

CO526 Databases Course Work 2: ER Modelling

Due in 12noon Friday 2nd March 2018

Submission

You must submit printed or neatly handwritten answers to all questions to the SAO by the submission deadline.

Background

You are to design a new database to hold data on various species of animals.

Each animal species will be identified by its name, and we will record the average weight, length and lifespan of the species. If a species is extinct, we record the date of the extinction. Where known, we also record for a given species the other species from which the given species evolved.

For all the countries of the world we record the country name, land area of the country, and the name of the main organisation for wildlife monitoring in the country. For all continents we record the continent name, and the land area of the continent.

We record the population of a species that is estimated to live in the land area of each country that falls within each continent (hence, for example, recording separate populations of species that estimated to live in European Russia and Asian Russia).

The species may be divided into reptiles, insects, fish, birds or mammals. However our database will only store information on the last three.

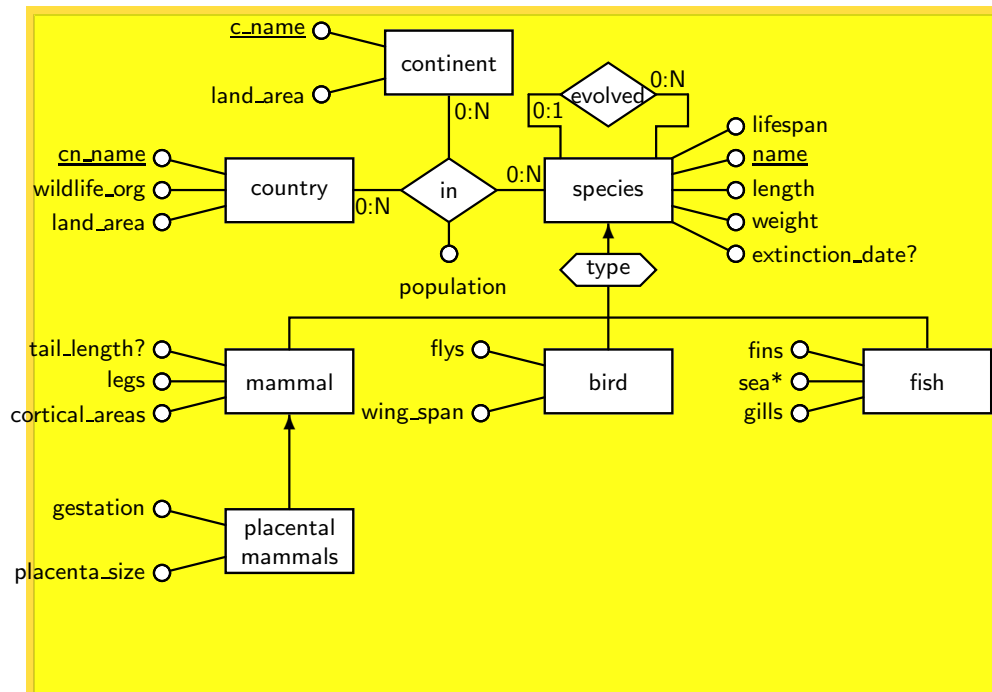
For fish, we will record the number of gills and the number of fins the species has, and the names of all the seas in which the fish is found.

For birds, we will record the average wing span, and if the bird flies or not.

For mammals we record the number of legs and the number of cortical areas found in the brain. If the mammal has a tail, then we record the length of the tail. Some mammals may be classed as placental mammals, and for those placental mammals, we will record the gestation period of offspring, and the size of the placenta.

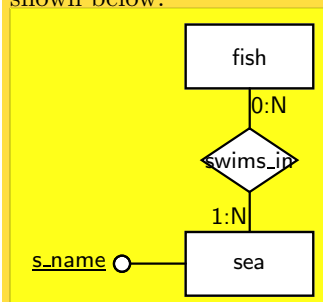
Questions

1. Design an ER^{ADHKLMNOSVW} Schema to represent the UoD.

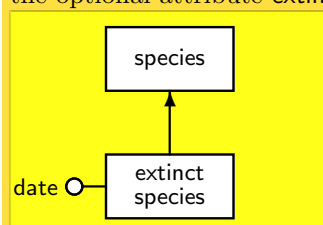


(A) Loose 3 marks for including reptile and insect entities, since the description specifically excludes the storage of these.

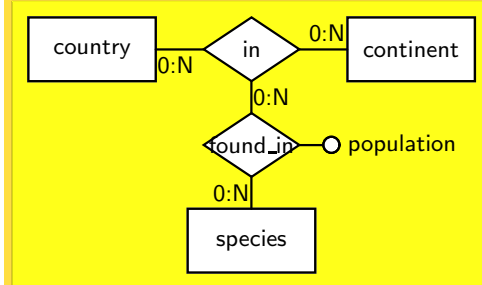
(B) Loose 5 marks for not using a multivalued attribute for sea, but instead a separate entity as shown below.



(C) Loose 3 marks for missing the optional ? cardinality on an attribute, or for using a subclass to represent cases where instead an optional attribute could be used. For example, replacing the optional attribute extinction_date with:



④ Loose 3 marks for making continent be associated to country only (and not species), and instead having a nested relationship as follows:



The text makes no mention of data associating countries with continents, except in the context of recording species.

⑤ Loose 3 marks for each missing attribute, or an attribute placed on the wrong entity/relationship, or a cardinality constraint error on a relationship.

Note that there must be a **land_area** attribute of **country** since the description specifically mentions its existence. There is no mention of the data for land area within a particular continent being available, even though the population is being recorded for a country within a continent.

However, do not lose marks for having a **land_area** on both **country** and **in**.

⑥ Loose 5 marks for making **evolved_from** an attribute

⑦ Loose 7 marks for having no representation of evolves from.

⑧ Loose 5 marks for each incorrect weak entity added. For example, making placental mammals a weak entity rather than a subset (only one instance of placental mammal can exist for any mammal, and so it is a subset). Country cannot be a weak entity since it does not depend on the existence of a particular continent (countries can span continents).

⑨ Loose 5 marks for making sea be an attribute of fish rather than a multivalued attribute or a separate entity (it cannot be a single valued attribute, since a fish may be in multiple seas). Note that the **sea** could have + or * cardinality.

⑩ Do not lose any marks for interpreting evolves from as a many-many relationship (since species can serve as the plural). But note relationship mapping must match the ER!

2. Map the ER schema into a relational schema.

continent(cn_name,land_area)

country(c_name,land_area,wildlife_org)

species(name,lifespan,length,weight,extinction_date?,evolved_from?)
species(evolved_from) \xRightarrow{fk} species(name)

in(cn_name,c_name,name,population)

in(cn_name) \xRightarrow{fk} continent(cn_name)

in(c_name) \xRightarrow{fk} country(c_name)

in(name) \xRightarrow{fk} species(name)

mammal(name,legs,tail_length?,cortical_areas)

mammal(name) \xRightarrow{fk} species(name)

bird(name,flays,wing_span)

bird(name) \xRightarrow{fk} species(name)

fish(name,fins,gills)

fish(name) \xRightarrow{fk} species(name)

fish_sea(name,sea)

fish_sea(name) \xRightarrow{fk} fish(name)

placental_mammal(name,gestation,placenta_size)

placental_mammal(name) \xRightarrow{fk} mammal(name)

⊖ If ① has been chosen, then there should be two tables:

in(cn_name,c_name,name)

in(cn_name) \xRightarrow{fk} continent(cn_name)

in(c_name) \xRightarrow{fk} country(c_name)

found_in(cn_name,c_name,name,population)

found_in(cn_name,c_name) \xRightarrow{fk} in(cn_name,c_name)

found_in(name) \xRightarrow{fk} species(name)

Ⓚ Loose 3 marks for each entity or many-many relationship that has not been mapped to a table in the ER

Ⓛ Loose 3 marks for each additional column of missing column or optional column not identified (cap at total of 9 marks lost for such errors)

Ⓜ Loose 3 marks for failing to identify the key of a relation (cap at total of 9 marks if all keys not identified)

Ⓝ Loose 3 marks for each FK missed (cap at total of 9 marks lost if no FKs)

Ⓤ If a many-many relationship has been identified for evolves from, then the relational mapping should be:

species(name,lifespan,length,weight,extinction_date?)
evolved(from,to)

evolved(from) \xRightarrow{fk} species(name)

evolved(to) \xRightarrow{fk} species(name)

