CSC343 Worksheet 1

June 9, 2020

Note: This is student designed study guide to make learnings easier. This does not reflect the course material. Please take it only as a reference.

1. **Exercise 2.4.2:** Draw expression trees for each of your expressions of Exercise 2.4.1

2. **Exercise 2.4.3:** This exercise builds upon Exercise 2.3.2 concerning World War II capital ships. Recall it involves the following relations:

   Figures 2.22 and 2.23 give some same data for these four relations. Note that unlike the data for Exercise 2.4.1, there are some "dangling tuples" in this data, e.g. ships mentioned in *Outcomes* that are not mentioned in *Ships*.

   Write expressions of relational algebra to answer the following queries. You may use the linear notation of Section 2.4.13 if you wish. For the data of Figs. 2.22 and 2.23, show the result of your query. However, your answer should work for arbitrary data, not just the data of these figures.

   a) Give the class names and countries of the classes that carried guns of at least 16-inch bore.

   b) Find the ships launched prior to 1921.

   c) Find the ships sunk in the battle of the Denmark Strait.

   d) The treaty of Washington in 1921 prohibited capital ships heavier than 35,000 tons. List the ships that violated the treaty of Washington.

   e) List the name, displacement, and number of guns of the ships engaged in the battle of Guadalcanal.

   f) List all the capital ships mentioned in the database. (Remember that all these ships may not appear in the *Ships* relation).

   g) Find the class that had only one ship as a member of that class

   h) Find those countries that had both battleships and battlecruisers.

   i) Find those ships that "lived to fight another day"; they were damanged one battle, but later fought in another

class	*type*	*country*	*numGuns*	*bore*	*displacement*
Bismarck	bb	Germany	8	15	42000
Iowa	bb	USA	9	16	46000
Kongo	bc	Japan	8	14	32000
North Carolina	bb	USA	9	16	37000
Renown	bc	Gt. Britain	6	15	32000
Revenge	bb	Gt. Britain	8	15	29000
Tennessee	bb	USA	12	14	32000
Yamato	bb	Japan	9	18	65000

(a) Sample data for relation `Classes`

name	*date*
Denmark Strait	5/24-27/41
Guadalcanal	11/15/42
North Cape	12/26/43
Surigao Strait	10/25/44

(b) Sample data for relation `Battles`

ship	*battle*	*result*
Arizona	Pearl Harbor	sunk
Bismarck	Denmark Strait	sunk
California	Surigao Strait	ok
Duke of York	North Cape	ok
Fuso	Surigao Strait	sunk
Hood	Denmark Strait	sunk
King George V	Denmark Strait	ok
Kirishima	Guadalcanal	sunk
Prince of Wales	Denmark Strait	damaged
Rodney	Denmark Strait	ok
Scharnhorst	North Cape	sunk
South Dakota	Guadalcanal	damaged
Tennessee	Surigao Strait	ok
Washington	Guadalcanal	ok
West Virginia	Surigao Strait	ok
Yamashiro	Surigao Strait	sunk

(c) Sample data for relation `Outcomes`

Figure 2.22: Data for Exercise 2.4.3

name	*class*	*launched*
California	Tennessee	1921
Haruna	Kongo	1915
Hiei	Kongo	1914
Iowa	Iowa	1943
Kirishima	Kongo	1915
Kongo	Kongo	1913
Missouri	Iowa	1944
Musashi	Yamato	1942
New Jersey	Iowa	1943
North Carolina	North Carolina	1941
Ramillies	Revenge	1917
Renown	Renown	1916
Repulse	Renown	1916
Resolution	Revenge	1916
Revenge	Revenge	1916
Royal Oak	Revenge	1916
Royal Sovereign	Revenge	1916
Tennessee	Tennessee	1920
Washington	North Carolina	1941
Wisconsin	Iowa	1944
Yamato	Yamato	1941

Figure 2.23: Sample data for relation **Ships**

3. **Exercise 2.4.4:** Draw expression trees for each of your expressions of Exercise 2.4.3

4. **Exercise 2.4.5:** What is the difference between the natural join $R \bowtie S$ and the theta-join $R \bowtie_C S$ where the condition C is that $R.A = S.A$ for each attribute A appearing in the schemas of both R and S

Reference

1) Stanford: CS145 - Introduction to Databases, link