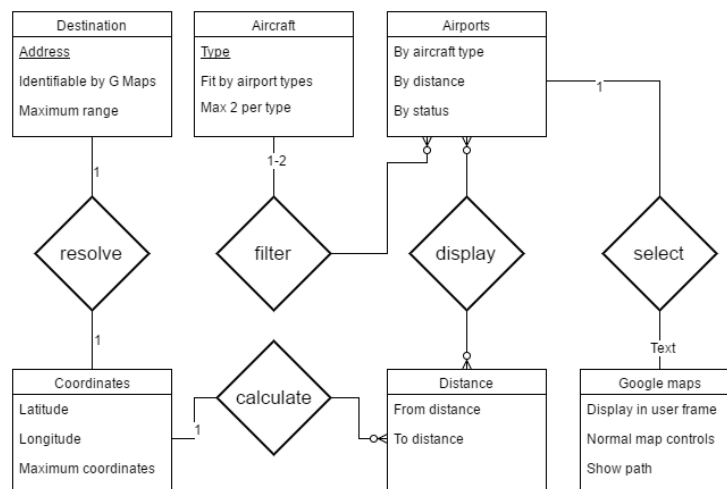


Motivation and Goal

Goal was to fulfill Project Two – Airports requirements so, that all needed functionalities works as requested, but not tested from all possible angles and not designed so that solution works in large scale organizations.

Therefore, first goal prior to project I had to learn new Excel features. After studying Excel features, following diagram explains rest of the goal:



Approach

First I had to upgrade to latest Office version. Office 2010 in Finnish is not likely best choice to start with. Secondly I have to refresh my knowledge about Excel features. Moodle's links to Youtube videos and Microsoft Learning Center are very good starting point.

Speeding up learning curve, "googling around" examples in the Internet are most likely best practice. Learning by examples.

Project does not need complex "ITIL" processes, but some recovery possibilities shall be considered. As an example, I shall always keep in mind that I have at least two different versions of the project, development version and release candidate version. Rolling back to older version(s) should be as easy as copying old version to new development version.

During coding, I shall think user perspective and possibility to use application multi nationally. Excel has bad reputation how to deal with local settings such as decimal pointers and such. Perhaps new version does better than old versions.

Subroutines should be designed from reusable standpoint. If same subroutine could be used for several purposes, it simplifies application and improves integrity.

When I feel that I know Excel enough, and feel that my possible deliverables fulfill project requirements so that goals could be reached, I need to split project to a few logical steps:

1. Data acquisition
2. Data cleaning
3. Data manipulation to format which can be used for project outcome
4. User interfacing, including selections and decisions
5. Displaying results

For the data acquisition, I have to learn how to download data into Excel. First look into source web site I saw immediately that UTF-8 characters are problem for Excel. I need to study how to overcome this issue.

Data cleaning part shall be rather easy with Excel Data Modelling tools. Many can be done within VBA macros if needed.

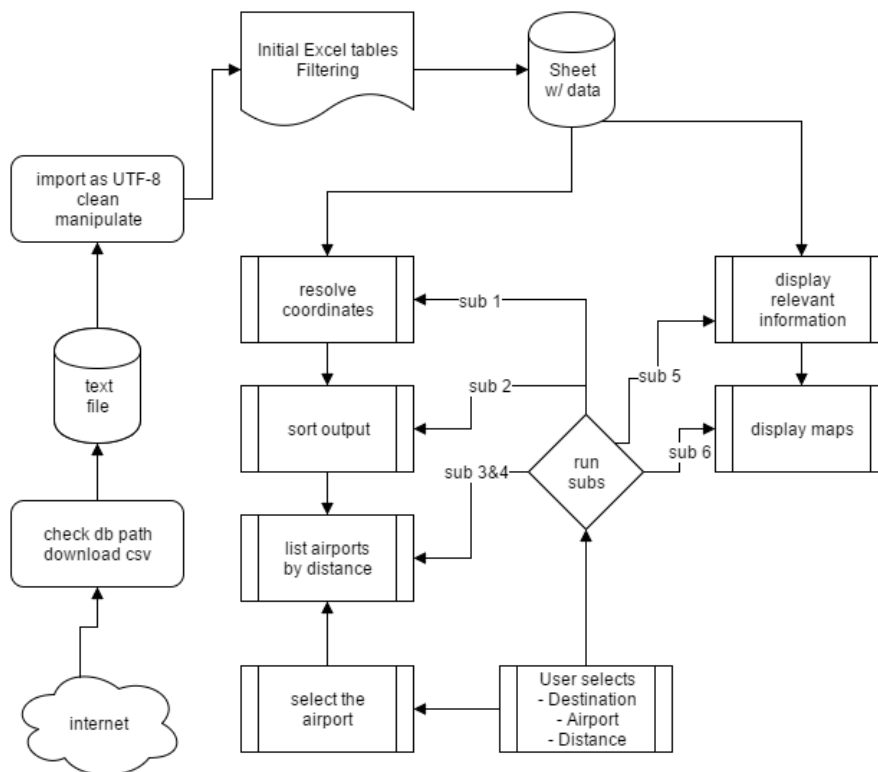
Data manipulation may be problem due to fact data downloaded seems to be in US-format (decimal pointer). Otherwise I do not see issues with data manipulation.

User interfacing shall be rather straight forward. The User Form shall run a few subroutines, which allows user to do following:

- Select aircraft type
- Input maximum distance from the airport
- Select airport from the filtered list

Displaying results should be easy part, but how to integrate Google Maps into Excel Forms could be issue. I know that OLE-automation can be used for many purposes in Office applications, but how to deal web forms within Excel form is unknown to me.

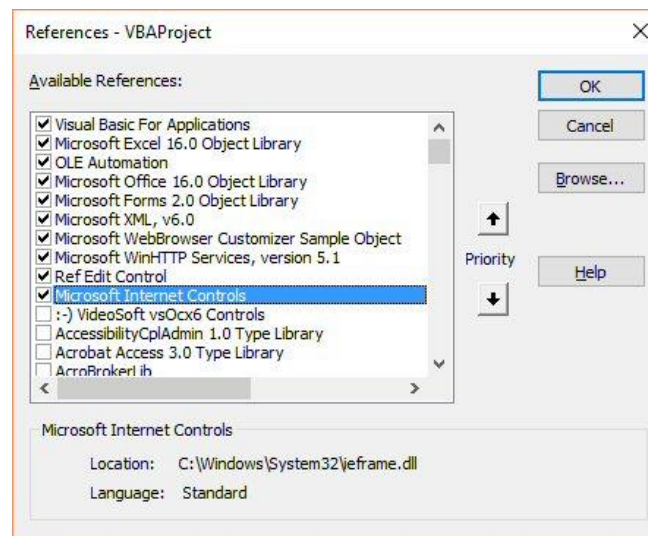
Everything else shall be automated within Excel. This can be represented as follows:



Discussion

Before you test, make sure that files are expanded to C:\ExcelData-directory. You can watch how code shall work and perhaps download zip file containing all needed data from [this Youtube link](#). Åbo Academi's Moodle restricts maximum upload size to 5 megabytes.

During very first tests we found that sometimes Excel does not enable proper settings for executing macros. You may receive error "Compile Error, Can't Find project library". This can be fixed by enabling a VBA console Alt+F11 and making sure you have at least following components enabled:

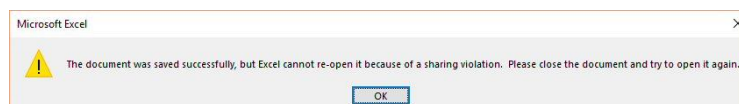


It is also advisable to check what is your localization before you execute the code (File – Options – Advanced - Editing Options – Decimal and Thousand separators). Write them down in case you need to restore them manually.

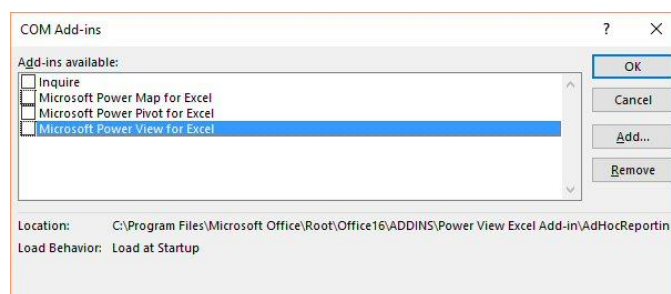
It was a big surprise how much compatibility issues I faced in the beginning of the project! I wonder how Excel-based solution can be passed through release certifications, because so many issues I needed to solve in this small project? Making universal VBA code for all localizations adds a lot of complexity.

Issues I faced:

1. Office 2010 in Finnish does not work for training, because basically everything is translated into Finnish. Translation does not give a clue about English original words. Office 2010 had language packs, but they are already discontinued and not available. Solution: Åbo Academi provided a Student license of Office 365 (Excel 2016).
2. Office 365/Excel 2016 32 bit version was not able to handle large data amounts. That was default installation what installer gave. I had to remove and re-install Office.
3. First I was able to write macros and save workbooks just fine, but after I went first time into Data Model, suddenly I started getting strange errors about file sharing issue:



And practically all my VBA codes were missing. After googling around, I found solution which solved problem by disabling Data Model Add-Ins from the COM Add-ins.



That worked quite ok, but then I was unable to use even tables import in Excel. I started debugging further and found, that same problem is related to indexing. I disabled indexing from the directory and still got error. Then I started looking Windows Defender (I had new clean install laptop with Windows 10 64 bit) and realized, that origin of the problem is in fact Windows Defender. Disabling xlm and excel.exe process monitoring solved the problem.

Then I decided to buy Bit Defender and funny enough, it worked fine for a day or two, but then I hit into same “unable to save” problem. I disabled xlm-scanning from the Bit Defender and after that Excel workbooks with macros worked just fine.

4. If CSV-files contains special characters, Excel cannot read them directly properly. Solution is to download them to txt extension and import them as a text files. Macro in module 1.
5. I realized, that if I add data source to Excel, path is absolute! That is very bad, because then everyone need to have same paths to flat data source files! Solution: I created a script which standardized data path to C:\ExcelData. Macro is Module 1.
6. Then I hit into localization problem. Finland uses comma (,) as a decimal pointer and a thousand pointer is empty. List separator is semicolon (;), not comma (,) as in examples. Functions normally are shown “=something,something,something”, but in Finland they are “=something;something;something”. This is not so bad, but when data is imported to cells, dot (.= US locale decimal separator) is not recognized as decimal pointer AND comma (between coordinates) is treated as decimal pointer! Solution: change decimal pointer when Excel workbook is loaded to US-format (this is done in workbook_open macro).
7. Localization issue causes also some strange behavior in VBA: command like CDBI (convert to double value) does not work as it should. Solution: use Val instead.
8. Selecting filtered range was problematic. Sometimes it worked, sometimes it did not work. I tested several approaches and selected one which worked best.
9. When you have a ListBox (in User Form), that needs to be dynamically updated. Practically a ListBox references named range, which picks up information from the sheets. I spend a few hours testing different ListBox and UserForm settings and did not find reason why ListBox shows only 9 items! Solution was to add named range into the code (not just form settings) and do Me Repaint!
10. Google Maps within the User Form worked just fine in the beginning, but then all the sudden it started telling me that Windows 10 Internet Explorer 11 is too old for Google Maps! Forms uses OLE-automation (COM-based) and I did not find solution how to replace Excel components so that default browser can be integrated into the form. Solution: use Microsoft BING maps instead and create separate button for Google Maps, which opens default browser.
11. The User Form goes sometimes background and does not come front during List airports execution. I changed form properties to ShowModal and it works better, but is not robust. I cannot figure out why forms goes background.
12. Sorting was bit strange. I created “intelligent” code which selects the area to be sorted and defines by which column is sorts. It worked fine until for some reason built in command “selection” started to bring something from the sorted area as a selection, not the range. I decided to use 65535 as a maximum row for the dynamic selection of the sorting range. That solved the issue.
13. If you receive error “Compile Error, Can't Find project library”, then you have to check that you have Alt+F11 to VBA console, there Tools -References you shall have these enabled:



As mentioned in the plan, my first idea was to create a range from original coordinates and then compare imported Airportdata into coordinates (not distances). That could be done, but then you end up to calculate new distances to all 360 headings. Example of the function which calculates new longitude from distance:

```
=((origLongitude*PI()/180)+ATAN2(COS(distance/6371)-  
SIN(origLatitude*PI()/180)*SIN(ASIN(SIN(origLatitude*PI()/180)*COS(distance/6371)+COS(origLatitude*PI()/  
180)*SIN(distance/6371)  
*COS(Heading)));SIN(Heading)*SIN(distance/6371)*COS(origLatitude*PI()/180)))*180/PI()
```

Latitude is bit simpler to calculate:

```
=ASIN(SIN(origLatitude*PI()/180)*COS(distance/6371)+COS(origLatitude*PI()/180)*SIN(distance/6371)*CO  
S(heading))*180/PI()
```

I immediately saw that this is not proper way to handle the task. I decided to create new row cDistance into Airportdata, where distances are calculated and then for listing compare just distances, not coordinates.

First I thought that I shall create relationships within a Data Model to several data files available (like radio frequencies) etc. That can be done, but then Data Model caused so many issues in the beginning, which in fact was not a Data Model related, but a Windows Defender related, that I kind of mistrust it. Therefore, I kept only airportdata.txt as a source of the information. If someone would like to improve this application, it is not big task to use other files in Data Model (now empty) and do relationships and data cleaning there.

Code is tested with Windows XP and Office 2007 and it worked just fine. You shall have proper access to the Internet and firewall shall let macros to download information directly from the internet.

The code is commented within the workbook macros.