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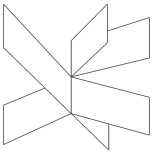

Project Description
Flight Data Collector

Students:

Krzysztof Majcher 253784

Maja Petrusic 253899

Maria Jose Ferreira 254175

Sara Nunes 254272

Supervisors:

Bo Brunsgaard Christensen

Richard Brooks

IT- SEP4D-S18

4TH semester – Data Engineering

May 2018

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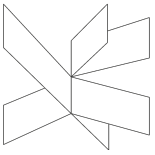


1 Background description

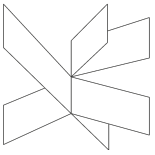
Gliding is a recreational activity and competitive air sport in which pilots fly unpowered aircraft known as gliders or sailplanes using naturally occurring currents of rising air in the atmosphere to remain airborne.

In Denmark there are annual gliding competitions. In order to be part of the competition it is necessary to have experience and authorization to flight a glider. To win the competition it is not only necessary to have good performance skills, but, to flight longer distances. Competitive soaring flight involves flying set tasks of between 100 and 500+ km in gliders. This involves alternating phases of altitude gain in columns of rising hot air and gliding flight by converting altitude to distance.

Thermals can form when sunlight heats up some spot on the Earth's surface more than the surroundings. This heat is reflected back to the air, which warms up. At some point, the heated air is sufficiently warmer than the surrounding air, and a "bubble" of warm air detaches from the surface and rises. The secret to soaring flight is to be able to locate those bubbles and gain altitude by circling in them. The secret to successful competitive flight is to know beforehand where the thermals will form.

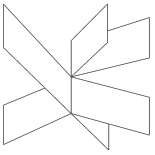
These thermals occur in Denmark but their locations are unknown because that can change depending on the weather. There is not an specific map with all the possible thermal locations in Denmark. Therefore, the pilots that participate in competitions cannot be certain about how far they will go because, even if they have found thermals in previous flights,because that doesn't guarantee them that they will find the thermals in the same location.

It is difficult to forecast where the thermals can be located before starting a flight, but there is information about the location of flights where the thermals occurred and there is also weather condition information during the days that the thermals occurred. That information can be matched to make a possible thermal forecast for the pilots.



2 Definition of purpose

The purpose of this project is to identify thermal hotspots in Denmark to help the pilot have a longer flight duration.

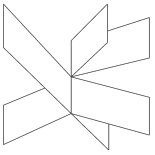


3 Problem Statement

The project focus is to gather information about the location of thermals that happened during flights and the weather information during the flight. It is necessary to build the required data structures and processes to acquire, store and process data from flight recorders with an aim of analyzing flight data to identify thermal hotspots in Denmark.

Questions to be answered:

- How to store the flight and weather data so that it becomes readable and accessible?
- How to find thermals within the flight data?
- How to get the thermal location?
- How to match the flight data with the weather data?
- How to make an average of locations and thermals
- How to analyze the data over time?
- How to present the data?



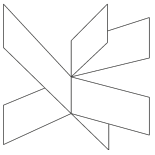
4 Delimitation

The flight data is delimited to competitive gliding flights done in Denmark, because that is the data available from the IGC flight recorders and it contains the location of routes that pilots have taken when flying in gliding competitions. It is on behalf of the project that the data is provided from the competitions because they represent longer and efficient flights with their location. From that data it is also possible to analyse if the pilot has passed through one or more thermals.

The weather information is delimited to the information that the Danish Meteorological Institute can provide. The data is delimited to precise information about the weather conditions from the specific locations where the gliding flights took place during the specific day and time when the flights occurred.

The project will analyse the data gathered in Denmark until May, 2018 and not future information from future gliding competitions in Denmark or any other location.

The possible thermal locations are delimited to the data available from competitive gliding flights in Denmark and no other type of flights or locations. Even though, the more flights information, the more precise the thermal's forecast can be. But there is no data available from other type of gliding flights in Denmark rather than competitive flights.



5 Choice of models and methods

What -partial problem	**Why** -study this problem-related to the purpose of the project	**Which** -level of the outcome is expected-	**Which** -methods/models/theories will be used.	**Who** -in the group is the main responsible person for this point	**What** -is the estimated workload (hours)
How to store the flight and weather data so that it becomes readable and accessible?	Data required to identify thermal hotspots are coming from multiple sources and there is possibility that some of them could be incorrect or inaccurate	Finished	Dimensional Model, Entity Relationship Diagram	All the members	20

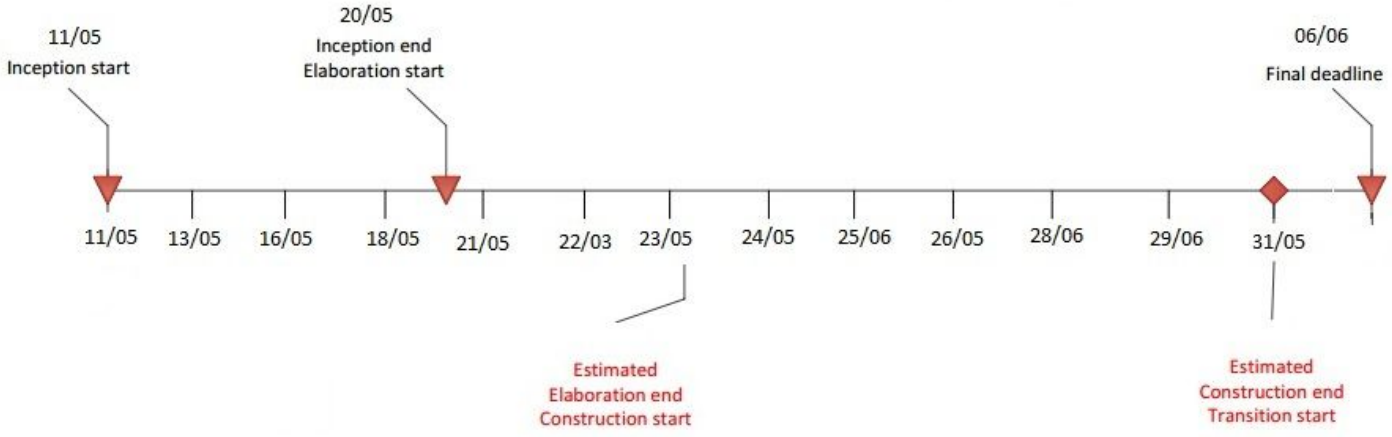
How to find thermals within the flight data?	Data received from planes flight by experienced pilots contains position and altitude of the vehicle. Gliders are increasing their altitude by circulating in hot air tubes. Knowing that it's possible to analyze where gliders are most likely to increase their altitude	Finished	Object oriented programming, Mathematical calculations	All the members	10
How to get the thermal location?	Date received from flight log are received as specific point in map but thermal hotspots are created in larger area.	Finished	Object oriented programming, Mathematical calculations	All the members	12

How to match the flight data with the weather data?	Weather has a very strong impact on thermal spots creations and must be considered in predicting them. Every flight log contains position and time this information need to be connected with weather archivers	Finished	Object oriented programming, Weather archives	Krzysztof	3
How to make an average of locations and thermals?	In order to conclusions from stored data it is required to create average thermal spots locations that will consider date and weather	Finished	Object oriented programming, Mathematical calculations	All the members	8
How to analyze the data over time?	As more and more log files will be delivered to in database some hot spots could appear and others could become outdated.	Finished	Object oriented programming, Mathematical calculations	All the members	10

How to present the data?	Presenting data in readable form for end user in an essential part in making this project usable	Extra challenge	Business intelligence analyzer, Business intelligence visualization	Maria	5

6 Time schedule

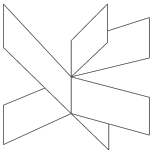
The time scope is estimated at 600 hours (approximately 120 hours of work per member). Our project combines the Unified Process, but each cycle is divided into many sprints. The following time schedule is regarded as a planning tool, likely to change.



Scrum will be also used to have a better overview and organization of the sprints. It is combined with the Unified Process because on each cycle (inception, elaboration, construction and transition) the sprint will have a focus for the cycle's tasks but there will be taks from all other cycles, for example construction and testing will be in all the sprints.

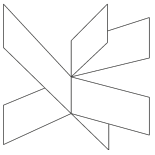
The following table represents the tasks to do from the choice of model and methods and problem formulation. There is an estimation of hours that each task can take per person. The tasks will be expanded in the Product backlog and sprints.

Task Name	Time (hours)
Dimensional Model with the Flight and Weather data	5
Save the data as readable columns in tables	10
Make a Data Warehouse to keep track of changes	20
Find all thermals that happened during all flights	12
Store thermals data	15
Match flight with the weather data	20
Calculate average of thermal location considering the weather	15
Present the data in form of map or data visualization tool	10
Document the project	20



7 Risk assessment

Risks	Description	Likelihood Scale	Severity Scale	Risk mitigation	Identifiers	Responsible
Not enough data	Not enough different flight data logs to make it accurate	4	3	Collect more data	Group	All
Factors	Some factors, for example constructions over the years that can have affected the data	4	4	Consider other facts	Group	All
Imprecise analysis	Data analysis problems resulting in imprecise results	4	2	**Preventive**: Include points for landing in map visualization **Responsive**: Warn pilots	Group	All



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Appendices

1.- Group Contract

Group Contract

Group Name: Krzysztof, Maja, Maria, Sara Date: **11/05/2018**

These are the terms of group conduct and cooperation that we agree on as a team.

Participation: We agree to participate actively in the group meetings, planification, implementation and documentation.

Communication: We agree to let the group know our opinions and respect others opinions. We also agree to let the group know when a member has difficulties in a task and get to an agreement to solve it. We agree to have constant communication with the supervisors to get feedback on time.

Meetings: We agree to attend to all the meetings, or let the group know with anticipation if we won't be able to attend. We agree to make planification meetings before assigning tasks an follow-up meetings to keep track of the team's progress and difficulties.

Conduct: We agree to take the project seriously, finish the tasks assigned to each of the members.

Conflict: We agree to make a group meeting to solve a conflict that may arise during the project period and get to an agreement to solve it.

Deadlines: We agree to make our work before the deadlines set by the group and by the project.

Attendance: members can work individually as long as they are responsible with theirs tasks and meet the deadlines.

Group Member's Name	Student number	Signature
Krzysztof Majcher	253784	
Maja Petrusic	253899	
Maria Jose Ferreira	254175	
Sara Nunes	254272	