VITMAB04 – Databases

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5 November 2020 – 4th tutorial: Relational Algebra

Consider the following relations.

Student

Name	University	Course	Year
Jodie Whittaker	KCL	Informatics	2011
Peter Capaldi	KCL	Mech. Eng.	2007
Matt Smith	UCL	MBA	2009
David Tennant	Imperial	Informatics	2004
Pete Tong	Birkbeck	MBA	2010
Paul McGann	York	Teacher	2011

StarUniversity

University	Founded
Exeter	1955
York	1963
Imperial	1907
Birkbeck	1823
KCL	1829

Person

Name	City
Jodie Whittaker	Budapest
Peter Capaldi	London
Matt Smith	Oxford
David Tennant	Cambridge
Pete Tong	New York
Paul McGann	Debrecen
Johnny Bravo	Budapest

Construct the relational algebra expressions that answer the following queries.

1. Which are the non-star universities?
2. Which students do not attend any star university? Assume that a student attends one university at a time.
3. Which courses are taught at a minimum of 2 universities?
4. Which courses are taught at only one university?
5. Which is the oldest star university?
6. Which courses are taught at star and non-star universities?
7. Who are the informatics students from Budapest?
8. Which cities do star university students come from?
9. Which students were admitted before 2005 or attend a non-star university?

Brainteasers

1. Show that every theta-, equi- and natural join expression can be rewritten using only $\times$, π and σ.
2. From the relations above, repeating any known relational algebra operator a finitely infinite number of times, can we obtain the below tuples? If yes, show the expression, if no then prove it's not possible!
    a. (Jodie Whittaker, Budapest, Matt Smith, UCL, Oxford)
    b. (Jodie Whittaker, Budapest, Harvard)
3. Construct relational algebra expression to find the
    a. smallest element of a set;
    b. the greatest element before the smallest element of the set.

Transformation of ER to relational schema

Transform the schema from Exercise 1 of Practice 2 to a relational schema.