Front-End for Stored and Inherited Relations Defined through Implicit Schemes: Proof-of-Concept Demo of Suppliers-Parts Database on SQLite3

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The proof-of-concept implementation of an SQL DBS with Stored and Inherited Relations (SIRs), evolved further. Up to now, it demonstrated the processing of SIRs defined through, so-called *explicit* schemes. Recall that these are Create Table statements defining every inherited attribute (IA), in addition to every stored one (SA) of course, as usual. Now, the demo illustrates also the preprocessing of the so-called, *implicit* SIR schemes into the explicit ones. The former, i.e., Create Table R for some SIR R, does not need the definition of the inherited attributes (IAs) of R that are, so-called, *naturally inherited* (NI). The resulting lesser procedurality with respect to the explicit scheme should often be a substantial benefit for a DBA of a SIR DB.

More in depth, an implicit scheme is possible for any R with foreign keys (FKs), in Codd's initial sense. We qualify such FKs as *Primary Key Named* FKs (PKN FK). For a PKN FK F, referencing a relation R', the NI IAs of R, say A1,..Ak, share the proper names of every non-key attribute of R'. For every tuple of R, the values of NI IAs are defined as:

Select A1,..Ak From R_ left join R on R.F=R'.F.

Recall that R_ denotes here the relation termed *base* of R, consisting from all the stored attributes (SAs), of R only. We finally qualify all the NI IAs as the *natural inheritance* (NI) in R.

The new prototype is a front-end to the already existing demo. It continues with the Codd's S-P DB, the "mother" of all the relational DBS, as we all know. We presume therefore the reader familiar with. For the prototype, Create Table SP for S_P.SP, becomes also the implicit scheme for the SIR S_P1.SP. That one has the same SAs as S_P.SP, but also has the NI, inserted into Create Table SP as the demo illustrates. Not surprisingly, the demo shows the result substantially more procedural.

In the demo, we qualify the resulting SIR DB of S-P1. As in general for a SIR DB with NIs, the major advantage of S-P1 over S-P is the Logical Navigation Free (LNF) queries to the base tables. E.g., a typical for S-P1 query:

Select P#, PNAME, QTY From SP Where SNAME = 'Smith';

is, likely for any SQL clients, by far more awkward for S-P, since it becomes:

Select SP.P#, PNAME, QTY From SP Left Join S On SP.S#=S.S# Left Join P On SP.P#=P.P# Where SNAME = 'Smith'; .

Since S_P is 'the mother of all the relational DBs', as we all know, the property generalizes accordingly to any SQL DBs. Seemingly, in trillions+ thus at present, (VLDB 22).

The prototype itself is again a Python program using the SQLite3 kernel. It constitutes a self-running demo. For SQLite convenience, we renamed S-P to S_P. The demo first creates S_P1 with the same S and P base tables as in S_P. It then demonstrates the preprocessing of the S_P.SP scheme, considered as the implicit one of SIR SP. The end result is the *explicit* Create Table SP, with the NI explicitly in. One may pass that scheme to the prototype serving the previous demo accepting only the explicit SIR schemes and recalled here.

Once S-P1 with S and P relation is created, the demo illustrates the preprocessing steps. First, it determines all the, so-called, *declared* PKN FKs. These are all the present SQL FKs. Next, the demo finds all the, so-called *natural* (PKN) FKs. These are implicit, hence beyond the SQL definition of the concept, at present, although FKs for Codd, and contribute to the NI as well. Next, the demo adds all the NI attributes found to the Create SP. Finally, it inserts the corresponding (explicit) From clause.

Numerous prints & comments help readers familiar with Python to play with the demo by modifying the schemes. To access the prototype, click here. The program will show up at the on-line Python interpreter site. Click "Run" to start the demo. One can also save the original or any modified code in a private window on the site, by pressing F9 key. Or download it by clicking on "Floppy Disk" icon. Every download may later be uploaded to a private window at the site as well, by clicking on "Open Folder" icon there.

[1] Latest update: April 6, 2024.