

Brown plant hopper is a pest insect that regularly devastates the rice fields in South-East Asia and Vietnam in particular, causing very important damages for the agriculture and economics of the concerned countries. In order to diminish the risk of invasion, farmers tend to increase the quantity of pesticides they use in the fields, which may have a great impact on public health in the coming years. In order to better monitor and understand such invasions, some projects focus on surveillance networks. For instance, thanks to the project network of observation of pest and diseases for crop in Vietnam (led by the Department of Plant Protection of the Mekong Delta, in collaboration with Can Tho university), more than 300 fixed light traps are now spread in an area covering 4 million hectares in the region of Mekong delta (Vietnam). The average distance between two traps is 20km. Every day, farmers visit those light traps and count the number of insects (including brown rice hoppers) captured in those traps during the preceding night, which allows to monitor the insects invasion and fight almost real-time against those invasions.

Let us describe the monitoring procedure in order to model the operational database (i.e. the database storing real-time the information in order to fight against the insects invasion). More than 300 light traps are spread in an area covering 4 million hectares in the region of Mekong delta (Vietnam). Each light trap is located at a fixed position (and therefore a GPS position). Every month, people working for the monitoring network visit the surroundings of the trap, check the neighboring ecosystem (water meadows, rice fields, forest...) and measure the level of pesticides. Let us assume they obtain only one measure (scalar value) for the level of pesticides near each trap. All kinds of insects are attracted and fall in these traps. Each kind of insect can be designated by its name, its minimum size, its maximum size, its diet (what kind of grass/plants/insects it eats), its sub-type (long wings, short wings. Among these insects, some kinds are pests (dangerous for the environment), and some are good for the environment. All of them can be affected by pesticides. Every week, some farmers (designated by their first name, last name, address and telephone) check every trap (each trap is checked each week by exactly one M. Visani 2/8 farmer). They take some notes about the insects they find in the trap: kind of insect, sub-type, age (young/adult), approximate size (in mm), its gender (male/female), and quantity (for instance 5 young female brown rice hopper with long wings and approximately 12mm, 2 adult male cockroaches with long wings and approximately 17mm...)

Business Requirement

There are some requirements that decision database has to support the decision maker

1. Analyst the insects which are most frequently trapped in the region, according to their kind, subtype, and diet for instance;
2. Analyst the correlation between the density of insects trapped and the level of pesticides around the trap;
3. Analyst the correlation between the density of insects trapped and the ecosystem around the trap, according to the diet of the insects;

4. Determine which kinds of insects are the most affected by pesticides (which insects are the most rare in the presence of a high level of pesticides), and if these insects are pests or not;
5. Analyse the density of insects according to time criteria: are there more or less insects at the end of the lunar month for instance?
6. Analyse the insects which are frequently trapped together (or rarely trapped together). Indeed, the disappearance of the insect of type A might announce an invasion of the insect of type B...
7. Analyse the density of insects in each trap, according to their position. This analysis can lead to tracking insect invasions.
8. Sometime, some of farmers give the same checking trap result as the last time. Normally it means they did not check the trap, in this case they should be notified to do it again (additional requirement)

According to the scenario, there are 300 traps, some farmers (not so many farmers) and type of insects (that always attack the fields of this area) so it is possible to model the decision database with star model

Your work:

- 1. Using ER modelling to construct an OLTP Data Model**
- 2. Using star schema to construct a Multi Dimension Data Model**