONTACT INSPECTION METHOD

Technique	Description
Electrical Field	An electrically active probe creates an electrical field which is affected by the proximity of an object to the probe. In typical applications, the object to be inspected is placed at a set proximity to the probe, and the effect on the electrical field is measured. This procedure is repeated at different distances from the probe, and results are compared against each other to complete inspection procedure.
Radiation	Uses x-ray radiation to accomplish non-contact inspection on metals and weld-fabricated products. The amount of radiation absorbed by the metal is measured and compared against standards. This allows metals that do not absorb sufficient amounts of radiation to be quickly spotted as flawed.
Ultrasonic Inspection	Uses very high frequency sound as an inspection mechanism. Methods can be either manually-performed or performed automatically. Automated methods include emitting ultrasonic waves from a probe and reflecting them off the object to be inspected, to create a sound pattern. This sound pattern can be compared against the sound pattern produced by an ideal object for inspection purposes. If the produced sound pattern matches the standard pattern the object passes the test; otherwise it fails.



ADVANTAGES & DISADVANTAGES

Advantages:

- No physical contact.
- Ability to detect colors.
- Ability to scan highly detailed objects, where mechanical touch probes may be too large to accomplish the task.
- Fast digitizing of substantial volumes.

Disadvantages:

- Possible limitations for colored, transparent, or reflective surfaces.



SURFACE AND SOLID MODEL RECONSTRUCTION

- One of the first steps in reverse engineering is to reconstruct the subject of interest from the data obtained by scanners or probes.
- The model reconstruction process can be divided into four phases:
 - Data acquisition
 - Polygonization
 - Refinement
 - Model generation



SURFACE AND SOLID MODEL RECONSTRUCTION

- New **data acquisition** is accomplished with various measurement instruments, such as a three-dimensional (3D) scanner or a direct-contact probe.
- The accuracy of the data largely depends on the reliability and precision of these instruments.
- The **Polygonization process is completed using the software** installed with these instruments.



SURFACE AND SOLID MODEL RECONSTRUCTION

- **Polygonization process** is often followed up with a refinement phase such as segmentation **to separate and group data point sets.**
- Related mathematical techniques include automatic surface fitting and constrained fitting are also used for **computer model refinement.**
- The details and quality of the final **surface models** depend on the data collected, the mathematical methods utilized, and the intended application.