Door Fitting Assembly Inspection System

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Industry: Automotive – BIW / Trim Line

Solution: Inline Machine Vision-Based Inspection for Gap, Flush, Fitment & Seal Verification

The Problem We're Solving

- Door misalignment leads to customer complaints

- Manual inspection is slow, subjective, and inconsistent

- Poor door fitting causes wind noise, water leakage, and aesthetic issues

- Rework and quality audits increase line-side delays

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Why Inline Inspection Is Critical
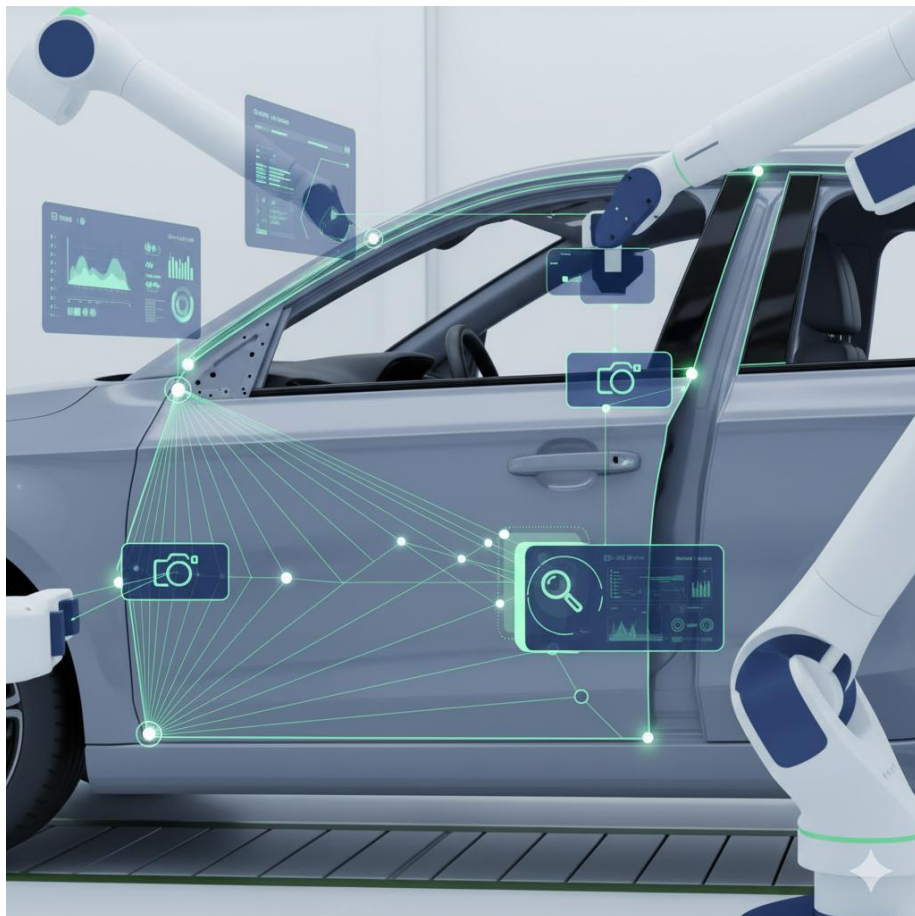
Tight tolerances: ±0.5 mm flushness

Catch defects before post-paint rework

Enables real-time corrections without dismantling

What Parameters Are Inspected

Gap & Flushness – Laser profiling

Hinge Position – Bolt presence and torque

Latch Alignment – Correct placement

Seal/Beading Presence – Full insertion

Aesthetic Check – Visual finish

Why is this inspection critical

Ensures consistent fit & finish, aligned with premium vehicle expectations

Detects issues like wind noise, leaks, and vibrations due to misaligned doors

Confirms that doors close securely and safely in real-world driving conditions

Helps avoid costly rework or post-sale warranty repairs

How does machine vision help

Gap & Flushness Check:

- Validates uniform spacing between door edges and car body
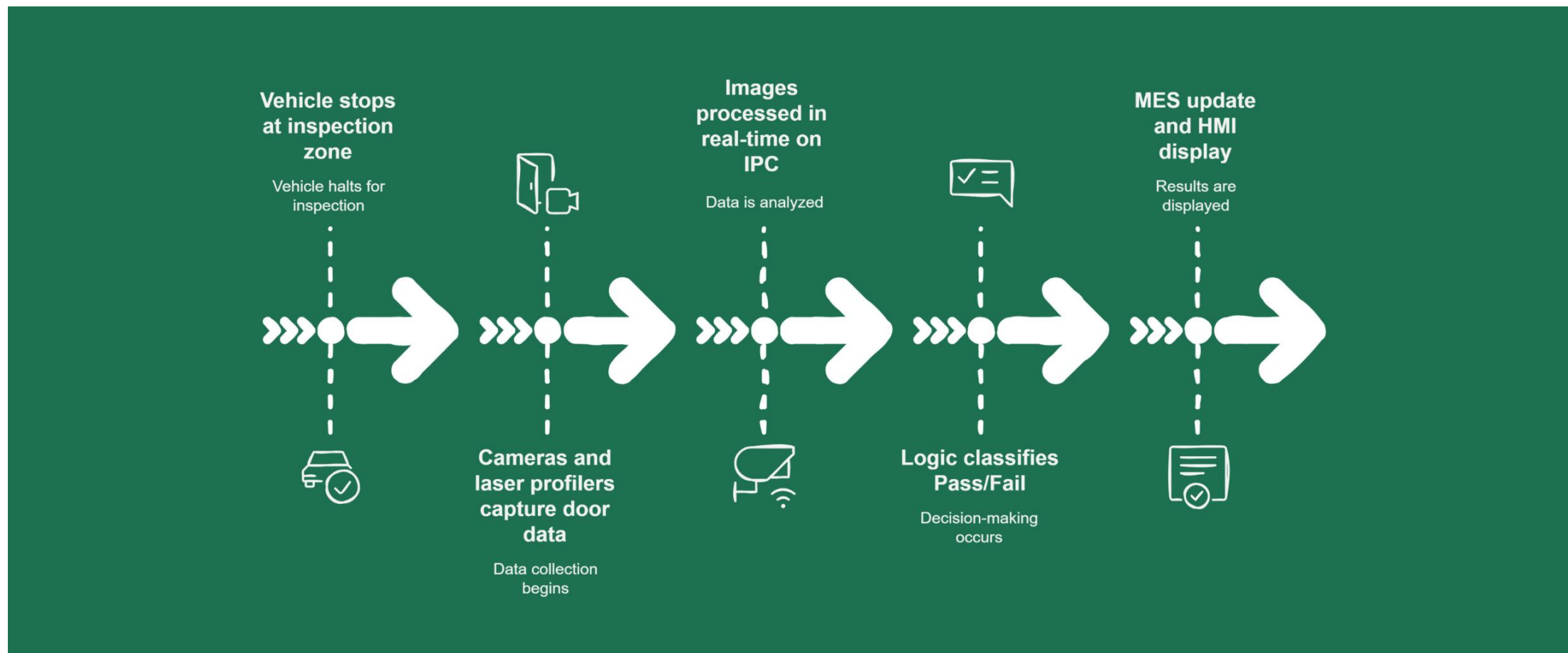- Checks surface alignment for aesthetic and structural flushness

Hinge & Latch Verification:

- Confirms proper positioning and torque of hinge bolts and latches

Seal & Weather Strip Validation:

- Ensures installation of rubber seals to prevent air/water ingress

How the System Works (Process Flow)

Vehicle stops at inspection zone

Vehicle halts for inspection

Cameras and laser profilers capture door data

Data collection begins

Images processed in real-time on IPC

Data is analyzed

Logic classifies Pass/Fail

Decision-making occurs

MES update and HMI display

Results are displayed
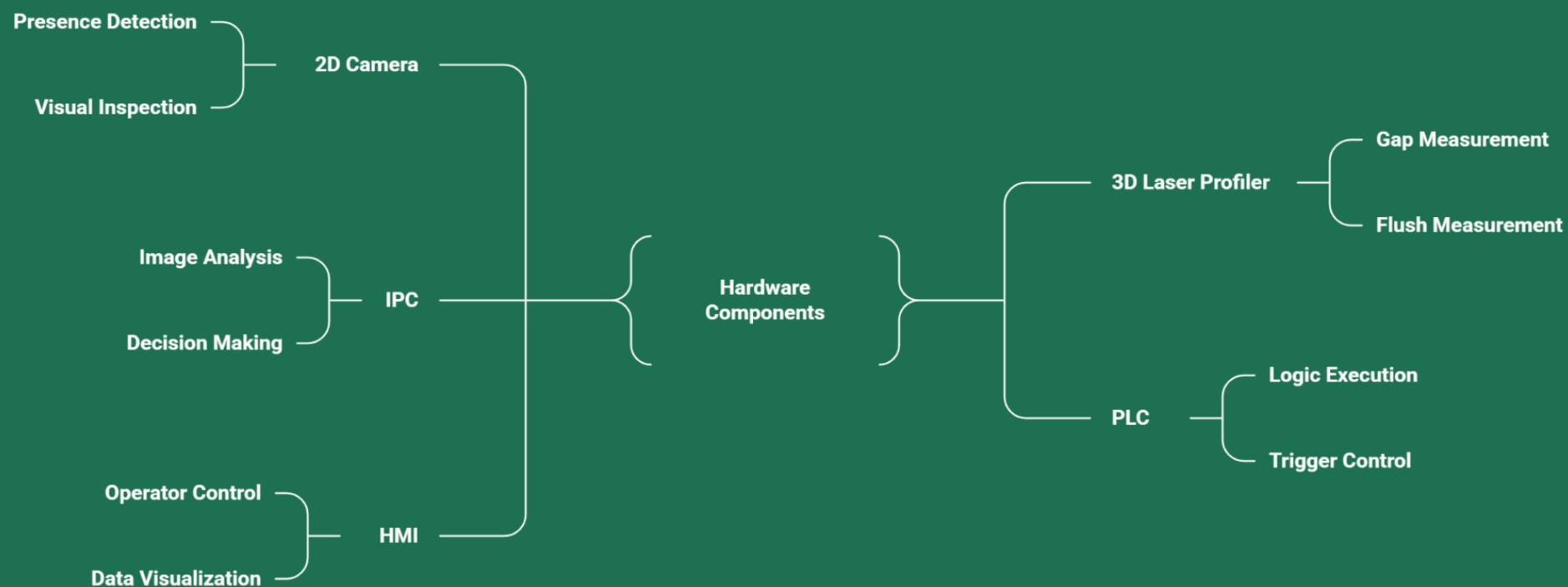
System Architecture

Cameras (2D) + Laser Profilers (3D)

Industrial PC (IPC)

PLC for logic & output

HMI for visualization

MES interface

Hardware Components

Software Logic

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Image to numeric dimension conversion

Rule-based inspection logic

Real-time classification

NG tagging and image storage (*NG = No Good, flagged parts for rework or review)

Inspection Accuracy & Speed

Cycle Time: ≤ 3 seconds per vehicle

Gap Accuracy: ±0.2 mm

Flushness Accuracy: ±0.1 mm

False Rejection Rate: < 1.5%

Operating Temp: 10–45°C

Integration Options

Stationary setup on trim line

Jig integration with position verification

MES feedback loop

NG tagging via VIN

Benefits

✓ Eliminates manual inspection dependency

☺ Reduces rework and complaints

🔍 Enables traceability and quality control

⚙ Compact and modular system

Operational & Financial Impact

Inline defect detection

Reduces post-paint rework

Saves manpower

ROI varies by defect rate and plant volume

Why our system works reliably

Combines laser profilers and industrial cameras for precise geometry capture

Uses real-time dimensional algorithms for accurate inspection feedback

Built on field-tested architecture, optimized through years of machine vision deployment
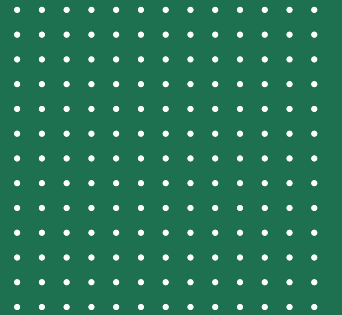
Let's Build It Together

Book a demo or share your current dispatch process.

We'll design a system tailored to your line.

www.associatedengineers.co.in