Tutorial 7: Basic Relational Algebra

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Consider a database consisting of the relations, where the primary key of each relation is underlined.

sailors(<u>sid</u>, sname, rating, age)
boats(<u>bid</u>, bname, color)
reserved(<u>sid</u>, <u>bid</u>, date)

1. Find the names of sailors who have reserved at least two different boats with the same color.

   - **RA**
     $rb \leftarrow \pi_{sid,bid,color}(reserved \bowtie boats)$
     $good \leftarrow \pi_{sid}(rb \bowtie_{rb.sid=rb2.sid \ \wedge \ rb.bid \neq rb2.bid \ \wedge \ rb.color=rb2.color} \rho_{rb2}(rb))$
     $answer \leftarrow \pi_{sname}(good \bowtie sailors)$
   - **Datalog**
     $rb(S, B, C) \leftarrow reserved(S, B, \_),\ boats(B, \_, C)$
     $good(S) \leftarrow rb(S, B, C),\ rb(S, B', C),\ B \neq B'$
     $answer(N) \leftarrow good(S),\ sailors(S, N, \_, \_)$

2. Find the names of sailors who have reserved all red boats.

   - **RA**
     $allred \leftarrow \pi_{bid}(\sigma_{color='red'}boats)$
     $good \leftarrow (\pi_{sid,bid}reserved) \div allred$
     $answer \leftarrow \pi_{sname}(good \bowtie sailors)$
   - **Datalog**
     $allred(B) \leftarrow boats(B, \_,\ 'red')$
     $witness(S, B) \leftarrow reserved(S, B, \_),\ allred(B)$
     $bad(N) \leftarrow sailors(S, N, \_, \_),\ reserved(S, B, \_), \neg witness(S, B)$
     $answer(N) \leftarrow sailors(\_, N, \_, \_), \neg bad(N)$

3. Find the name and color of boats which are reserved by all sailors rated above 7.

4. Find the name(s) of sailors with the lowest rating.

5. Find the name and rating of the oldest sailor(s).

6. Find the names of sailors who have reserved every boat reserved by those with a lower rating.