People counter

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A **people counter** is a device that is used to measure the number of people traversing a certain passage or entrance.

Contents

Use cases

Retail stores

Conversion Rate: People counting systems in the retail environment are used to calculate the conversion rate, which is the percentage of total visitors versus the number that make purchases.

Marketing Effectiveness: Shopping mall marketing professionals rely on visitor statistics to measure the effectiveness of the current marketing campaign. Often, shopping mall owners measure marketing effectiveness with the same conversion rate as retail stores.

Staff Planning: Accurate visitor counting is also useful for optimizing staff shifts. Staff requirements are often directly related to the density of visitor traffic, and services such as cleaning and maintenance are typically undertaken when traffic is at its lowest.

Shopping Malls

Monitoring of High-Traffic Areas: Shopping centers use people counters to measure the number of visitors in a given area. People counters also assist in measuring the areas where people tend to congregate, the areas where people tend to gather are often charged higher rent.

Museums and libraries

Funding Justification: Non-profit organizations often use visitor counts as evidence when applying for grants or other financial aid, when planning for seasonal staffing, or other strategic operational decisions. In cases where tickets are not sold, such as in museums and libraries, counting is either automated or staff keep a log of how many clients use different services.

Stadiums and Concert Halls

Crowd Management: People counters are used to measure the traffic flows of events; traffic patterns are used to improve traffic flow, particularly when large crowds are entering and exiting the stadium.

Smart Office buildings

Energy Usage Optimization: Commercial buildings utilize people counters to measure the use of different areas of the building at different times. This information is then used to optimize the energy usage in the building by reducing power to non-essential systems, such as air conditioning, in empty areas of the building.

Fire Management: In the case of fire, people counters can be used to approximate the number of people inside the building.

Business Metrics

Footfall

Footfall measures the number of people who enter a shop or business in a particular period of time.[1]

Window Conversion Rate

Window Conversion Rate is the percentage of shoppers who enter a store over in relation to the number of people who walk by it. With WiFi counting, shops can estimate the number of people who walk past a store. A more accurate method is video counting. While revenue and footfall are important, the number of people who walk past a store often reflects the potential of the store location. The Window Conversion Rate often depends on the attractiveness of the shop window design, and the effectiveness of marketing campaigns.[2]

Visit Duration

Visit duration is the amount of time visitors stay in a venue. WiFi counting has the ability to track both the time a person carrying a smartphone has entered the venue, as well as when that same person has left the venue.

Returning Customers

This metric looks at the number of people entering a store who had visited the store previously. WiFi counting has the ability to remember the Unique WiFi beacon signal ID emitted by shoppers, allowing the system to detect if a shopper has previously visited the store.

Cross-Shopping

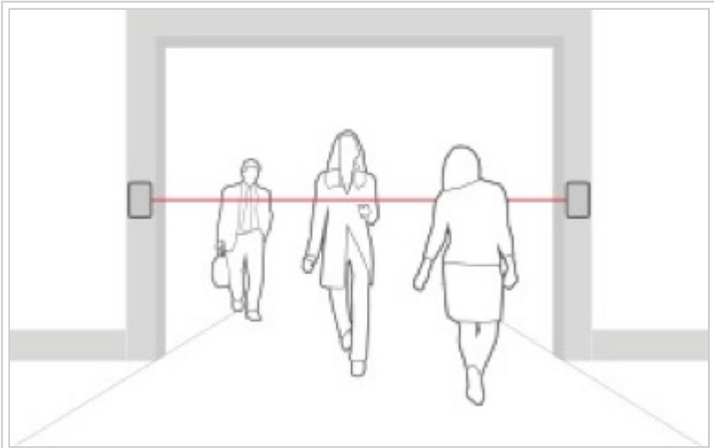
This is the number of shoppers who enter a store who have previously visited other stores of the same chain. This is available for third-generation people counters that have WiFi counting functionalities.

Technologies

Many different technologies are used in people counting devices, such as infrared beams, thermal imaging, computer vision, and WiFi counting.[3]

1st Generation: Infrared Beam Counters

The simplest form of counter is a single, horizontal infrared beam across an entrance which is typically linked to a small LCD display unit at the side of the doorway. Such a beam counts a 'tick' when the beam is broken, therefore it is normal to divide the 'ticks' by two to get visitor numbers. Beam counters usually require a receiver or a reflector mounted opposite the unit with a typical range from 2.5 metres (8 ft 2 in) to 6 metres (20 ft). Despite the limitations, infrared counters are still widely used due to the low cost and simplicity of installation.



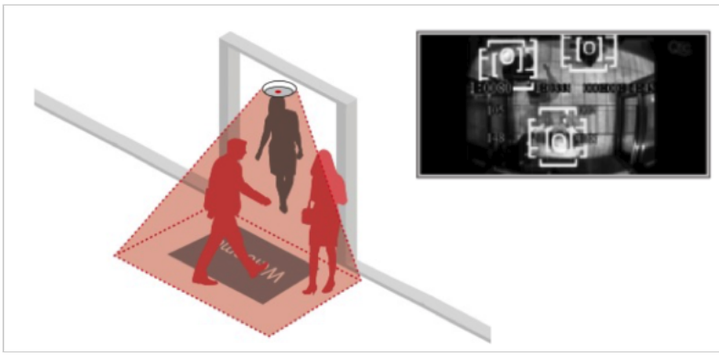
The simplest form of counter in which a single, horizontal infrared beam across an entrance counts when a person or object passes and breaks its beam

2nd Generation: Thermal counters

Thermal imaging systems use array sensors that detect heat sources. These systems are typically implemented using embedded technology and are mounted overhead for high accuracy.

Before the advance of computer technology that allows complex algorithms to perform video counting, thermal counters were the main choice for most businesses. They are fairly accurate; however they do have limitations, such as:

1. Thermal counters cannot be mounted on a high ceiling
2. Thermal counters can only cover a narrow door entrance
3. It is difficult to verify the accuracy of the counter
4. Accuracy is reduced in places with slight variations in thermal conditions



Thermal imaging systems use array sensors which detect heat sources from human body.

3rd Generation: Video & WiFi counting

There are two types of 3rd Generation People Counters. Video counters use complex algorithms perform counting using camera imaging by counting the number of people directly from video tape. Wifi Counting functionality collects WiFi probe request signals from shoppers' smartphones, allowing data to be collected on those not in the store. This adds a number of important metrics for businesses, especially for the retail industry, such as the ability to determine how effective a window marketing campaign is.

Video Counting

Computer vision works via an embedded device, reducing the network bandwidth usage, as only the number of people must be sent over the network. Adaptive algorithms have been developed to provide accurate counting for both outdoor and indoor counting using video counting. Multilayer Background Subtraction, based on colour and texture, is considered the most robust algorithm available for varying shadows and lighting conditions.[4] With the advances in image processing, video counting can achieve 98% accuracy in some lighting environments.[5] The use of artificial intelligence and pattern recognition functions is expected to further enhance its accuracy.

WiFi Counting

WiFi Counting uses a WiFi receiver to pick up unique WiFi management frames emitted from smartphones within range. While not all people carry a smartphone, WiFi counting can produce statistically significant metrics with a large enough sample size. Modern mobile operating systems, such as Apple's iOS9 and Android 6.0 Marshmallow, use MAC rotation schemes which makes WiFi counting impractical for those and future devices.[6][7]

See also

- Traffic count

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