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(54) Title: RETAIL CUSTOMER ANALYTIC SYSTEM

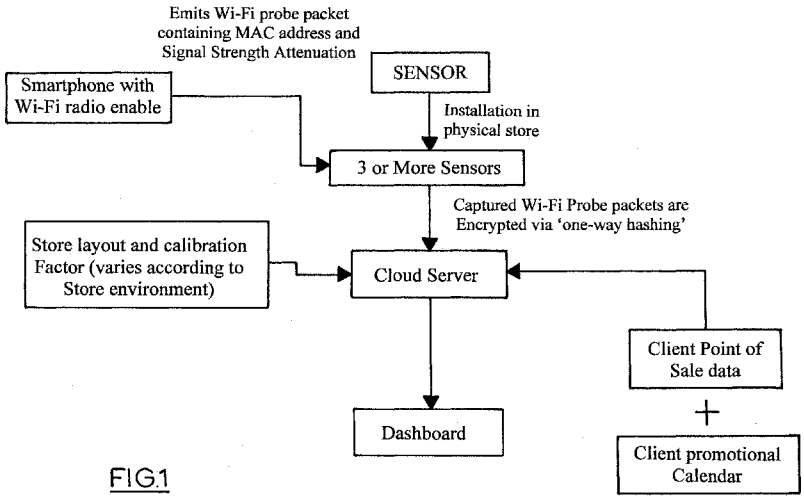

FIG.1

(57) Abstract: A tracking system that utilises one or more sensors to collect movement by shoppers in the store in which each sensor includes a cell phone antenna, a WIFI antenna, a microcomputer and a passive infrared sensor in which the microcomputer is programmed to collect signals from shoppers cell phones via the WIFI antenna and to collect signals from the infrared sensor and to correlate the two sets of signals to provide accurate movement information of shoppers in the store. By combining the infra red and WIFI data the WIFI data is able to be verified as being within the store environment. Preferably three sensors are used so that by triangulation the movement of a cell phone can be tracked and used to create a heat map of the shoppers movements with in the store. By synchronising these movements with a map of the store layout information about the shoppers behaviour can be collected for analysis.

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RETAIL CUSTOMER ANALYTIC SYSTEM

This invention relates to the collection of customer behaviour in retail outlets and an analytical system for use by retail management.

Background to the invention

Online retailing offers retailers the opportunity to easily monitor buyer behaviour in the online environment

Patents have been filed for monitoring and analysing online shopping customer behaviour. An example is USA patent 8898290 by Google.

In a physical store environment it is more difficult to assess the effectiveness of store displays and staff interaction with customers apart from measuring actual sales. One approach is to measure and track customers who carry a mobile phone. In Australia it is estimated that 90% of shoppers carry a mobile phone. These phones are constantly checking automatically for a wifi network. It is possible to identify individual phones by their unique MAC address

USA patent application 20150026009 discloses a cloud based system utilising customer's mobile devices and an in store wifi.

USA patent application 20150025936 discloses a customer MAC address tracking and retail analysis system. At paragraph 113 a triangulation method is disclosed for tracking the location of a customer over time within the store.

One difficulty with these systems is that tracking a phone is not accurate in regards to tracking customers movements within a store because the signals may be coming from outside the store. Using instore video cameras is one means of verifying the information collected but use of cameras in this way may be regarded as breach of privacy laws.

It is an object of this invention to provide a more accurate method of tracking customers in a retail store environment.

Brief description of the invention

To this end the present invention provides a tracking system that utilises one or more sensors to collect movement by shoppers in the store in which each sensor includes a cell phone antenna, a WIFI antenna, a microcomputer and a passive infrared sensor in which the microcomputer is programmed to collect signals from shoppers cell phones via the WIFI antenna and to collect signals from the infrared

sensor and to correlate the two sets of signals to provide accurate movement information of shoppers in the store.

By combining the infra red and WIFI data the WIFI data is able to be verified as being within the store environment. Preferably more than one sensor more preferably 3 sensors are used so that by triangulation the movement of a cell phone can be tracked and used to create a heat map of the shoppers movements with in the store. By synchronising these movements with a map of the store layout information about the shoppers behaviour can be collected for analysis.

Detailed description of the invention

A preferred embodiment of the invention will now be described with reference to the drawings in which

Figure 1 is an overview of the system;

Figure 2 is an example of an in store sensor;

Figure 3 is a flow chart illustrating the use of the sensor of figure 2;

Figure 4 is an example of a screen illustrating the analytics available .

With reference to figure 1 an individual store will preferably have 3 sensors which capture data from a cell phone which includes a MAC address and signal strength attenuation. The position of the smart phone at any instant is calculated using a triangulation estimation. The captured data is encrypted and sent to a server for processing.

The sensor shown in figure 2 includes a raspberry –PI microcomputer , a 3G dongle, a WIFI or WLAN antenna, a passive IR sensor and software.

The combination of a wifi antenna and a passive IR sensor enables the self correcting analytis of shopper motion in the store.

The WLAN antennas are used to determine the number of people in the store by analysing ping signal strengths and associated MAC addresses emitted by smart phones. This sensor alone may not differentiate between people in the store and outside the store because of variability in ping signal strengths. The PIR sensor determines the amount of human activity in the store and can be used to correct for errors in the WIFI signal analysis. The PIR sensors are an accurate measure of the number of people in the store. If the store is closed the PIR sensor can determine

that there are no shoppers in the store and discount the WiFi measurement accordingly.

As shown in figure 3 the information from the WiFi antenna and the PIR sensors are sent to the server and analysed to provide the shopper in store motion data for use in the analytic software.

The software on the server includes a map of the store layout and a calibration factor determined for each store. The server will also have point of sale data and other information such as a promotional calendar for the store.

The system is able to produce from this data four core metrics:

1. Store passers by
2. Visits into store
3. Time spent in store
4. Locations visited in store

These metrics are combined with point of sale data . The results may be displayed as heat maps of the visit. Accuracy is usually 1 to 2 metres.

By accumulating data statistical information can be derived and displayed. Figure 4 is an example of a screen displaying the analytics available.

On the database millions of data points that chart the relationship between the PIR sensor output and the number of people in a store are accumulated. The database takes into account different types of retail environments and store area sizes. The relationship between the PIR output and Wi-Fi sensor output is different depending on the type of store, but we can classify the types of stores into several broad categories including:

- Small store (under 100 sqm), medium store (100 sqm - 500 sqm) or large store (over 1000 sqm) with low-shelves.
- Small store (under 100 sqm), medium store (100 sqm - 500 sqm) or large store (over 1000 sqm) with high-shelves.
- Outdoor stores.
- Temporary pop-up 'booth' stores

The system of this invention is able to detect when the output of the PIR sensor and Wi-Fi sensor are diverging and provide a notification alert, to investigate potential problems.

This method of notification has been a reliable method of identifying changing conditions in the retail store or potentially, a malfunctioning sensor.

The PIR sensor also helps identify Wi-Fi signals that should be classified as outside traffic rather than inside traffic. For example, if the PIR sensor detects no body heat within the store, it will be able classify the Wi-Fi signal signature (signal strength and dwell time) as attributable to outside visitors.

From the above it can be seen that this invention provides a unique means of providing accurate data on shoppers in store motion. Those skilled in the art will also realise that this invention may be implemented in embodiments other than that described without departing from the core teachings of this invention.

CLAIMS

1. A store tracking system that utilises one or more sensors to collect movement by shoppers in a store in which each sensor includes a cell phone antenna, a WLAN antenna, a microcomputer and a passive infrared sensor in which the microcomputer is programmed to collect signals from shoppers cell phones via the WLAN antenna and to collect signals from the infrared sensor so that the two sets of signals may be used to provide accurate movement information of shoppers in the store.

2. A tracking system as claimed in claim 1 in which 3 sensors are used in each store.

3. A tracking system as claimed in claim 1 in which the data collected is used to provide metrics of the number of shoppers passing by, the number of visits into the store, the time spent in the store and the locations visited within the store.

4. A tracking system as claimed in claim 3 in which the database is cumulative and the stored data is available for analysis.

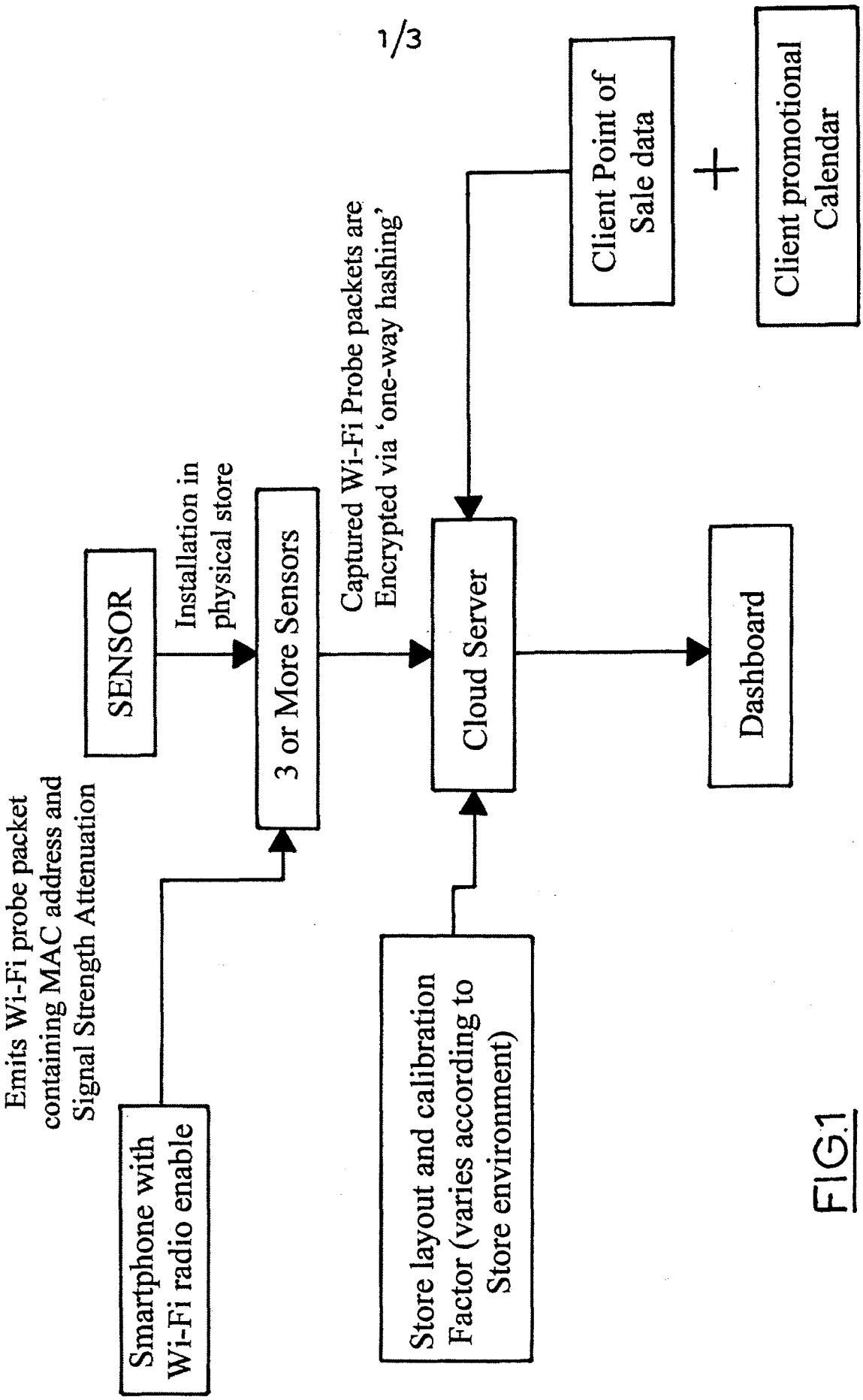
Emits Wi-Fi probe packet containing MAC address and Signal Strength Attenuation
Smartphone with Wi-Fi radio enable
SENSOR
Installation in physical store
3 or More Sensors
Captured Wi-Fi Probe packets are Encrypted via 'one-way hashing'
Store layout and calibration Factor (varies according to Store environment)
Cloud Server
Client Point of Sale data
+
Client promotional Calendar
Dashboard

FIG.1

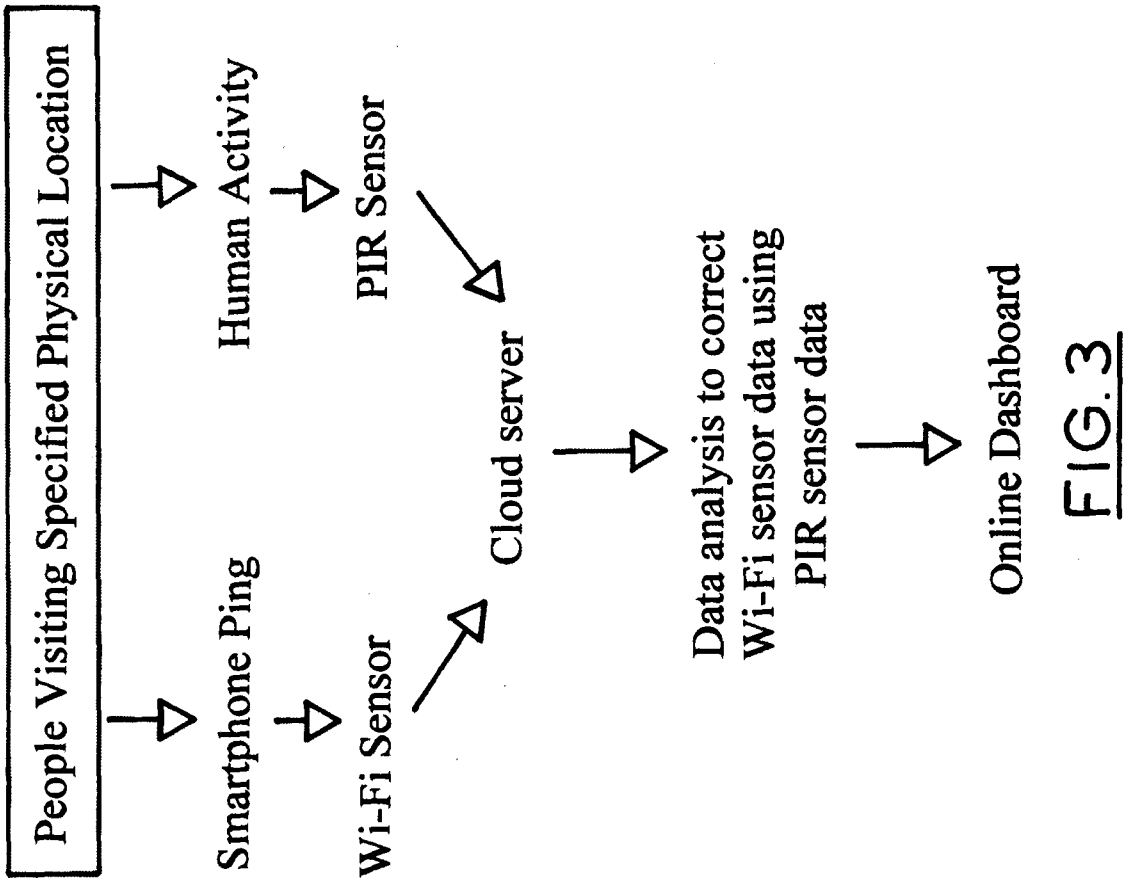
People Visiting Specified Physical Location
Smartphone Ping
Human Activity
Wi-Fi Sensor
PIR Sensor
Cloud server
Data analysis to correct Wi-Fi sensor data using PIR sensor data
Online Dashboard

FIG. 3

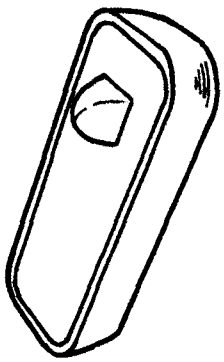

FIG. 2

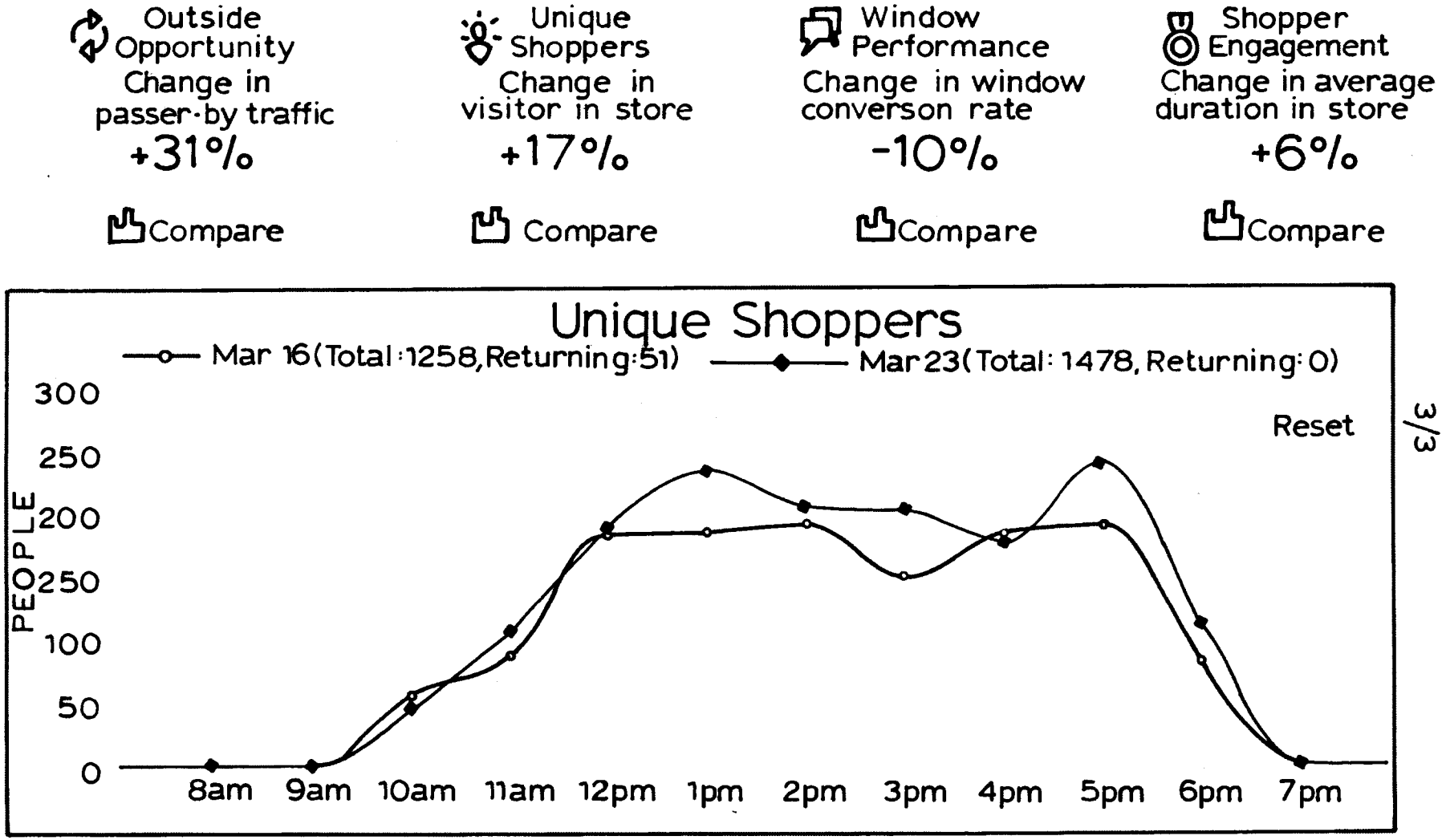
Outside Opportunity
Change in passer-by traffic
+31%
Compare
Unique Shoppers
Change in visitor in store
+17%
Compare
Window Performance
Change in window conversion rate
-10%
Compare
Shopper Engagement
Change in average duration in store
+6%
Compare
Unique Shoppers
Mar 16(Total:1258,Returning:51)
Mar 23(Total: 1478, Returning: 0)
Reset
PEOPLE
300
250
200
250
100
50
0
8am
9am
10am
11am
12pm
1pm
2pm
3pm
4pm
5pm
6pm
7pm

FIG.4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2016/000180

A. CLASSIFICATION OF SUBJECT MATTER

H04B 7/00 (2006.01) G06Q 30/00 (2012.01) G08B 13/19 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Internal databases provided by IP Australia, **Auspat**, **Espacenet**, **Lens** and **Google Patents** searched for applicant and inventor names. **Google Patents and Google Scholar** search with keywords [MAC address tracking "sensor fusion" "passive infrared", shop customer tracking system infrared WLAN "MAC address" cell phone, sensor fusion cell phone WLAN infrared, store analytics infrared cumulative] and similar terms. **WPIAP, EPODOC** search with keywords [store tracking shopper, WLAN antenna, cell phone antenna, passive infrared sensor, Wi-Fi mac address tracking, Bluetooth tracking, WLAN tracking, occupancy sensing, inside store] and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 June 2016	17 June 2016

Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Marthinus Van Der Westhuizen AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262832283

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2016/000180**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2014/102797 A1 (WISEYE VIDEO SYSTEM LTD.) 03 July 2014 title, abstract; pg.14 line 5-7, pg.15 lines 1-10, pg.17 line 13-29, pg.22 line 22-31, pg.27 line 24 to pg.28 line 6, pg.33 lines 15-20, pg.48 line 16-29, pg.62 line 6-22, pg.66 line 4-61	1-2
L	WO 2012/024516 A2 (NEARBUY SYSTEMS, INC. et al.) 23 February 2012 Incorporated by reference into citation D1	
Y	WO 2015/010086 A2 (EYEQ INSIGHTS) 22 January 2015 title, abstract; fig.1; para 0009, 0061,00100-00112, 00133	1-2
Y	US 2014/0107846 A1 (TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)) 17 April 2014 title, abstract; para 0005	1-2

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2016/000180**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
WO 2014/102797 A1	03 July 2014	WO 2014102797 A1	03 Jul 2014
WO 2012/024516 A2	23 February 2012	WO 2012024516 A2	23 Feb 2012
		US 2012046044 A1	23 Feb 2012
		US 8615254 B2	24 Dec 2013
		US 2014285660 A1	25 Sep 2014
		US 9270952 B2	23 Feb 2016
		US 2012044355 A1	23 Feb 2012
WO 2015/010086 A2	22 January 2015	WO 2015010086 A2	22 Jan 2015
		EP 3022652 A2	25 May 2016
		US 2015025936 A1	22 Jan 2015
		US 2016162912 A1	09 Jun 2016
US 2014/0107846 A1	17 April 2014	US 2014107846 A1	17 Apr 2014
		EP 2906880 A1	19 Aug 2015
		WO 2014057460 A1	17 Apr 2014

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.