

Problem Analysis

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When you are going on a trip and have to stay out for one or more nights you usually need to pack some luggage. The way people pack their luggage is not always the same. Some just throw their items randomly into the suitcase, while others put it nicely into the suitcase but without a specific order. Others again have a system regarding which order the items are put into the suitcase. If the bags are not packed in the smartest way that means that the consumer has wasted useful space and therefore not fully. Another problem with unorganised packing is that there is no order in the bags and it might require a bigger amount of time for the consumer to find things they are looking for.

1.1 Problem

In the modern society, families or groups of friends tend to take on vacation to other countries to relax and enjoy their vacation or explore the world [?]. With vacation trips comes packing luggage which plays a role regarding the journey. The size and weight of the luggage can be determined by the time of the stay, the purpose of the trip, and the number of people. Time of stay means that the traveller will have to bring more cloth or instead be willing to wash his/hers cloth on the trip. The amount of stuff to bring can also depend on what kind of trip and what its purpose is. For example if the purpose of the trip is a sports competition, there is a possibility that there is equipment. The number of people on the trip means that all must have a reasonable amount of cloth or other items that will be needed on the trip and thereby increases the amount of luggage.

When travelling with many and/or heavy bags it can be frustrating to carry the luggage too far and it can be hard to manoeuvre with large luggage if the room is permeated or narrow. Also if its travel by plane, too large or too heavy luggage can trigger a fee. The size of the fee is informed on the airlines website and varies from airline to airline [?].

Therefore it can be an advantage to pack the bags properly and limit the choice of things to take on the journey.

People who are travelling with airlines and have over 23 kg in one bag will experience that they will get charged with an extra fee. This fee has been introduced so the airlines bag handlers do not have to take the risk of getting injuries by carrying too heavy luggage.

Packing

Because of the weight and size restrictions it can be difficult to pack all the cloth and accessories that is necessary to have for the trip in a limited amount of bags and it can be necessary to acquire more bags for the trip or pick less items to pack for the vacation. More luggage means a bigger cost for the flight to the desired destination. A way to avoid buying and paying for extra bags for the vacation is to pack bags more compact. This on

the other hand increases the bags weight [?]. This should be thought through because too much weight can be unhealthy to carry around if not done correctly.

The increased weight means the bags might exceed the limit for weight and therefore trigger a fee for overweight luggage. It seems people often pack their luggage more compact instead of taking extra bags with them on vacation. Generally people take a lot with them on vacation or might not have packed their luggage optimal [?].

[?] shows the amount of fees given in context to luggage that have been registered at the U.S. airlines. Through these statistics it is possible to see that there are people that exceeds the set of limits given by the airline. A note regarding this source is that the fee amount is a combination of the different rules and related fees. Therefore the statistics do not give an accurate image of weight limit but more an image of the problem in general with luggage exceeding the given limits.

The problem with packing luggage is tied to most kind of transportation be it train, car, or flights. But flights is the one transport where it plays the biggest role for the consumer because it have economical consequences. With train and car the consumer is the only one to define how heavy luggage may be but there is restriction to how big the bags are allowed to be. For train it is 100 x 60 x 30 cm [?], for cars it is the size of the car and number of passages that defines the size for how big the bags can be to be safe.

Going on vacation using the car as transportation, depending on how much luggage have been brought along the limitation will then come down to the size of the car. When packing a car it is important to place the heaviest of the luggage just behind the back seats and evenly spread to the sides. This is to prevent the luggage from gathering momentum during an emergency brake and maybe go through the back seats. Furthermore it is to prevent over steering should the luggage be too far in the back. It is also crucial to fasten all loose objects like water bottles and the like, because in the event of a crash these items can become projectiles and deal some serious damage[?].

On a vacation there can be many good experiences and memories. A memory tends to be bound to photos, items and souvenirs and thereby makes it easier to remember. Photos and souvenirs also have a certain value and can be used to fill the home with memories about the past experiences. With this in the mind, it is important to make room for possible souvenirs or other things that that simply had to be bought.

As it earlier have been mentioned the weight and size of the luggage were a problem before the takeoff, therefore it must mean that it also will be a problem on the trip home. This means that if a family packs just to the limits and then buy things and souvenirs on their vacation they will get into trouble at the airport.

So the general problem is the packing of the bags in the most optimal way and spread the weight in the available bags. It can also be difficult when packing the bag to make some space for possible souvenirs or other goods.

1.2 Luggage rules

This section will focus on the general rules regarding luggage when going abroad, whether by plane, train or other.

Luggage table

This table displays the varies rules of luggage on public transport

Type of luggage	Dimension limit	Weight limits
Check-in luggage(Airplane)	158 cm (Height+Width+Depth)	20-23 kg
Carry on(Airplane)	Height 50-55 cm + Width 40 cm + Depth 18-25 cm	5-8 kg
Extra luggage(Airplane)	158-277 cm (Height+Width+Depth)	20-45 kg
Luggage(Train)	100 x 60 x 30 cm	Within reason

Table 1.1: Carry on luggage is the only one with restriction on the specific dimensions.
[?]

1.2.1 Charter trips on air planes

Given below is the rules for varies items you could bring on the plane

Checked-in luggage

Items not allowed:

Explosives, corrosive and flammable compounds e.g. gas, methylated spirit, paint and the like

Oxygenated, toxic and radioactive compounds

Flammable gases

Magnetic materials

Fireworks

Sedatives

Bleach

Paint

Carry on

Approved items:

Liquids, perfume, gel and spray – max. 100 ml – equal to one decilitre pr. container

You are only allow to bring these containers (bottles, cans, tubes and, so on), if they are contained in a transparent plastic bag, which have to be closed (1 litre bag per passenger). The bag have to be resealable.

Past security, wares can be purchased (including spirits, perfume and other liquids). Wares are handed out in sealed bags, these bags may only be opened after the final destination have been reached.

It is now a requirement that you take off your overcoat, take laptops and other larger electronic devices out of the bag before the security check-in.

[?]

1.2.2 Rules on trains

There are different rules depending on which train company you are using.

The Danish train company, DSB, have very few rules regarding the luggage you are allowed to bring with you.

The only other rule is that your luggage need to be able to lie on the luggage rack or under the seat and not be bothering or putting any other person on the train in danger [?].

Another example could be Indian Railways where the luggage is allowed to have dif-

ferent weight depending on which class you are on. They have no other rules regarding luggage [?].

1.3 Luggage allowance

Because of the capture and crashing of an air plane into the world trade center the 9/11 2001, the security of airports have increased dramatically. Some of the hijackers carried knives and box cutters and this led to an immediate restriction of any and all types of sharp objects. The reason behind the hijackers could get these weapons on board the plane, was lax security around for instance Swiss army knives and blades like a box cutter. Along with stricter rules for items allowed on the plane, a thorough check up of the security personnel hired by the airport have been issued. After the change, airports are no longer allowed to hire their own security personnel due to a lack of discipline and training and in some cases hiring of personnel with a criminal background.[?]

The 5th of October 2006 more regulations were introduced to prevent passengers from bringing liquids of too large a quantity on board.(**See luggage rules for a complete list of restricted items**) To construct a bomb a certain amount of "liquid" is required for it to have enough power to be a threat, and studies have showed that 100 millilitre containers stored in a 1 litre bag equals around 500 millilitres of liquids which in turn is not enough to make a bomb that can take down a plane. This restriction covers all types of liquids because the screening points at the security can not distinguish one liquid from another without the security personnel manually checking the various liquids, which would severely slowdown the whole process.[?]

1.4 Solutions on the market

The amount of lists and guides on the market is huge. These lists and guides offers help and provide tips for packing for travelling. Some of these lists and guides have been developed into apps(application) that are available for the customer to use. There also exists programs, that have integrated algorithms to handle optimization of the packing, on the marked that can be used. First a look into these lists and guides and the more advance solution thereafter.

App - Packing Pro

Packing pro is an app that offers templates for check lists to the customer. These templates are designed to different purposes regarding the customer, gender, type of trip, and purpose of the trip. The customer can then load the wanted template for the purpose. Packing Pro does nothing else than offer a management tool that helps the customer get an overview of all the things to remember. Packing pro is an app for the smart phone and thereby does not need a running computer to use. As the name implies(pro) the app have to be bought before it can be used [?].

App - Checkmark Packlist

Checkmark Packlist offers different kinds of templates like Packing Pro. Between these two products there are almost no variation expect for the applications GUI(graphical user interface). This is also an app for the smart phone and thereby easy to access and use. This app needs additional software to work and thereby slightly more annoying for the

customer to use this product. The customer will also have to pay an additional price to get the full product [?].

Online check/tip list

The online check list works as a reminder when packing luggage. It also give tips and tricks that could be considered when packing for the trip. There exists a lot of different websites offering this service for free. Some are posted by an organization and others by a person on a forum. [?] is an example of this kind of website. This website offers a list of 10 tips that can be helpful for the customer when they are packing for a trip. The site does not help with the actual packing, instead it helps with the planing of materials that the user might want to have on the trip.

The e-Commerce shipping calculator

The e-Commerce shipping calculator is an advanced program that helps the customer packing large containers and calculates the price of the shipment. By typing the size, weight, location, and destination of the items that should be shipped, the program can calculate what the prize is going to be and generates a 3D(3 dimensional) model of the container where the given items are placed in the best possible way so there are a minimum of wasted space. On their website [?] they offer a demo(demonstration) of their program.

Solutions coverages of the requirements

In this section there will be looked into what the different existing programs features and compare them to the requirements that have been set to solve the given problem. The comparison will be in the form of a table that gives an overview of the coverage of the requirements. The table will be used to conclude if there is already a program that solves this problem.

Included in product	Solutions			
	App - Packing / Packing Pro	App - Checkmark Packlist	Online check/tip list	The e-Commerce shipping calculator
Guide the user	x	x	x	x
Distribute weight				x
Distribute space				x
Account for the trips length	x	x	x	x
On the road	x	x		x
Baggage rules				
Where in the suitcase				x
Solid/liquid/bendable shapes				
Packing list	x	x		x

Table 1.2: Table for the different products on the market compared to the requirement seen in section ??

On table: 1.2 it can be concluded that none of the found program fully covers the requirements set to solve the problem at hand. Therefore it can be conclude it is relevant to work with this problem and try to solve it.

1.4.1 Thesis Statement

In this section a thesis statement will be formulated which will be used to develop a method to this problem and to get a more precise problem to work with. The method is used to try and solve the problem stated in the thesis statement.

- Is it possible to develop a program that helps the customer through the progress of packing one or more suitcases the most effective way?

The meaning of this thesis statement is to research and develop a program that in some way could handle the problem and all the calculation that lies in the problem. But the consumer also plays a role in the problem. Therefore the consumer must also be taken

into account when it is being developed. The reason for this is to make the program as user friendly as possible.

Sub Statement

The sub statements have been made to help find a solution to the thesis statement. These sub statements describe some of the steps that need to be made in order to find the solution for the thesis statement.

- **How can it be checked that the weight in the suitcases are evenly spread and does not exceed the allowed weight?**

The program will need to handle and solve calculations with weight and volume. Through these algorithms the program should find the most optimal solution for the given data. It will also have to check that the solution weight does not exceed the given limits.

- **Which functions are needed to get the program to compute the best way to fit the items into the suitcases?**

The functions are needed for the program to find the best solution. The functions will use an algorithm for optimising and thereby the program will fulfil its purpose.

- **How should the program communicate with the user and inform where the items are placed, and tell how much space is left?**

The program will have to be developed and tested so the customer can use the program to its full extent. Therefore it is important not to use advanced technical language or unexplained abbreviations.

- **How can the program be developed so it takes the length of the journey into account, and enable the user to update the program on the go?**

The program should also be developed so it is possible for the user to update the program's database while on vacation thereby get a packing order for the new content of the bags.

From this thesis statement there will be developed a list of requirements for the program, which it will need to solve the given problem and be user friendly. The system requirements can be seen on page (blabla, en ref ting mangler)

1.5 Target group analysis

1.6 Specification Requirements

The program has some features, which are essential for the program to work, these are catalogued as "targeted features". The other features, the program does not necessarily need to work, is catalogued as "Nice to have" features.

1.6.1 Targeted Features

These are the features that the program will have.

Written in C#: The requirements of the project is, that the solution must be a program written in C#. It must have a graphical user interface (GUI).

Guide the user: The program will have a little readme file, or other form of guide, that will tell the customer how to use the program..

Distribute weight: The program must be able to distribute weight of items evenly in each individual suitcase and if needed spread out in multiple suitcases.

Distribute space: The program also needs to distribute the items by space. The whole idea of the program, is that it should be able to pack the suitcase, and be able to tell if there is enough space for eventual souvenirs. Lastly it should inform the user how much space, if any, is left.

Account for the trips length: If a long trip is planned, the program must be able to account for more souvenirs.

On the road: The program will be able to tell you, while you are on the trip, if there is enough space for a souvenirs, if you input the dimensions and weight of that item.

Baggage rules: The program will need to know basic baggage rules. For example the luggage must not weigh too much, and it must be below certain dimensions.

Where in the suitcase: When the user asks the program if an item will fit in the suitcase, the program will show exactly where in the suitcase the item will fit.

Solid/liquid/bendable shapes: The program will also take in account that items might be bendable, and therefore fit in other ways than solid items.

Packing list: To make it easier for the user to know what will be packed an editable lists will be included depending on the type of trip.

1.6.2 Optional Features

Type of trip Depending on the nature of the trip different packing lists will be necessary because each trip might require different items.

Number of people Usually a trip is done with more than one person, so more suitcases might be available to distribute items between.

1.7 Method

This project structure will be based on Aalborg PBL (problem based learning). The Aalborg PBL is a method whereby the learning process lies in the work with problem and try to develop a solution for the given problem. The Aalborg PBL method also trains the students ability to work together in a project group and give them tools to handle the processes that goes with working in a group.

The first stage of the project is the problem analysis, which purpose is to find and document a that there are a problem to begin with. From the problem analysis a thesis statement are formed and are used to produce a list of product requirements. The requirements are then use to design and develop a product that should solve the problem stated in the thesis statement. The program are then tested on the targeted group that was found affected by the problem. The testing leads to a conclusion of the project. This main course of the project work when using the Aalborg PBL.