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Demo: Smartwatch based Shopping Gesture Recognition

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1. INTRODUCTION

In the current retail segment, the retail store owners are keen to understand the browsing behavior and purchase pattern of the shoppers inside the physical stores. Profiling the behavior of the shopper is key to success for any marketing strategies that can optimize or personalize shopping-related services in real-time. We envision that exploiting the knowledge of real-time behavior of shopper's in-store activities enables novel applications such as: (a) *targeted advertising or recommendations*: based on longer term shopper profiles, (b) *proactive retail help* to assist the shoppers who are confused in choosing between two items, (c) *smart reminders* that can remind the shoppers to pick up an item in the shopping list that they might have missed.

Our work is motivated by the fact that a significant fraction of in-store shopping activities involve gestural interactions with objects of interest (such as picking up an item and putting the item in the shopping cart in a grocery store or retrieving and trying out a dress in a clothing store). In our recent works [1, 2], we showed the design and initial prototype of frameworks for reliably inferring shopper's in-store interactions and behavior by just observing their hand and foot movement inside a store. The hand gestures and locomotive pattern of the shopper inside a store is identified by appropriately mining the sensor data from shopper's personal smartphone and wearable devices (smartwatch).

The key challenges in building such a system that automatically identifies the various shopping interactions requires us to (a) determine discriminative features that can identify the gestures, (b) reliably demarcate the (start, end) times of individual interactions and (c) accurate recognition of shopper's interaction based on the features generated from the sensor data.

One of the main contribution of our work lies in performing robust and accurate segmentation of an entire shopping visit into a series of hierarchical individual and product-level interactions. Figure 1 represents the typical sequence of activities that are carried out by a shopper in a grocery store. We use a combination of (i) landmarking based on sensor features to identify the aisle and non-aisle zones and (ii) viterbi decoding to predict the sequence of hand activities that are occurring within an aisle.



Figure 1: Typical sequence of shopper activities in a grocery store

2. DEMONSTRATION

In the demo, we focus on showing the detection of various shopping related hand-gestures and its sequence such as picking an item, returning back the item to the shelf, putting the item aside etc. in real time using a smartwatch. We leverage the accelerometer and gyroscope sensors in the smartwatch to distinguish these gestures. The smartwatch performs the following steps in real-time to accurately identify the gestures: (i) pre-processing and smoothing of the raw sensor data, (ii) computing the features on short overlapping sliding windows of the sensor data and (iii) running the decision tree classifier model to classify the gestures.

We will show a live demo of our system that accurately recognizes shopping gestures. We will emulate the setup of a rack of items as in a grocery store. The users can try the system by wearing a smartwatch on their dominant hand and performing gestures such as picking an item from the rack, putting the item aside etc.

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