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A SURVEY ON PREDICTION OF COMPLEX HUMAN ACTIVITY BY TEMPORAL SEQUENCE PATTERNS

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Abstract

Human activity has become more valued in a large variety of time-critical applications. Human activities can be illustrated by temporal data by simple action and related objects. Normally the existing system deal with Simple actions, we proposed this framework for long complex activity prediction by temporal sequence patterns. The major three key aspects are: Causality, Context- cue and Predictability. The Main contribution of our work embrace: (1) PST (probabilistic suffix tree) is to model casual relationship between both larger and smaller action captured by Markov dependencies. (2) Context- cue mainly interactive objects information collected through SPM. Here we examine this by action-only prediction and context-aware prediction. Our method achieves better performance for predicting comprehensive activity classes and local action units.

Keywords- Activity prediction, content- cue, Predictability

1. Introduction

In recent years, different emerging application domains have introduced new constraints and methods for data mining. One such application domain is activity discovery and recognition in smart environments. Sequential pattern mining has been studied for more than a decade and many methods have been proposed for finding sequential patterns in data [1].

Sequential Pattern mining is a topic of data mining concerned with finding statistically relevant patterns between data examples where the values are delivered in a sequence. So here pattern mining method is mainly used

to discover the Human activity recognition, an automated detection of events performed by humans from video data, is an important workstation vision problem. In the past decade, the field of human activity recognition has grown dramatically, corresponding to societal demands to construct various important applications including smart surveillance, quality-of-life devices for elderly people, and human-computer interfaces.

Researchers are now graduating from recognizing simple human actions such as walking and running [2,3], and the field is gradually moving towards recognition of complex realistic human activities.

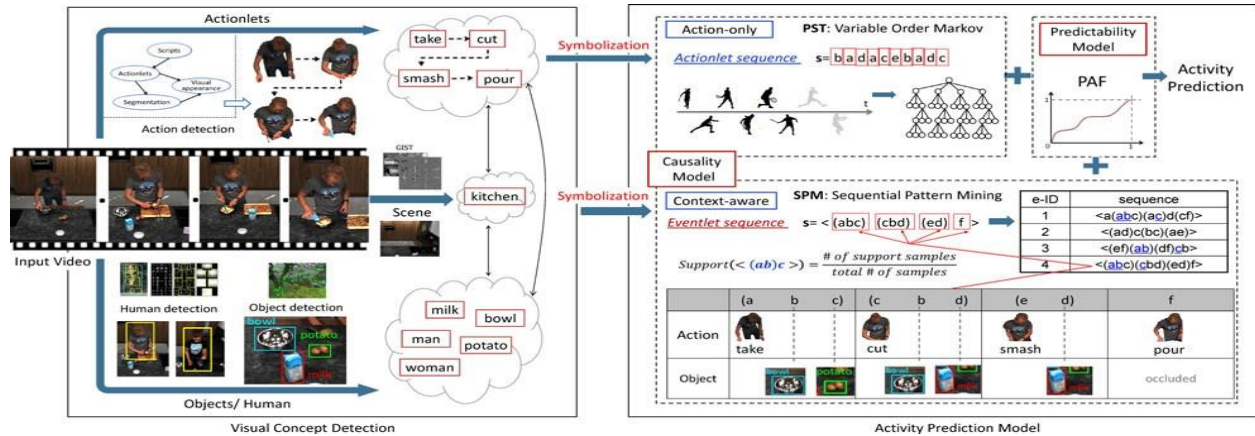


Fig.1. Frameworks of long-duration complex activity prediction. Two scenarios: (1) Action-only activity prediction. (2) Context-aware activity prediction.

In this paper, we propose a new approach for predicting long-duration complex activity by finding the contributory relationships between constituent actions and predictable characteristic of the activities. The key of our approach is to utilize the monitored action units as context to predict the next possible action unit, or predict the intension and effect of the whole activity. In this paper, we extend our previous work [4], an action-only model, to include a context-aware model. Hence we develop a Sequential Pattern Mining Algorithm (SPM) to incorporate the context information into actions which together can be represented as enhanced symbolic sequences.

2. Problem Definition

Early detection aims to recognize an ongoing tiny action from observation of its early stage. For example, an action of “Wishing” can be identified by just observing “Outstretched hand”. However, for activity prediction, it aim to infer the intention or an advanced level activity class with observation of only a few action units. The problem defined here is for complex activity which involves various Structural details by temporal logical patterns. The goal of activity prediction is to recognize unfinished single actions from observation of its early stage. Two extensions of Information retrieval paradigm, (i) dynamic and (ii) integral retrieval are proposed to handle the sequential nature of human activities[5].Then a structure SVM based event detector is learned to recognize partially observed sequences.

2.1 Contributions of this work

- First Our approach is to, solve the long-duration complex activity prediction problem, which has the following theoretical contributions on modeling[6]. 1) **Causality** by probabilistic suffix tree (PST), which can represent both large and small order Markov dependencies between action units; 2) **Context-cue** by sequential pattern mining, which utilizes interactive objects as cues for predicting human activity; and 3)

- b. **Predictability** by predictive accumulative function, which automatically learns the predictability pattern of each kind of activity from data.
- c. Our approach is a general framework for human activity prediction. 1) It can be integrated with any sequential decomposition methods of complex activity with flexible action lets granularity. 2) It can also include context information, such as objects, as strong cues for predicting high-level activity. 3) Useful observation derived from other sensors, besides cameras, can be easily added into the framework to improve prediction capability.

3. Comparison between Action-Only and Context-Aware Models

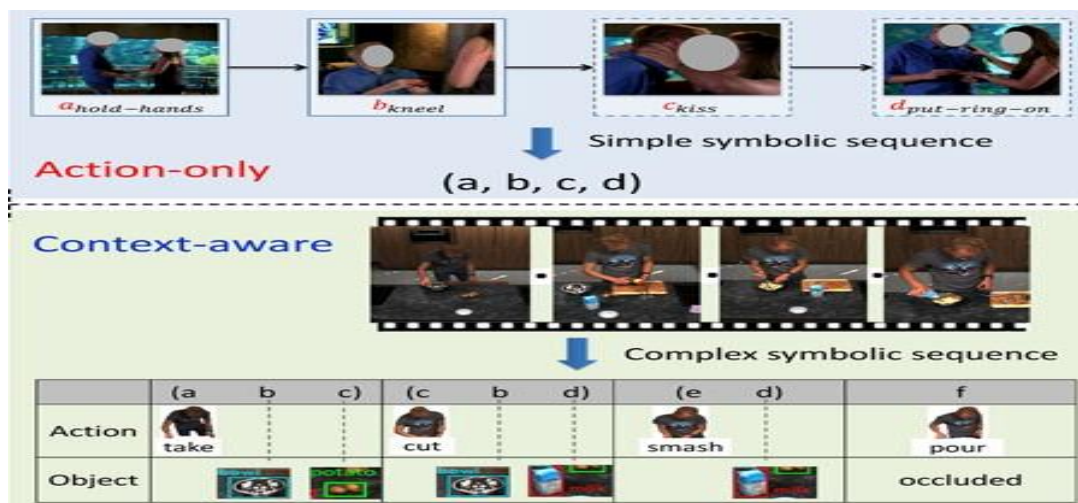


Fig.2. Two scenarios of activity modeling: action-only model (top) and context-aware model (bottom).

3.1 Action-Only Prediction model

Given an alphabet of actionlet symbols $\text{sum of } \{a_1; a_2; a_3; \dots; a_n\}$, an observation of activity is represented by a simple symbolic sequence, which is an ordered list of the actionlet symbols from the alphabet. An action-only prediction model takes this type of sequence of actionlets from an ongoing activity as input, and predicts the high level activity class. Fig.2(a)

3.2 Context-Aware Prediction Model

Given an alphabet of semantic symbols (actionlet and object labels) $\text{Sum of } \{e_1; e_2; e_3; \dots; e_n\}$. In context-aware prediction model, an observation of activity is represented by a complex symbolic sequence, which is an ordered list of vectors. Each vector is a subset of the alphabet. Fig.2 (b)

4. Algorithm used in context-aware prediction model

We introduced three algorithms namely; (i) Mapping-based (Algorithm 1) (ii) SPM-based (Algorithm 2). (iii) PST Algorithm

4.1 Mapping based Algorithm

The mapping-based algorithm is a simplified version of our context-aware causality model, which transforms the complex symbolic sequence (event lets) into a simple symbolic sequence. Then a similar PST model can be applied for the mapped simple symbolic sequences, as we used in the action-only model [7].

4.2 SPM based Algorithm

The SPM based Algorithm is a relatively complex version of our context-aware causality model, which finds frequent subsequence of item set as sequential patterns by conditional probabilities. Either we can use algorithm1 or algorithm2 for Context-aware Model [8].

4.3 Probabilistic suffix tree Algorithm

Causality is an important thing for human activity prediction. Our work is to acquire that causality relationship automatically so, we implementing Markov model for prediction of discrete sequences. The main reason for preferring is it can capture both large and small order which can extracted from training data [9].

5. Conclusion

In this paper we survey about human activity prediction by using temporal sequence pattern. The major contributions include a probabilistic suffix tree for representing various orders Markov dependencies between action units; we also analyze context-Aware prediction method to solve the complex activity into symbolic sequence through Mapping-based and Spm algorithms.

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