Show Me the Money

RFID-based Article-to-Fixture Predictions for Fashion Retail Stores

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Increasing adoption of RFID by fashion retailers

- tracking items along the supply chain
- frequent and fast stocktakes in stores

Foundation for state-of-the-art retail technologies

- customer-focused applications (e.g., Click&Collect)
- retailer-focused applications (e.g., Money Mapping)

Money Mapping

link sales figures of articles to their placement on fixtures



Motivation

Conventional Money Mapping

- manual tracking of article placements
- $\cdot\,$ tedious and time consuming task
- often limited to individual fixtures

Goal

Use already established RFID-based stocktake process, to determine placement of articles on fixtures.

Additional applications

- improvements of the replenishment process
- evaluation of visual merchandising strategies

Methodology

1. Placement of reference tags

enumerate fixtures and place passive RFID tags on them

2. Perform RFID-based stocktakes

collect signal strength (RSSI) and timestamps of read events

3. Read event aggregation

combine reads from "stacks of articles" to reduce sparsity

4. Predict article-to-fixture assignments

- clustering-based approach (DBSCAN)
- time series-based approach (DTW)
- leverage historic information

Experiments

- laboratory setting
- two fashion retail stores

Evaluation metrics

- Accuracy
- Chebyshev distance (L_{∞})

Experiment	Articles (Items)	Ref. Tags	Fixtures	Stocktakes
Lab Store A	27 (916) 197 (1.739)	74 156	10 33	33 (01:43) 11 (07:29)
Store B	200 (1,977)	98	23	11 (10:06)

https://github.com/detegoDS/show_me_the_money_dataset

Controlled environment to show feasibility of approach



Results (Accuracy)

- Random Baseline: 10%
- DBSCAN: 78.5%
- DBSCAN (History): 85.4%
- DTW: 90.9%
- DTW (History): 93.1%

Two real-world fashion stores with different characteristics

Store A is a more challenging environment, as

- it has more fixtures on a smaller sales floor
- many fixtures are made of metal

Experiment	DBSCAN		DBSCAN (History)		DTW		DTW (History)	
	Accuracy	L_{∞}	Accuracy	L_{∞}	Accuracy	L_{∞}	Accuracy	L_{∞}
Store A	81.5%	1.2	88.3%	1.2	70.5%	2.0	71.7%	2.6
Store B	88.3%	1.7	93.1%	1.8	80.8%	2.2	83.9%	2.1

 \rightarrow we can accurately assign articles to fixtures, and are not far off in case of wrong predictions (small Chebyshev distances)

Conclusion

Contributions

- methodology to determine article-to-fixture assignments
- evaluation¹ in real-world (retail store) environment
- foundation for many practical applications

Future Work

- influence of reference tag placements
- \cdot apply approach on individual items

¹https://github.com/detegoDS/show_me_the_money_dataset