The Motion Picture Paradigm: Record, Play and Re-play in Data/Information Management

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Research Project Description

The concepts of record, play and replay have hitherto been investigated mainly outside the core of data and information management. The usefulness of these concepts has been well demonstrated in computing infrastructure-oriented domains and software engineering domains such as program testing [Orso & Kennedy 2005; Sprenkle et al. 2005] and debugging [Georges et al. 2004; Geels et al. 2006] database management systems [Galanis et al. 2008; Wang et al. 2009], computer security [Shafique, Po & Goel 2006], and system dependability [Brown & Patterson 2002]. Data and information management has been used to support play and replay in these domains.

The capability of computer-based information systems (CIS) to provide a continuous, on-the-fly “recording” and “playable information/process scenes”, together with their future projections, for any specified review interval of arbitrary granularity within multiple dimensions would help to enhance task management, reviews, reporting and decision-support capabilities of CIS. The “motion picture paradigm” for information management is a proposed view that says that data and information systems can allow us to record, play and replay data and information in the same way that we do for video and audio recordings.

Recording (capture and storage in structured and semi-structured formats) and retrieval of information could be considered to be well-researched and supported by now. The concepts of play and replay has not been fully investigated in a direct way for data and information within the various application domains as evidenced by their absence in modern database and information systems. The need and benefits for the capability defined in the motion picture paradigm is reflected in domains such as Healthcare Records (EHRs) where its has been noted that the “... EHR not only has to present the medical data of the patient as they are at the present time, we can anticipate that in situations of medical audit, law suits, quality control and self-assessment it may be necessary to be able to replay the EHR output as it was or would have been at a certain moment in the past” [Bakker 2004] and, indeed, in the future.

Recent recognition of the importance of record, play and replay in database systems [Galanis et al. 2008; Wang et al. 2009] has remained focused on the infrastructural level with little support at the application level. Information Visualisation (InfoVis) [Card, Mackinlay & Shneiderman 1999; Carpendale 2008] has focused on graphically visualising information possibly using some form of graphical metaphors [Alty et al. 2000; Kosara & Miksch 2001] with a provision for directly manipulating the visual objects [Ahlberg, Williamson & Shneiderman 1992; Frohlich 1997; Bryson 2005] and information as well as support for animations [Robertson et al. 2008] and dynamic queries [Agne, Reuschling & Dengel 2006]. InfoVis has also addressed the problem of visualising information in databases [CRUZ & LEVEILLE 2001; Mariani & Kadyamatimba 2001; Morris et al. 2002; Chittaro & Combi 2003] including visualising query results [Owor 2002; Nürnberger & Detyniecki 2006]. However, modern InfoVis remain detached or decoupled from both the processes and the systems/infrastructures, such as database management systems (DBMSs), for the recording and retrieval of information. Thus, InfoVis, though it is becoming a mature domain, has not yet succeeded in influencing database and information systems with the concepts developed in its sub-domains of graphical visualisation, direct manipulation,
dynamic queries and animation of information. The motion picture paradigm could be useful in narrowing the gap between data and information management in practice and research developments in InfoVis by providing a framework and informational and computational foundation.

This project explores the development of meta-data and computational approach to supporting record, play and replay of information as native concepts in information systems. The project will seek to initially address the questions that deal with the meta-data and computational formalisms that are at the foundation for supporting record, play and re-play of information. This aspect is investigated before addressing the question of the presentation of instances of play and re-play of information, which could be achieved through InfoVis approaches. Existing data and information could possibly already be, or include, or be designed or enhanced to include, the meta-data and the characteristic that could support record, play and replay of the information. The project will determine the required nature and form of meta-data for supporting play and replay of data/information in an information system. Further inquiring will then focus on the use of this meta-data in algorithms and computational techniques that will be developed for supporting play and re-play of data/information.

This project will harness data and information analysis, mining, discovery and learning in supporting the view that organisational databases and information management systems are systems for recording “motion pictures” of organisational “information scenes” that can be queried, operated upon and presented through live, dynamic, specifiable and interactive play and re-play scenarios that can support business activities and tasks in an organisation. The main contribution of this research project is expected to be a generic approach and implementation for the motion picture paradigm. The generic approach is expected to be useful in information systems in any domain and to enhance information analysis and synthesis by harnessing data mining and knowledge discovery approaches in the daily routine for information management.

References


