

Introduction to Databases

Homework no. 3: Database design

1. A monitoring society is interested in analyzing the measurements of sensors from different buildings.
 - The measurements are collected by the sensors spread over the different rooms of the buildings. Each sensor is identified by a code, and it is characterized by a type and a version. Each sensor has a list of measures that it can read, and for each measure that it can read, the measurement error value is known. Measures to be read are identified by an acronym, and they are characterized by a name and a unit of measure. The minimum and maximum acceptable values may be known for each measure. Each measurement collected by a sensor has a value, it is associated with one measure only, and with the date and time of collection. Sensors can collect different measurements throughout the day. For each date and time, a sensor can collect different measurements of different measures, but at most one measurement for each measure.
 - The database must record the different rooms where a sensor is located in different dates. At a given date, each sensor is located in one room only. Rooms are characterized by a name and a list of features. Rooms are identified by an incremental number which is unique within the building they belong to. Rooms are of one type between big or small. Big rooms are characterized by their dimension, small rooms are characterized by a category.
 - The building is identified by a code, it is characterized by its geographical coordinates (latitude and longitude) and by the list of rooms that belong to that building.
 - Building owners can have different buildings, they have a unique VAT number, a full name, a short name (if available), a phone number, and a list of email addresses. Please note that the phone number changes over time. The database must track the different phone numbers the building owner has had over time, and the corresponding periods (start date, end date). The same phone number can be associated with the same building owner in different periods.
- (a) Exercise (a): Describe the conceptual schema of a database for the above application by means of an ER diagram.
- (b) Exercise (b): Derive a normalized relational logical schema for the same database.
- (c) Exercise (c): Define referential integrity constraints for 3 relations of your choice among those defined in the conceptual schema.