Title: A SURVEILLANCE SYSTEM

Abstract: The invention provides a method of monitoring a point of sale, the method including the steps of monitoring the point of sale, and triggering a recording function in response to the occurrence of a predetermined event. The invention extends to a point of sale surveillance system (10) which includes at least one video camera (12), set up to capture a visual image of the point of sale, an event recorder (14) operatively connected to the video camera (12), and monitoring means for monitoring the point of sale. The monitoring means may be in the form of a sensor (22) connected in circuitry to a processor (20) which is connected in circuitry with the event recorder (14). The processor being configured to trigger recording by the event recorder (14) when a predetermined event such as the opening of a cash drawer (24), occurs.
A SURVEILLANCE SYSTEM

THIS INVENTION relates to a surveillance system. It relates in particular to a method of monitoring a point of sale and to a point of sale surveillance system.

When a customer presents goods for payment and clearance at a point of sale, events generally occur in a predetermined sequence with acceptable time tolerance between events. Fraudulent conduct by operators at points of sale cause some losses to business. Video surveillance can be used to monitor the activities at points of sale. The real time monitoring of images and the scanning of recorded images for possible fraudulent conduct can be costly in terms of supervisory time.

According to the invention, there is provided a method of monitoring a point of sale with a continuous point of sale video surveillance system, the method including the steps of

- monitoring the point of sale; and
- triggering a recording function in response to the occurrence of a predetermined event.

The method may include triggering the recording function in response to the occurrence of any one of a plurality of predetermined events.
The predetermined event or events may be defined as a predetermined sequence of events.

The method may include comparing the events monitored by the monitoring means with events stored in a database to determine whether or not the events monitored by the monitoring means constitute a predetermined event in response to which the recording function is triggered.

Accordingly, the invention extends to a point of sale surveillance system, which includes

at least one video camera, set up to capture a visual image of the point of sale;

an event recorder operatively connected to the video camera, in use to record visual images of the point of sale; and

monitoring means for monitoring the point of sale and configured to trigger recording by the event recorder in response to a predetermined event being monitored.

The monitoring means may include at least one sensor which, when activated, triggers the recording function. The monitoring means may include a plurality of sensors.

The point of sale surveillance system may include an events database in which details of the predetermined events are stored.

The event recorder may have a video input terminal connected in circuitry to a video output terminal of the video camera, in use to record visual images of the point of sale. The system may include at least one sensor connected in circuitry to a processor which may be connected in
circuitry with the event recorder and the at least one sensor. The processor may be programmed with code to trigger recording by the event recorder when a predetermined event sensed by the at least one sensor occurs.

The processor may be programmed with code in which at least one predetermined sequence of events is defined that will trigger recording.

The processor may include a timer measuring the time of occurrence of a certain event. The processor may be programmed with code in which allowable tolerances for the occurrence of certain events are defined and in which recording is triggered if the tolerances are exceeded.

The event recorder may include circuitry to record analog signals and/or digital data signals.

The event recorder may store the recorded images and/or signals on any one of magnetic tape, magnetic disk, optical disk or solid state components.

The event recorder may be arranged to store the recorded images and/or signals as segments of a continuous recording. In addition, or alternatively the event recorder may be arranged to store segments of the recorded images and/or signals leading up to the triggering. As an option, the point of sale surveillance system may include a separate event recorder to record the images and/or signals continuously.

The sensor may be an electrical switch mounted in operative relationship to a cash drawer of a cash register at the point of sale, such that
the switch is activated when the cash drawer is open and de-activated when the cash drawer is closed.

The sensor may be a motion detector set up with its activation zone being any one of the position of the point of sale attendant, the position of the customer at the point of sale, the position of the goods presented at the point of sale, or the position of the cash drawer.

The motion detector may be any one of an infrared sensor, an ultrasonic sensor or a real time image processing sensor. The sensor may be a hand-held or permanently installed bar code reader.

In more sophisticated embodiments of the invention, the sensor may be an electronic data interface to the cash register monitoring the occurrence of certain transactions performed on the cash register.

It is to be appreciated that the system may possibly make use of a plurality of sensors linked to the processor.

In the drawings,

Figure 1 shows a schematic block diagram of a point of sale surveillance system in accordance with the invention;

Figure 2 shows a hierarchical structure of a number of events; and

Figure 3 shows an embodiment of the invention using real time image processing techniques.

Referring to Figure 1 reference numeral 10 generally indicates a point of sale surveillance system comprising a video camera 12 with its video output terminal connected in circuitry to the video input terminal of an
event recorder 14. In addition a microphone 16 is connected in circuitry to an audio input terminal of the event recorder 14. A time lapse recorder 18 is connected in circuitry to a video output terminal of the event recorder 14.

A processor 20 is connected in circuitry to a trigger input of the event recorder 14. As sensors the processor 20 has connected to it a switch 22 mounted in operative relationship to a cash drawer 24 of a cash register 26, such that the switch is activated when the cash drawer 24 is open and de-activated when the cash drawer 24 is closed; a scanner, e.g. a hand-held bar code scanner 28 to sense when a bar code label is been scanned; and an electronic data interface 30 to the cash register 26, monitoring the occurrence of certain transactions performed on the cash register 26.

In an event database (not shown) in the processor 20 is stored a number of predetermined events that may occur. The event may be a single event, e.g. opening of the cash drawer 24 as signaled by the switch 22 or a sequence of events which occur between the switch 22, the bar code scanner 28, and the electronic data interface 30, with set time tolerances between the occurrence of the events. Events may even be stored temporarily to keep a history of events and logically to combine the events as defined in the event database. The processor 20 is programmed to trigger the recording by the video camera 12, the microphone 16 and the event recorder 14 if one or more of the predetermined events occur.

The events may be classified in different categories and prioritised accordingly. An example of an event hierarchy is shown in Figure 2, showing the hierarchical structure of events in the event database. On the highest level 21 indicates the state of a cash register 26. On the next
hierarchy level is indicated the status of two of the sensors namely the bar
code scanner 28 (being indicated by 21.2), and the cash drawer 24 (being
indicated by 21.4). The bar code scanner status 21.2 can be either in scan
mode 21.2.2 or no scan mode 21.2.4. While the cash drawer status 21.4 can
be opened 21.4.2, or closed 21.4.4, or open for a short duration 21.4.6, or
open for a long duration 21.4.8. The events in the hierarchical structure in
Figure 2 can each trigger the recording function of the event recorder 14
while certain events of a higher priority may alert the immediate attention of
the supervisor via a signaling device (not shown).

In use, the event recorder 14 can record images of the point of
sale via the video camera 12 and voice signals at the point of sale via the
microphone 16. The event recorder 14 will only record images and voice
signals in the event of being triggered by the processor 20. The time lapse
recorder 18 will however capture continuous images of the point of sale. It is
to be appreciated that the recording by the event recorder 14 can be done in
a digital format on a computer, and the storage of the events can take place
on magnetic disc, optical disc or any other permanent or semi-permanent
storage means.

It is further to be appreciated that in a digital system the video
camera 12 may also be used as a programmable movement detection
sensor. Real time image processing techniques programmed in the
processor 20 may be used to define certain areas in the image to be sensed
for movement, triggering the event recorder 14 when movement is detected.
The events in the processor 20 triggering the event recorder 14 can be
stored in combination with the image and voice signals.
In Figure 3 an alternative embodiment of the invention, using real time image processing techniques is illustrated.

The point of sale surveillance system 10 includes a video camera 12, a time lapse recorder 18 and a computer 40 that includes the functionality of the event recorder 14 and the processor 20 (in Figure 1). A processing unit 42, operatively connected to an event database 44 and an image processing unit 46 is shown. A video clip storage unit 48 is operatively connected to the image processing unit 46. In use, the image processing unit 46 will trigger the video clip storage unit 48 storing images of the point of sale when triggered, and the processing unit 42 will store events leading up to the triggering by the image processing unit 46.

Examples of events that may be stored in the processor 20 are:
The cash register drawer not being closed after a transaction;
the bar code scanner being activated without a valid bar code being scanned;
repeated scan of the bar code scanner without a valid bar code being scanned;
the cash register drawer opening and closing too quickly for a real transaction;
 cash register drawer staying open too long;
cash register drawer not closing after a transaction;
cash register drawer never opens during the transaction;
a customer approaching a point of sale;
placing of merchandise on the desk;
customer at the point of sale but no cash register transaction; and
events that require a manual override by a supervisor.
The above list is not exhaustive and can be extended to any number of detectable events with the sensors being used in a specific system.

At the end of each business day a supervisor may scan the events recorded for the day for a specific point of sale, and the events being stored will only include the events being pre-programmed on the processor 20.

The inventor believes that the invention, as illustrated, provides a new point of sale surveillance system allowing a supervisor to scan only suspicious events at the end of a business day. This system will be less costly in terms of supervisory time when used at a point of sale.
CLAIMS:

1. A method of monitoring a point of sale with a continuous point of sale video surveillance system, the method including the steps of monitoring the point of sale; and triggering a recording function in response to the occurrence of a predetermined event.

2. A method as claimed in claim 1, in which the recording function is triggered in response to the occurrence of any one of a plurality of predetermined events.

3. A method as claimed in claim 2, in which the predetermined event is defined as a predetermined sequence of events.

4. A method as claimed in claim 2 or claim 3, which includes comparing the events monitored by the monitoring means with events stored in a database to determine whether or not the events monitored by the monitoring means constitute a predetermined event in response to which the recording function is triggered.

5. A point of sale surveillance system, which includes at least one video camera, set up to capture a visual image of the point of sale; an event recorder operatively connected to the video camera, in use to record visual images of the point of sale; and
monitoring means for monitoring the point of sale and configured to trigger recording by the event recorder in response to a predetermined event being monitored.

6. A point of sale surveillance system as claimed in claim 5, in which the monitoring means includes at least one sensor which, when activated, triggers the recording function.

7. A point of sale surveillance system as claimed in claim 5 or claim 6, which includes an events database in which details of the predetermined events are stored.

8. A point of sale surveillance system as claimed in claim 5, in which the event recorder has a video input terminal connected in circuitry to a video output terminal of the video camera, in use to record visual images of the point of sale, the system including at least one sensor connected in circuitry to a processor which is connected in circuitry with the event recorder and the at least one sensor, the processor programmed with code to trigger recording by the event recorder when a predetermined event sensed by the at least one sensor occurs.

9. A point of sale surveillance system as claimed in claim 8, in which the processor is programmed with code in which at least one predetermined sequence of events is defined that will trigger recording.

10. A point of sale surveillance system as claimed in claim 8 or claim 9, in which the processor includes a timer measuring the time of occurrence of a certain event.
11. A point of sale surveillance system as claimed in any one of claims 8 to 10, inclusive, in which the processor is programmed with code in which allowable tolerances for the occurrence of certain events are defined and in which recording is triggered if the tolerances are exceeded.

12. A point of sale surveillance system as claimed in any one of claims 8 to 11, inclusive, in which the event recorder includes circuitry to record analog signals and/or digital data signals.

13. A point of sale surveillance system as claimed in any one of claims 8 to 12, inclusive, in which the event recorder stores the recorded images and/or signals on any one of magnetic tape, magnetic disk, optical disk or solid state components.

14. A point of sale surveillance system as claimed in claimed in claim 13, in which the event recorder is arranged to store the recorded images and/or signals as segments of a continuous recording.

15. A point of sale surveillance system as claimed in claim 14, in which the event recorder is arranged to store segments of the recorded images and/or signals leading up to the triggering.

16. A point of sale surveillance system as claimed in claim 15, which includes a separate event recorder to record the images and/or signals continuously.

17. A point of sale surveillance system as claimed in any one of claims 8 to 16, inclusive, in which the sensor is an electrical switch mounted in operative relationship to a cash drawer of a cash register at the point of
sale, such that the switch is activated when the cash drawer is open and de-
activated when the cash drawer is closed.

18. A point of sale surveillance system as claimed in any one of claims 8 to 16, inclusive, in which the sensor is a motion detector set up with
its activation zone being any one of the position of the point of sale
attendant, the position of the customer at the point of sale, the position of the
goods presented at the point of sale, or the position of the cash drawer.

19. A point of sale surveillance system as claimed in claim 18, in
which the motion detector is any one of an infrared sensor, an ultrasonic
sensor or a real time image processing sensor.

20. A point of sale surveillance system as claimed in any one of
claims 8 to 16, inclusive, in which the sensor is a hand-held or permanently
installed bar code reader.

21. A point of sale surveillance system as claimed in any one of
claims 8 to 16, inclusive, in which the sensor is an electronic data interface
to the cash register monitoring the occurrence of certain transactions
performed on the cash register.

22. A method of monitoring a point of sale as claimed in claim 1,
substantially as herein described and illustrated.

23. A point of sale surveillance system as claimed in claim 5,
substantially as herein described and illustrated.
24. A new method of monitoring a point of sale or a new point of sale surveillance system, substantially as herein described.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

| IPC | Number | 168813/196 | 60763/00 |

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)

| IPC | Number | 7 | G08B | G07G |

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

Electronic database consulted during the international search (name of database and, where practical, search terms used)

**EP0-Internal**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>US 4 237 483 A (CLEVER ERIC C) 2 December 1980 (1980-12-02) abstract</td>
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Further documents are listed in the continuation of box C.

**Patent family members are listed in 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 document 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

Date of the actual completion of the international search

28 February 2003

Date of mailing of the international search report

10/03/2003

Name and mailing address of the ISA

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Authorized officer

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Form: PCT/ISA/210 (second anewl) (July 1992)
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