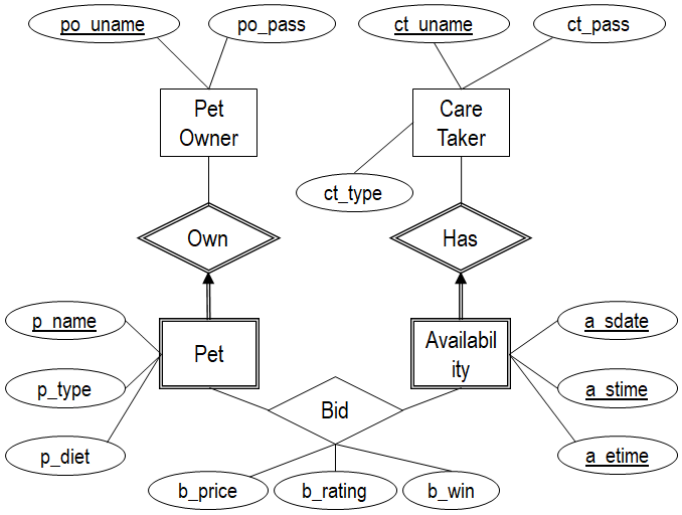
CS2102 Database Systems

Semester 1 2019/2020

Tutorial 09 (*Selected Answers*)

Introduction

This tutorial aims to aid the analysis of your ER diagram for redundancy and compliance with normal forms. We will use the simplified schema from Assignment 03 and Midterm shown below. Furthermore, we may add additional functional dependencies into the schema that is not captured by the ER diagram.



To ease your writing, we will use the mapping shown in the table below.

Attributes	Simplified Attributes
po_uname	A
po_pass	B
ct_uname	C
ct_pass	D
ct_type	E
p_name	F
p_type	G
p_diet	H
a_sdate	I
a_stime	J
a_etime	K
b_price	L
b_rating	M
b_win	N

Tutorial Questions

[Discussion: 1, 2, 3(a), 3(bc)]

1. Given the ER diagram above.
   a) List all the completely non-trivial functional dependencies captured by the ER diagram. Explain.
   b) Find all the keys of $R(A, B, C, D, E, F, G, H, I, J, K, L, M, N)$.

2. Given the completely non-trivial functional dependencies in question (1).
   a) Find a lossless-join BCNF decomposition of $R(A, B, C, D, E, F, G, H, I, J, K, L, M, N)$.
   b) Does your decomposition mapped perfectly with the ER diagram or is there a feature (entity-set, relationship-set, weak entity-set, etc) that are not present in the decomposition?
   c) If there are any feature not preset, explain.
   d) Is your decomposition in part (a) a dependency-preserving decomposition?

3. Consider adding a serial ID for `Pet` called `p_id` with a mapping to character "`O`" such that we have an additional functional dependencies $O \rightarrow FGH$ on top of any other functional dependencies in question (1).
   a) Find a lossless-join BCNF decomposition of $R(A, B, C, D, E, F, G, H, I, J, K, L, M, N, O)$. Is your decomposition a dependency-preserving decomposition?
   b) Find a lossless-join and dependency-preserving 3NF decomposition of $R(A, B, C, D, E, F, G, H, I, J, K, L, M, N, O)$.
   c) Try to draw the corresponding ER diagram generated by the 3NF decomposition.