图 18 展示了间隔查询的响应时间随数据量变化趋势,实验中仅改变 Wiki 的数据量,不同数据量的查询用例是相同的.随着数据量的增加,EPIMRST-SQ 和 EPIMRST 的检索性能均呈线性下降,二者的下降趋势相同.但 EPIMRST-SQ 的检索性能依然优于 EPIMRST 约 4 倍.

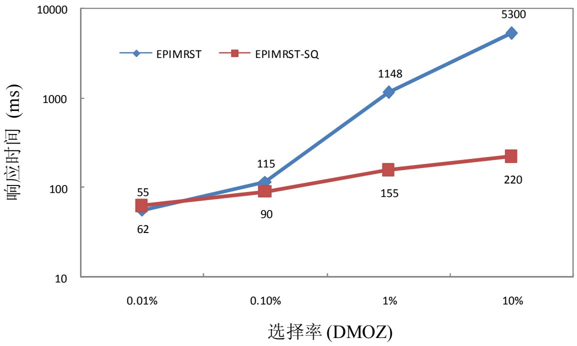

Fig.16 Respond time varies with query selectivity (DMOZ)

图 16 响应时间随选择率的变化(DMOZ)

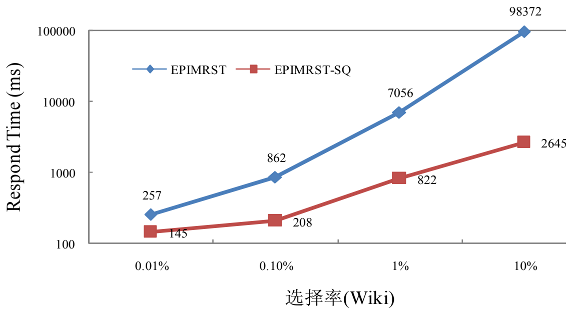

Fig.17 Respond time varies with query selectivity (Wiki)

图 17 响应时间随选择率的变化(Wiki)

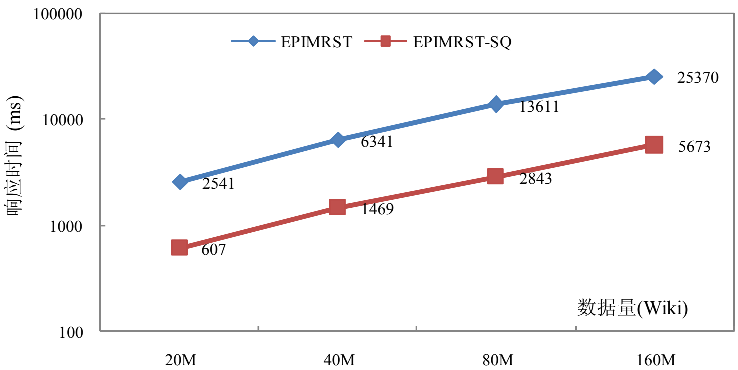

Fig.18 Respond time varies with the data size (Wiki)

图 18 响应时间随 Wiki 数据量的变化

以上实验从查询数、选择率、数据量这 3 个因子验证 SESIQ 的有效性.从结果可知:SESIQ 方法是有效的,特别是在数据量大、数据密度大的数据集中能够显著优化间隔查询,使其性能提升数十倍.

5 总结与展望

针对已有方法不能满足海量间隔查询性能要求的问题,本文首次将共享执行策略应用到间隔查询中,提出了采用共享执行策略优化间隔查询的方法 SESIQ.SESIQ 对接收到的间隔查询进行批处理,分析查询间可共享的操作,为多个查询生成一个全局的执行计划,从而减少重复数据的访问、提高检索性能.本文在已有分布式间隔索引基础上进一步优化间隔查询,基于理论分析和实验评估表明:SESIQ 是有效且高效的,其检索性能优于 NSESIQ 数十倍.

尽管本文提出的方案是高效可行的,然而本文还有一些问题待考虑:

1) 共享执行策略对内存需求相对较大.一般情况下,采用共享执行策略的应用都假设服务器的内存是足够大的,然而一些服务器的内存可能不够大,未来我们将研究内存受限的共享执行策略;

2) 本文在阐述 SESIQ 具体实施过程中仅对间隔查询进行了一维转换,然而一维转换使得 SESIQ 没有充分发掘间隔查询间的共享操作,因为范围查询的检索结果与覆盖查询的检索结果存在重复,如表 1 范围查询 q 的检索结果为{v,w},覆盖查询 q 的检索结果为{v,y,z},重复访问对象 v.

下一步我们将探索基于二维转换的 SESIQ 实现策略,从检索空间相交的角度深入挖掘间隔查询间重复访问的数据,进一步减少访问数据量,提升间隔查询的检索性能.

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