LifeLogOn: Log on to Your Lifelog Ontology!

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ABSTRACT

LifeLogOn is a system that enables users to easily and rapidly convert heterogeneous relational log data into instance-level integrated log ontology without requiring understanding any ontology languages. It also enables visualizing the created log ontology and allows users to navigate entities and events in the ontology by following their semantic relationships. This demo shows that integration of logs from many different sources can be practical starting point of realizing life logging which can support users' memory and future intelligent services.

Categories and Subject Descriptors

H.2.8 [**Database Management**]: Database Applications: data integration, visualization, management

General Terms

Algorithms, Management, Design, Standardization

Keywords

Lifelog, Ontology, Integration, Visualization, Navigation

1. INTRODUCTION

Lifelog means a set of logs that describes a person's entire life including any activities and interactions with the world. Realizing lifelog systems has been one of the important goals in ubiquitous computing research domain. So far, there have been several lifelog related projects [1-5] which aim to capture and store a person's life experience; however, existing systems are not flexible enough because they are based on fixed lifelog storage schema and rarely focus on integrating logs. Our motivation is 'if we can integrate currently available logs from different devices and create semantic relationships among logs, then it can be a practical starting point of realizing a lifelog system.'

We developed a prototype of *LifeLogOn* (Lifelog Ontology; 'Log on to your lifelog') that allows users to define flexible ontology schema and automatically generates instance-level log ontology based on the defined ontology schema and mapping information given by users. Finally, users can search and browse their life experiences, which represented in events and related entities, by using *LifeLogOn*'s visualization and browsing tool. Figure 1 shows the overall process of lifelog ontology generation process in *LifeLogOn*.
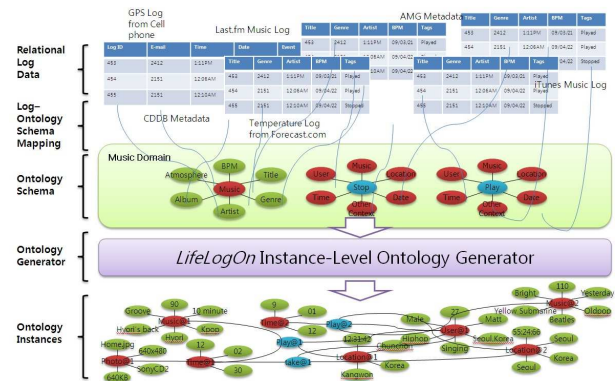

Figure 1. Lifelog Ontology Generation Process in *LifeLogOn*

The instance-level log ontology generated by LifeLogOn is semantically enabled in that we can use relationships among events and related entities in the ontology. *LifeLogOn* stores instances in its own knowledge base; however, for the compatibility with other standards, the system also supports RDF export so that any other applications which support standard RDF documents can use log ontology instantiated by *LifeLogOn*.

2. SYSTEM OVERVIEW

LifeLogOn consists of four sub tools and its own knowledge base. Each tool has its own user interface designed for its purpose. In this section, we overview each tool and explain its functionalities.
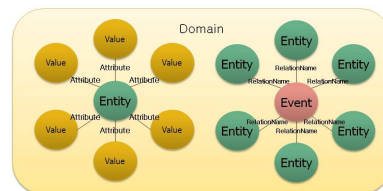

Figure 2. General Lifelog Model Used in *LifeLogOn*

[Ontology Schema Definition Tool] To integrate various forms of logs, we need to have one well-defined ontology schema that covers all the logs that we want to integrate. This tool gives an intuitive interface for defining ontology schema, according to a predefined general lifelog model. As Figure 2 shows, where a domain contains entities and events, an entity (e.g. song, person, location, timestamp…) is represented as a set of attribute-value

pairs, and an event is represented as a set of relation name-entity pairs. For instance, a song entity 'Yesterday' can be represented as {hasGenreOf: 'Rock', hasArtistOf: 'The Beatles', hasAlbumOf: 'Yesterday...and Today'...}, and a music play event can be represented as {IsplayedBy: 'S.K Lee', IsPlayedIn: 'At home', Timestamp:'19:01:44'...} Users do not have to know any ontology language when defining ontology schema using *LifeLogOn*.

[Log to Ontology Mapper] For automatic generation of instance-level ontology, *LifeLogOn* requires mapping information between relational log data (logs stored in RDB) to defined ontology. Users can use this tool to manage mapping profiles which describe which attributes in relational log should be converted into which types of classes or properties in ontology. Not only log data but also any other data stored in relational databases can be mapped to ontology schema, so LifeLogOn can also easily import additional information for logs such as metadata (e.g. CDDB, IMDB)

[**Instance-level ontology Generator**] Instance-level ontology Generator is for instantiating instance level ontology. By using this tool, users can select a mapping profile and start instantiation. When a user click the instantiation button, the ontology instantiation module in the generator connects to the source database where relational data including logs and others are stored, and it starts to decompose and transform relational data tuples into triples. The generated triples are stored in *LifeLogOn*'s knowledge base. Additionally, index structures are created for better search and navigation performance.
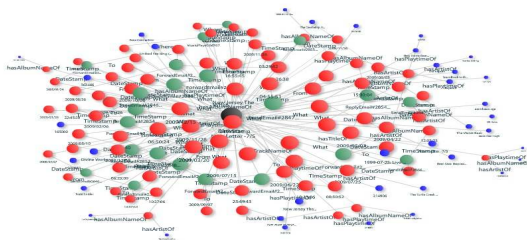

Figure 3. Ontology Visualization Example of *LifeLogOn*

[**Visualization and Browsing Tool**] *LifeLogOn* includes visualization and browsing tool for both ontology schema and instances. Generally, instance-level ontology has a lot more classes and properties than ontology schema, so we added a keyword search module for enhancing the accessibility of users to instances that they want to look at. The search module also supports an inference-level control, so that users can adjust the search inference-level according to their purpose. Users are able to explore their life experiences represented in the ontology, by using this tool.

3. USE CASE: FINDING WHAT YOU DO NOT REMEMBER

Assume that a user's instance-level lifelog ontology has been generated by *LifeLogOn*, integrating user's music listening logs, photo logs from digital camera, and CDDB music metadata for music items appeared in music logs. When the user is viewing photos that he took at his birthday party with friends few years ago, he eventually wants to figure out the title of a specific song

which was played with his mp3 player at the party but does not remember it. Thus, he types the filename 'party0916.jpg' into the keyword search box of the Lifelog Ontology Visualization and Browsing Tool. *LifeLogOn* shows events and related entities having values those match the filename. He looks at the '*PhotoTaken#812*' event which has a link to the photo entity that has filename of 'party0916.jpg', and he realizes that the event has a '*hasDateOf*' relation to a 'Date' entity whose value is '*2007/9/16*'. He clicks the entity, and he sees many events happened on the day. Among them, he finds the '*MusicPlay#124*' event which has a link to the song entity that has title of 'Yellow Submarine', which he was looking for.

This scenario shows that navigation process following links among events and entities of integrated log ontology can effectively support users' memory.

4. DISCUSSIONS & CONCLUSIONS

We developed a prototype LifeLogOn that (a) supports flexible ontology schema definition, (b) automatically generates instance level ontology based on user created mapping profile, and (c) visualizes and enables browsing entities and events in the generated ontology. In this paper, although we only show one use case scenario due to the lack of space, we believe that our lifelog ontology can support many useful scenarios. Moreover, we expect log ontology that *LifeLogOn* generates to be used for many applications such as personalized recommendation and context-aware services. We plan to develop APIs that enable other applications to access *LifeLogOn's* lifelog ontology and improve our system focusing on log model extension, matching algorithm among similar entities, and efficient visualization and navigation. More information and demonstration videos are available on our website: *http://lifelogon.snu.ac.kr*

5. ACKNOWLEDGEMENTS

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