

Modular Course D: Customization Engineering

Unit D2 – Scanning of Soles and Heels

Lecture D2.3 – Scanning of Soles and Heels



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T2.2 – Development of modular
courses and training
material.

D2.4 – Modular Course in
Customization Engineering

Lesson D2.3
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Scanning of
Soles and
Heels



Learning Objectives

- Explain importance of sole and heel scanning
- Describe suitable 3D scanning technologies
- Understand workflow: scanning → processing → CAD/CAM
- Evaluate challenges and limitations
- Apply scanning in customization and analysis

Introduction

Importance:

- Comfort, traction, flexibility, durability
- Stability, load distribution, aesthetics

Applications:

- Reverse engineering
- Customization
- Wear analysis
- Sports/fashion innovation

Scanning Technologies Overview

- Contact Scanners
- Non-Contact: Laser, Structured-Light, Photogrammetry, Smartphone LiDAR
- Pressure/Plantar Scanners

Laser Triangulation

- Accuracy: ± 0.05 mm
- Best for tread patterns
- Limitation: dark rubber, shiny surfaces



Structured-Light Scanning

- Accuracy: ± 0.1 mm
- Fast, handles complex geometries
- Widely used in manufacturing



Photogrammetry & LiDAR

- Photogrammetry:
cost-effective,
visualization,
less precise
- Smartphone
LiDAR: portable,
~1-2 mm accuracy,
limited detail



Workflow Steps

1. Preparation
2. Scanning
3. Merging
4. Mesh Processing
5. Measurement & Analysis
6. CAD/CAM Integration
7. Prototyping

Applications

- Reverse engineering
- Customization (orthopedic, sports)
- Wear & gait analysis
- Sports performance optimization
- Fashion innovation
- Sustainability and recycling



Advantages

- Detailed geometry capture
- Ergonomic improvements
- Supports customization
- Gait and wear analysis

Limitations

- Complex tread grooves need high-resolution tools
- Rubber/reflective surfaces distort data
- Smartphone scanning less accurate
- Worn/damaged soles harder to scan

Summary

- Scanning is key for performance, customization, and design innovation
- Structured-light and laser dominate for detail
- Smartphone LiDAR useful for quick prototypes
- Applications in sports, fashion, orthopedics, sustainability