Sensors for Passenger Counting

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Development and production of sensors for Automatic Passenger Counting (APC)

Our sensors are providing passenger numbers.
Why Passenger Counting?

**Operations planning**
- Timetable optimization
- Connections planning / optimization
- Capacity planning
  - choose high/low capacity vehicle
  - increase/decrease vehicle frequency
- Evaluation of changes in operation
- Analyze seasonal aspects (weekend, holidays)

**Revenue sharing**
- Sharing of ticket revenues
- Sharing of governmental funding
- Check sold tickets vs. passenger numbers

**Transport statistics**
- Governmental statistics
Why Passenger Counting?

Example: VBB
6,000 vehicles
41 transport operators
6 Mio. People

about 2 Billion EUR / year
Why Passenger Counting?

• Revenue sharing requires to measure transportation

• Transportation can be measured by real passenger numbers

• *iris sensors* are delivering these passenger numbers

• For later revenue sharing by: Passengers (P)  
  Transportation (PKm)
Development and production of sensors for Automatic Passenger Counting (APC)

Founded in 1991
Turnover 2013 10.2 Mio. €
Employees 60+

Vehicles worldwide equipped with IRMA* 70,000+
* First vehicles installed in 1994
Number of transit properties using IRMA 250+
Number of system integrators using IRMA 50+
Main Markets

- **Public transportation**
  - Bus
  - Tram
  - Train
  - Ships
  - Airports / Stations

- **Building Automation**
  - Retail
  - Security / Safety

- **Industry**

**Customer Categories:**
- System Integrators
- Vehicle Manufacturers
- PTO (Public Transport Operators)
iris Main Markets

- Germany: 38%
- Europe: 30%
- America: 29%
- Asia: 3%
Typical System Architecture
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• 5th APC generation of iris: Latest Time of Flight (TOF) technology produces 3D images instead of 2D contrasts of detection area, people and objects.

• Innovative TOF technology: evaluates real distance and contour data for most accurate people counting detects individual people according contour and movement, distinguishes between people and objects.

• **High counting accuracy**
  independent of color, temperature, changing background, ambient light, reflections, ...
The speed of light converts the **time** of flight into **distance**:

\[
\text{distance} = \frac{ct}{2}
\]

**Time-of-Flight-Technology (TOF)**

similar like but with light
3D TOF technology: **real distance and 3D contour data** for most accurate people counting - even in crowded situations
Modern Housing Design

- Surface mount and in-wall mount versions
- Customized surfaces possible
- Up to IP67 – increases lifetime in high humidity environments
- Mounting directly in door space enables reliable passenger detection.
- Fulfills the recent railway fire protection standards DIN 5510-2 and NF 161-01
Housing Versions

- surface mount
- in-wall mount
sCON Connector

- Only one connector to/from the sensor

- Innovative concept: sCON connector connects the sensor.
  - With two pigtails:
    - 1 m bus cable M12
    - 2 m power chord

- Standard cables from / to these pigtails

- Simplifies pre-wiring (pre-installation of cables)
Typical System Architecture

**M12-ETHERNET WIRING**

Diagram showing the connection of IRMA Matrix to on board system via the Ethernet interface (M12 system cabling).

**M12-CAN WIRING**

Diagram showing the connection of IRMA Matrix to on board computer via CAN interface (M12 system cabling).
Best Accuracy per Stop ensures reliable passenger miles

Typical Stop Accuracy
at 750+ stops with total 4,000+ passengers

- IRMA MATRIX
- Competitor
- IRMA MATRIX cum.
- Comp. cum.

absolute error

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Outlook: Coming Soon

- Height classification

- Detection of wheelchairs, strollers, bicycles, ...

- Detection of vandalism (covering, damages)
Sabotage Detection
IRMA MATRIX
Summary

• The Time of Flight (TOF) principle makes sensors independent from ambient conditions.

• 3D TOF based passenger counters are offering highest counting accuracy - even in crowded situations.

• iris IRMA MATRIX is enabling easiest smooth integration in the vehicle.

• Mounting directly in door space enables most reliable passenger detection.

• IP67 rating helps to increase system reliability and lifetime.

• Modern interfaces like Ethernet and CAN enable data transfer to on board computers.
Thank You

Passengers have 3 dimensions ...

... IRIS has 3D

The 3D sensor system features the latest Time-of-Flight (ToF) technology, which produces a 3D image instead of a 2D contrast of the door area and passengers. 3D produces the most accurate and reliable data, independent of environmental conditions.

3D – the new dimension for Automatic Passenger Counters.

www.apc-irma.com