

systems. A hyphen indicates incomplete information is available.

Free text retrieval systems suffer from limited data structuring ability, lack of navigational aids and an inability to model dynamic behaviour. Standard relational systems provide better data structuring and navigational facilities but their performance in context searching, other than on base units, is questionable and proximity searching is not available. Extended relational systems with flattened textual data can achieve a better performance and, through some ability to model complex objects, provide the basis of a unified model for multi-media data and of initiatives in advanced text processing such as semantic parsing. However, aggregation is a cumbersome task for a user and dynamic behaviour is not addressed. The E-R model has not been directly implemented so the information in the figure is incomplete but, with the lack of defined operations, it cannot be a complete solution.

Whether in the guise of semantic models like Taxis or databases such as GemStone, object oriented approaches appear to offer the most promise. Such systems handle quite naturally variable unit size, shared subobjects, dynamic behaviour and integration of function and data, and have considerable promise in multi-media modelling. The semantic models, in particular, also handle aggregation well through subtyping declarations. However, so far, object-oriented systems have presented relatively procedural interfaces to users, do not readily provide closure, are rather limited in standard database functions such as concurrent access and have not proved themselves in terms of performance. The optimum solution for users of textbases would therefore appear to be a merger of advanced database technology as in semantically-enriched relational systems with advanced object-oriented programming to create object-oriented textbases. Such textbases should be thought of as object-bases rather than pure database or object-oriented systems. It should not be pretended that such a merger will be easy. The cultural differences between the two approaches present many difficulties [Tsichritzis and Nierstrasz 1988] and much research of a fundamental nature is still required to attain a single complete multi-media model.

References

- [Atkinson81] M P Atkinson, K J Chisholm, and W P Cockshott (July 1981), PS-Algol: an Algol with a persistent heap, *ACM SIGPLAN Notices* 17(7).
- [Bloom87] T Bloom and S B Zdonik (1987), Issues in the Design of Object-oriented Database Languages, OOPSLA'87 Conf. Proc., *ACM SIGPLAN Notices* 22(12) 441-451.