Digital Technologies and Its Scope in Shoplifting Prevention

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Abstract: -

Background/Objectives: Today's world is based on emerging digital technologies. This paper discussed cutting edge digital technologies and how these can be used in Retail industry to prevent shoplifting – inventory theft.

Methods/Statistical analysis: Shoplifting can be monitored and prevented by using many digital technologies. However, this review paper will mainly focus on Artificial Intelligence, Machine Learning, Data Analytics, Process Automation methods to monitor, prevent and raise alarm if there is any inventory theft in brick-n-mortar retail stores. This will help higher management to take precautions based on analysed information.

Findings: Data is driving the retail industry these days. The retailers are trying to focus more on just in time inventory and improve services to the customer. The digital technologies will act as an enabler to help the retailers achieve their goals efficiently. In retail domain, these modern-day technologies can contribute a lot to assist the retailers in improving their existing business processes that will lead to their business growth and few such processes are explained here.

Improvements/Applications: This paper suggested different improvement process to track and prevent shoplifting using technologies – Artificial Intelligence, Machine Learning, Data Analytics, Process Automation.

Keywords: Retail, Shoplifting, Artificial Intelligence, Machine Learning, Data Analytics, Process Automation

1. Introduction

In Retail world shoplifting is a major problem resulting in inventory shrinkage. Retail inventory shrinkage is the difference between a product's recorded stock count and the amount physically on-hand. Lost stock stems from theft or inventory control issues like receiving errors, unrecorded damages, cashier mistakes, and misplaced items. Based on a 2018 survey[1] shrink, or loss of inventory related to theft, shoplifting, error, or fraud, is reducing the bottom line by $46.8 billion across the industry.

A lot of scope is there to explore its prevention mechanisms. This paper aims at touching upon some of the areas in retail domain where digital technologies can be utilized to benefit the retailers. The paper is organized into few sections. Section 2 explains the other related works in this sphere, in Section 3. Section 4 explores methodologies we observed and its results, Section 5 indicates some of the challenges. The paper is concluded in Section 6 finally.

2. Related Work

Digital technologies are in practical use of many retail operations including shoplifting. Japanese communications giant NTT East made AI enabled devices to catch the shoplifters[2]. Another software development organization, Vaak's works by tapping into the live security camera feeds a retail store has installed [3]. It then monitors customers looking specifically at their body language. If there are signs that someone is overly nervous, looking around a lot, fidgeting, or generally restless, the system contacts staff via a smartphone app.

3. Methodology

In modern days retailers are using many digital technologies from procurement to customer relationship. Shoplifting can also be monitored, prevented using many such cutting edge technologies. Few such cases are explained in this publication – AI enabled camera (using machine learning), security tag-based solutions, facial behavior recognition, Aerosol canister-based solution.

i) *Video camera, AI enabled device and machine learning/deep learning-based solution:* In most retail stores today, video cameras are used for little more than security. These simple cameras require a human being to watch a screen in real-time in order to act. Most camera systems in the retail environment of the future will be used for computer vision – delivering value to businesses without humans needing to watch the footage themselves. In stores one video cameras will be installed pointing to the inventory racks. If any internal/external person tries to pick-up and hide the product that will be recorded by the video cameras. These cameras will be sending the video frames to an AI enabled device which will later interpret the frames and will feed the data to computer. Here using machine learning/deep learning (data feed will be done from other stores) and analytics some patterns will be derived. These computers will also send an automatic notification message to store manager.

ii) *Security tag-based solution:* By barcode counterfeiting the shoplifter will bring in pre-made barcodes from low value items. They are then applied over the barcodes on higher value items. This allows the shoplifter to go through the checkout process, make a payment, have any security tags deactivated by the clerk and walk out without any suspicious behavior. Every merchandise has a security tag attached to it. For high value items this security tag should be matched with the barcode. If anyone tries to counterfeit the barcode of a high value item with a low value one, the POS system should raise an alert.
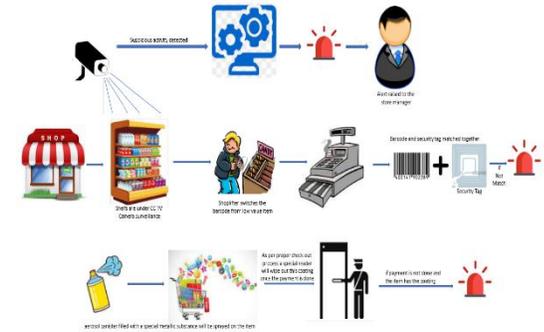

Figure 1: Sample Block Diagram of the eco-system

iii) *Facial, behavioral machine learning/deep learning-based solution:* Retail stores will be fitted with cameras that are AI enabled devices which will track shopper's faces and behavioral patterns. The faces will be matched with criminal records. The behavioral patterns will be analyzed using machine learning/deep learning to predict criminal action. Once a suspicious person is detected notification will be sent out to store manager to increase watch on this person. In this way an incidence of shoplifting can be avoided. The patterns obtained will be analyzed by machine learning/deep learning algorithms. Any new pattern identified will be shared across all stores using the system so that such incidents can be eliminated elsewhere.

iv) *Aerosol canister with specific metallic substance-based substance:* For items on display in a store an aerosol canister filled with a special metallic substance will be sprayed on the item. This substance will not be seen with naked eye. As per proper check out process a special reader will wipe out this coating once the payment is done. However, if payment is not done and the item has the coating and it is not located within the store, AI enabled device will trace its geographic co-ordinates that will be notified to the store manager. The store manager can then use this data to trace and pick-up the stolen item.

4. Results and Discussion

With the help of technologies discussed in this paper retailers can monitor, analyze the shoplifting incident, pattern for different stores and accordingly they can take corrective actions. This will help the retailer to reduce shrinkage and thereby increase the Return On Investment margin. Prevention of inventory shrinkage means more availability of products and increased customer satisfaction.

5. Conclusion and Future Scope

This paper has discussed about the digital technologies to monitor and prevent the shoplifting in retail stores along with some of its significant features and benefits.

The technologies are still evolving with a lot of scope to be used in large scale to change the retail world. These technologies are still being applied in stores for proof of concept purpose only. More detailed analyses must be done before adopting on day-to-day store operations.

In future, once these technologies are fully operational then need to explore the ways to integrate the derived shoplifting patterns from AI/machine-learning based algorithms with retail Enterprise Solution packages [4]. Cloud based retail solutions must be considered as well for future enhancement purposes.

6. Acknowledgment

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7.References

[1] Survey by the National Retail Federation (NRF).

[2] K. Wiggers, *"AI Guardsman uses computer vision to spot shoplifters"*

[3] Bloomberg reports published on 4-March-2019.

[4] M. Nadimpalli, "Artificial Intelligence – Consumers and Industry Impact", Int J Econ Manag Sci, Volume 6 , Issue 4 , 1000429

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