Temporal Model of the Feed Database.

1 Overview of the Database.

The Feed Database is designed to store aggregated measures of nutrients which compose different types of animal feed. Aggregated measures are derived in the following way. First, for a given type of animal feed a sample is collected from different places of Switzerland. For example, a sample can be grains from different fields or apples from the different gardens. Next, each sample is investigated in order to find out types and values of nutrients it contains. In the final stage, values of the same nutrients are aggregated and stored in the database. In addition to aggregated values, the database stores information about nutrients groups which are important for specific animal species.

The main focus of the Feed Database is to support analysis of nutrients for various feed types. Currently, the database does not contain historical information and, thus, only simple analysis is possible. For example, one can compare selected nutrients for a group of feeds, find the best combination of feeds which maximize selected nutrients, find the worst and best feeds for a given animals. However, content of nutrients and nutrient groups vary in time and, thus, the results of this analysis is valid only for some period. Moreover, the results are imprecise since the database stores aggregate value of many samples. Our major goal is to support the Feed Database with the full history of changes.

2 Task 1: Deriving Current Database Design.

Your first task is to investigate given SQL schema of the database and from that to derive current data model and entity-relationship diagram. Make sure, that you correctly recognize all entities, attributes, keys, relationships, participation and cardinality constraints. In case, if some parts of SQL schema are hard to translate into data requirements and include in the ER diagram, you should contact your supervisor for an advice or mention these parts in your description.

3 Task 2: Introducing Temporal Information.

Your second task is to extended ER diagram with temporal information so that the following data requirements are satisfied:

1. Instead of storing aggregated values of multiple measures, the database stores history of all single measures. In addition to nutrient's type, single measures are categorized according to location they come from. For each nutrient type and location single measures are classified into valid and

invalid: a valid single measure is the newest one; all other single measures are invalid. Locations are cities, villages or regions in Switzerland.

2. Nutrient groups are varying in time: it is possible that a nutrient is added or removed from the group. From your new design it must be possible to derive current and old content of the groups.

4 Task 3: Validating the Design.

Your last task is to validate new design of the database. First, you will translate ER diagram into SQL schema and next, you will identify two SQL queries which *i*) use time domain and *ii*) in your opinion are the most expensive to execute. Your goal is to improve SQL schema with indexes and/or views which benefit most in optimizing given SQL queries. For one of the queries, you will experimentally evaluate querying time with and without optimization.

5 Literature and Software

- A good starting point is to read user manual of the Feed Database.
- In case, if you want to refresh your knowledge about ER model, please, use slides of 'Datenbanksysteme' course lectured by prof. Michael Böhlen:

  `http://www.ifi.uzh.ch/dbtg/Classes/fs10/datenbanksysteme/`

  More exhaustive material to read is 'The Entity-Relationship Model: Toward a Unified View of Data' by Peter Pin-Shan Chen.
- For drawing ER diagram you might want to use free of charge 'Dia' editor:

  `http://live.gnome.org/Dia`.
- You are free to use standard ER model or Temporal ER model introduced by H. Gregersen in 'Conceptual Modeling of Time-Varying Information'.

All the literature in the above list is found at project's home page:
`http://www.ifi.uzh.ch/dbtg/Projects/feed_database/`