**LITERATURE SURVEY**

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| **TEAM ID** | **PNT2022TMID44838** |
| **PROJECT** | **RETAIL STORE STOCK INVENTORY ANALYTICS** |

**Mobile Robot for Retail Surveying and Inventory Using Visual and Textual Analysis of monocular pictures based on Deep Learning**

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**METHOD:**

The framework for joint visual and textual analysis as well as the dataset used for evaluation comprises three main components: the visual feature extractor, the textual feature extractor and the fusion classifier. For visual and textual feature extraction we use two especially trained DCNNs.

The visual and textual features are combined and fed into the fusion classifier. For estimating the overall content of image, we compare common machine learning algorithms. Further details about the main components are given in the following subsections.

The framework is comprehensively evaluated on the “ROCKy Dataset”, a proprietary dataset collected for this work. The details of the data collection and ground truth labelling are discussed in Subsection IV-D.

The visual feature extractor provides information about the visual part of a picture and is therefore trained with image labels indicating the visual category of the images. The training is performed by fine-tuning a VGG16 net.

**RESULT:**

In this section, the results of the experiments conducted on “ROCKy Dataset” are reported. In addition to the performance of the fusion classifier, we also present the performance of the visual and textual category classifier form the basis of the visual and textual feature extractors and are key to the overall classification.

SOOS situation is an important problem in the retail field. In this paper, we propose ROCKy a mobile robot to detect SOOS in real-time as well as on-demand. In addition to the identification of SOOS and misplaced items, ROCKy can provide several other value added services like informing customers in the form of promotions or discounts.

**Applying Image Processing for Detecting On-Shelf Availability and Product Positioning in Retail Stores**

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**METHOD:**

Images of certain products were stored in MATLAB as reference images and detection of those on a shelf was performed. The experiments performed successfully helped to in identifying the following:

• Presence/absence of a product on the front row and its count

• Products not been kept face-up and those placed on incorrect shelves (as compared to the intended positions)

• Excessive void spaces to imply less than optimal shelf utilization

The experiments have been performed on target images consisting of three products each. The algorithm has been optimized to process target images with ‘N’ number of products. Moreover, the algorithm successfully processes misaligned target images (E.g. product image turned upside down), by image registration.

The algorithm worked efficiently with canned images. But when the shelf image in Figure was processed using the same algorithm, incorrect results were encountered. The first row of the real time shelf image in Figure , consists of products of the same brand, with identical packaging.

These products differ only in terms of the color of the packaging. Thus, the algorithm was not able to differentiate between these products. On changing the value of size (matchedBoxPoints, 1) parameter, it was found that an increase in the value of the parameter enables the unique identification of the differently colored products with the same packaging.

**RESULT:**

The goal of the research was to automate the manual inspection of retail shelves in a cost-effective manner. The implemented solution demonstrates that it is possible to detect and count the front-facing products on a shelf as well as identify the void spaces by applying image processing techniques (MATLAB R2013a).

In case of products of the same brand but in different coloured boxes, the algorithm has to be modified to increase the value of the matching parameter, so as to enable the unique identification of such products. If two products are placed adjacent to each other, without any gap in between, the algorithm can still differentiate between the them.

The average time taken to process a real time large shelf image (~190 seconds) was much higher than that for the smaller, canned images (~33 seconds). The algorithm needs to be further optimized in order to make it suitable for practical use. But, The system can be installed at minimal costs, allowing the store manager to keep a check on every shelf in real-time.

**Improving inventory management in the retail store: The effectiveness of RFID tagging across product categories**

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**METHOD:**

The goal of this study was to determine the influence of RFID tagging on stockouts for different product categories. In order to examine this influence, we conducted within store comparisons between tagged and untagged products. More specifically, we compared the difference between the percentage of stockouts for tagged versus untagged products in the baseline as compared to the treatment period.

Equipping a store with readers, developing and implementing software that will integrate RFID read information with inventory management systems, eventually integrating these into customer relationship management systems these have significant infrastructure cost implications.

Researchers can also incorporate the insight that it is not equal opportunity for all when considering RFID as a means of reducing stockouts for product categories in a retail store. Either by parametrization or by building contingency models, they may be able to develop new findings that will inform practitionersand may be tested empirically.

**RESULT:**

The research questions motivating this research may be answered as follows: First, the effectiveness of RFID tagging in improving inventory management is not the same across all product categories. We found that tagging was effective for some categories, with estimates for the reduction in the percentage of stockouts ranging from 21% to 36%.

We also found that tagging was not effective for one category out of the five in our study. Second, we found that this variability in the effectiveness of tagging has a theoretical basis for explanation, and is not a mystery that may be attributed to mere statistical chance.

The evidence indicates that tagging is most effective for product categories that have predictable record inaccuracy which causes stockouts.