Informatics 1: Data & Analysis
Tutorial 1

Week 3, Semester 2, 2011

- Please answer questions 1–6 of this worksheet in advance of the tutorial, and bring with you all work, including printouts of any computer work. Tutorials cannot function properly unless you do the work in advance.
- Please also think about the **Tutorial Discussion** points.
- Data & Analysis tutorial exercises are not assessed, but are a compulsory and important part of the course. If you do not do the exercises then you are unlikely to pass the exam.
- Attendance at tutorials is obligatory: if you are ill or otherwise unable to attend one week then email your tutor, and if possible attend another tutorial group in the same week.
- *Required Reading:* Chapter 2 of 'Database Management Systems' (Raghu Ramakrishnan and Johannes Gehrke, 2003). This was distributed at the first lecture, and photocopies are available from the ITO.

Introduction

In this tutorial you are required to design an Entity Relationship Model for a database to be used by the organisers of a poster exhibition in order to keep track of the submission, selection and presentation phases. You should read the scenario carefully, making a note of all the candidate entities you think are involved, and of their attributes. Think about the relationships between the entities as you do this. The tutorial consists of answering a series of questions about your design and producing a final ER diagram for it.

A Poster Exhibition

The scenario is that you are organising a poster exhibition on "Global Problems of the 21st Century", and you have decided to design a database to keep track of the administration of the exhibition. Three main phases are recognised for the exhibition: the submission, the selection and the presentation phase. These are further explained below.

Submission Phase: Graphic designers create posters for the exhibition where they illustrate a global problem of the 21st century. Graphic designer information that is of relevance to the organising committee includes the graphic designer's name and their affiliation, i.e. the organization they work for. A poster has a title and is assigned an identification number, and it may be created by several graphic designers. However, each individual graphic designer is allowed to (help) create only one poster for this exhibition, and no more. In the case of groups of graphic designers creating a poster, we distinguish between the main designer and the co-designers. In case of a single graphic designer, he/she is considered to be the main designer of the poster. In any case, the main designer is the point of contact, so his/her email address should be available to the organising committee.

Selection Phase: All posters created for this exhibition need to be judged by members of the jury. A judge is a graphic design expert with experience in communication for raising public awareness and for public benefit. Judge information that is of relevance to the organising committee includes the judge's name, his/her affiliation and email. Each poster is judged by three different judges. When judging a poster, a judge gives a decision: accept or reject. A poster is selected for the exhibition only if all three judges give an "accept" decision. We should note that judges are not themselves allowed to compete in "Global Problems of the 21st Century".

Presentation Phase: All selected posters are then presented in the exhibition by their main graphic designers. The poster presentation is allocated a stand and an exhibition session. Each exhibition session takes place at a specific date, and 4 sessions have been announced: human rights, environmental pollution, poverty, and war.

Question 1 - Determining possible entity-sets

What are the candidate entity sets you would consider in order to build your ER model? Choose your final set of entity sets from the candidates, making sure to include 'Judge', 'Poster' and 'Graphic Designer'.

Things to think about: Is it possible to map entity sets directly and unambiguously from the information given, or is there more than one possibility for modelling these entity sets?

Question 2 - Defining attributes for a given entity-set

At this point you will have decided your sets of entities that can be used to design the ER diagram. For this question, focus on just the two entity sets below:

- Judge
- Poster

What are the attributes you can assign to each of these given the available information? What are the attribute domains?

Note: In order to draw your diagram you will need to decide the attributes for *all* your ER objects. You do not need to list them all here, but they must appear on your final diagram.

Things to think about: According to the scenario given, a judge gives a decision on a poster that he judges, either accept or reject. Is this an attribute? If not, what is it? If it is an attribute, does it belong to Judge or to Poster or to neither of them? If it belongs to neither, where does it feature in the ER design?

Question 3 - Describing relationships

Define relationships between the entities you defined in the first question. What kinds of relationships are these? *one-to-one*? *one-to-many*? *many-to-many*? Are there any weak entities in your model? Are there any ISA hierarchies? Are there any key constraints? Do any of these relationships involve total participation?

Question 4 - Defining primary keys

What are the primary keys for each entity in your model? Why did you chose them?

Question 5 - Drawing the diagram

Draw the diagram representing your ER model. Use the conventions given in the lecture slides.

Question 6 - Using `dia`

Draw the ER diagram you created in Question 5 using the `dia` application on the DICE machines. Follow the instructions below to use `dia`.

1. Start `dia`. Either go to the main menu on your `dice` desktop (by clicking on the icon at the bottom-left corner of the screen) and select the option for `Dia Diagram Editor` from the `Graphics` menu, or type `dia` at the command line in a terminal window. (You can run it in the background by typing "`dia &`" — ask your demonstrator if you don't know what this means.)

2. You will see a diagram window and a `Diagram Editor` window with tool buttons. In the middle of the tool buttons window there is a pull-down menu (which may be labelled `Misc` or `Assorted` initially). Click on that menu and select the option `ER`, either from the list if it's present, or from the `Other Sheets` sub-menu. Once you've done this, you will see a set of buttons for drawing entities, relationships and so on, just below the pull-down menu.

3. The blue lines on the diagram window are page-delimiters. By default they are set as size A4 with portrait orientation. You may prefer using landscape orientation for this task. To change the orientation use the `File - Page Setup...` menu option.

4. To draw an Entity, select the `Entity` drawing tool (first one on the left, denoted with a square labelled "E") and click anywhere on the diagram window. Double click on the Entity you just created and explore the different options you can use for customising entities. Once you have played with these options, set the final name of this entity to be `Glider`.

5. In the same way, but using the `Attribute` tool (a circle with the letter "A") define the attributes for this entity. When you double click on a defined attribute you also have a number of options for customisation. Spend some time exploring these as well.

6. In order to connect objects, select the icon with two parallel lines and then click on the screen. Then click and drag (while keeping mouse button pressed) on one of the green ends of the line and connect it to one of the objects (when you see a red line around the object it means the connection is made and you can release the mouse). Do the same for the other end of the line. The small square in the middle of the line allows you to change the shape of the line. Notice that the connection lines will follow if you move the objects around — this makes it easy to lay your diagram out neatly.

7. If you prefer a straight line connection to a zig-zag, use the `Line` button from the top part of the tools window. You can also add arrows and change the width of lines using the options at the bottom of the window. These are useful for showing key dependencies and total participation relationships. Experiment with these options.

8. There is also a tool for drawing relationships (the button icon contains a letter "R"). Explore how it works and define the relationships between entities.

9. Build up your gliding ER diagram by adding and connecting all the entities, attributes and relationships from the model you designed in the tutorial.

10. Editing tips:

    (a) *Deleting:* If you want to delete an object, click on it and press the `delete` key. You can also undo the last action performed, by clicking `Edit - Undo`.

    (b) *Scaling:* Objects created in `dia` by default are quite large; you will want to make them smaller for printing. The simplest way to achieve this is to lay out your diagram on the screen without worrying about the size, and then — once it is complete — use the `File - Page Setup...` menu, `Scaling` option, and scale the diagram to fit in a single page (i.e. `1 x 1`).

11. To print your diagram, use the `File - Print Diagram...` menu.

You may choose to work on this task during one of the drop-in labs, where you will be able to ask a demonstrator for help. Drop-in labs are daily in the afternoons in Computer Lab West on level 5, Appleton Tower.

Tutorial Discussion - Thinking around the model

- According to the scenario: "A poster...may be created by several graphic designers. However, a graphic designer may create only one poster for this exhibition, and no more." Can you model this in your ER diagram? If yes, how?
- According to the scenario: "Each poster is judged by three different judges." Can you model this in your ER diagram? If yes, how?
- According to the scenario: "A poster is selected for the exhibition only if all three judges give an "accept" decision." Can you model this in your ER diagram? If yes, how?
- According to the scenario: "...judges are not themselves allowed to compete in Global Problems of the 21st Century" Can you model this in your ER diagram? If yes, how?
- Based on your answers for the above questions, what do you think about the expressivity of the ER model?
- Based on your answers (and your classmates' answers) for this tutorial, do you think there is only one solution for this ER model?
- If there is more than one correct answer, how can you be sure that your answer is correct? Any tips on modelling strategies?
- So far in Informatics 1 you've seen several different modelling formalisms, such as the ER model, Propositional Logic and Finite State Machines. Based on your experience, for what kinds of situations/scenarios would you use one over the other? Do you think that Propositional Logic and FSMs have the property that there may be several different ways of modelling a given scenario?