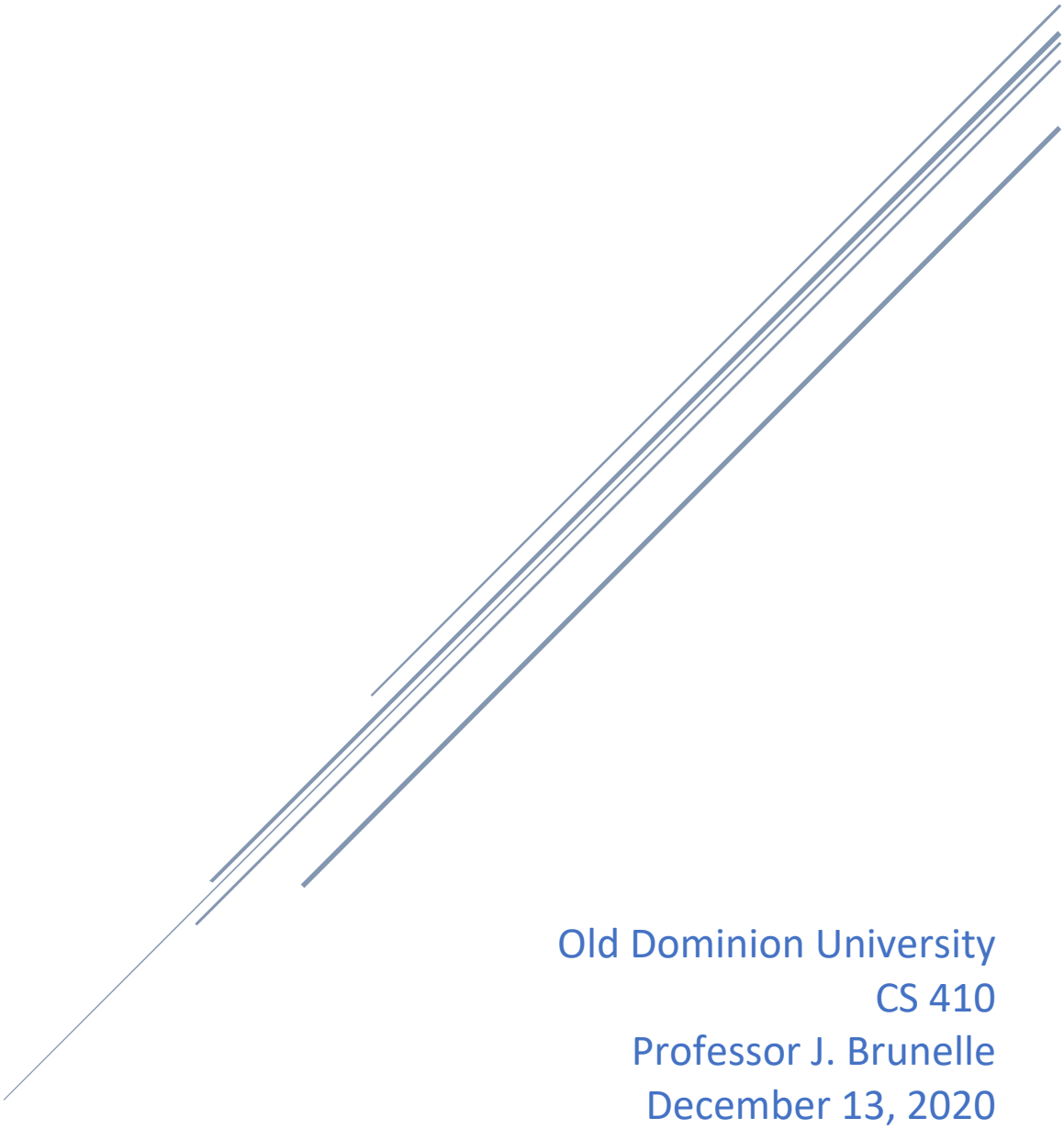
LAB 1: LOAD.IN DESCRIPTION

LANCE PERDUE



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Introduction

Moving can be stressful and requires extensive planning. The problem when it comes to doing it yourself is that one lacks the expertise to handle the logistics of moving. In a study conducted by OnePoll, the average American takes four and a half months to unpack after moving [1]. The cost of moving can increase exponentially when choosing between professional moving companies or a do it yourself move. Another factor that people are not paying close attention to is how important it is to pack things properly. This could lead to people forgetting where the birth certificate was kept if an event occurred where the item had to be presented. Subsequently, people have the problem of not using the space of a moving truck effectively. This can lead to you making more trips than necessary. More trips one must compete means more money out of the driver's pocket. Thereafter, you have to pay attention to how he / she loads the truck while driving, to avoid overturning or tipping over. Since there is much more logistics to consider, moving is stressful. According to a study by the New York Post, more than one in ten people would rather spend a week in prison and then move [1]. As you can see, moving is the last thing a human wants to do.

When it comes to moving, you have two options: either hire a professional moving specialist to take over the move, or you can carry out the move yourself. The problem with professional moving companies is it can quickly get pricey. The cost of hiring a professional moving company can verify depending on the distance of the move. A move between the states can be expected to cost more than $4,300 [2]. For most people, this price is unaffordable. For a move within the state, a payment of over $2,300 can be expected [1]. This does not even include the tipping the movers, which can cost between $2 and $5 an hour. If you take matters into your own hands, you will find that the cost is cheaper. For example, if someone has to move locally,

they can expect to pay between 40 and 70 US dollars for a rental truck per day. These costs are manageable for moving around the city, but can be inefficient due to lack experience. Since time is money, that time could be made up by using professional movers. When it comes to running a long-distance move, you can pay more than $1,800 to $2,000 to rent a 10-day truck for one or two bedrooms. With over 31 million people moving each year in the United States, the market of the DIY mover sitting at 78.3% of the moves [3]. As pointed out above, the cost of hiring a professional mover is expensive on its own. This results in people taking the matters in their own hand by moving themselves. With 82.7 percent of people conducting a move within their home state, the number of rental trucks used is a market worth exploring [3]. This is where load.in can make an impact on the moving industry.

Load.in is an implementation of the move process that gives your move a game plan. With load.in, we support you in cataloging your boxes, measuring furniture, estimating truck sizes, knowing the number of journeys a move takes, packing like a pro and knowing where everything is. With the assistants of artificial intelligence and computer vision, you can become an expert in moving. The use of artificial intelligence will enable the end user to place objects professionally in the moving truck. Using computer vision, the sizes of the boxes are measured and displayed to visualize the placement of the boxes. Helpful tips and tricks are also provided to the end user to help with moving. If the end user needs help moving an object, the end user will also receive expert-level instructions. Loan.in is the solution for the do ti yourselfer to speed up the relocation process and turn you into a professional.

Product Description

Loan.in will implement a load plan by providing these step-by-step instructions for the logistics of moving. The loan plan will consist of the collection of data from using Computer

Vision to measure boxes and furniture. To take advantage of the computer vision, the end user will take photos of the objects that will be loaded into the truck. The end user must take enough photos of the object to create a 3D model, and the 3D model is then stored in the database. Each scanned article is assigned a QR code, which points to the position of the article. Any image left over after rending the 3d model is then deleted from the system. The loan plan then shows the end user where each item should be placed in a moving truck. The load plan will utilize the truck space available against the 3d rendered models left to load. Each object will be processed to determine the placement inside of the moving truck.

End users can estimate the cost of a move by indicating the amount of trips, the estimated time of a move and the cost of the truck. The amount of trips a user will take will be depended on the items the user has scanned into the system vs the truck space available. By collecting more moving data from end users using the application, loan.in can estimate the moving time for a person and estimate how much a truck rental will cost.

Another important feature that loan.in will offer end users are expert tips. Packing can be a stressful event if someone has no experience in moving. Loan.in gives tips and suggestions on how to pack certain items. Consumers can enter the item they are having problems with and receive instructions on how to package it. The guide will be useful articles written by our moving expert to explain the techniques to be used.

If expert tips do not help the end user, they can connect to a chatbot for additional assistance. This live chat bot operates on artificial intelligence to answer any questions that are asked. The chatbot will rely on the user to the tips that are stored in the database when the key word is flagged. If the chat bot is unsuccessful in answering questions, the end user resorts to a live representative.

Web scraping is used to collect data from seller websites, such as truck rental companies. The data drawn from these websites is the availability of trucks, rental costs and the like. This data is then stored in the database in order to inform the user about current prices and truck rentals at the rental company.

When researching this product initially we discovered there wasn't much data when it comes to moving. This is why a key feature of loan.in is to provide analytics of a move. The analytics collected by the application is location, cost of move, user inventory and feedback for a move. The recorded location data includes the distance traveled, number of trips and the start / end point. The relocation data include the recording of the gas, rent and supply costs of a move. The collected inventory data of the user are weight, fragility, dimensions and box dimensions. In the end, we collect user feedback to improve the application. The collection of all this data is summarised in a report made available to the vendors who pay for access. This type of historical move data has never been collected before and will be a major selling point for Loan.id.

Load.in will utilize a heat map that will help identify problem areas in the UI. One of the biggest concerns with apps is being user-friendly. We want to know which components of the user interface are not used to address problem areas. For this purpose, we implement this heat map, which records event-based data and stores it within the database. This heat map will also have the ability to tell when a user has stopped using the application. This will help improve the next iteration of the application to fix the areas flagged in the heatmap.

The database in which these functions mentioned above are stored will be a relational database. Amazon RDS and EFS are used to remotely store the data for this application. The most important database tables that are needed include user, expert tips, rental information and

analysis. To manage the entire database, the preferred language will be MySQL. The user's device also stores the photos at the local level to save space and protect the user's privacy.
The application runs on Android smartphones running version 4.4 KitKat and higher. The CPU needs eight cores, which operate at 1.8 GHz. The Internet speed on these devices must be at least 15 Mbps to transfer data to the server. The required amount RAM to load.in properly is 4 GB. The smart phone device is used to capture the measurement of the boxes and furniture. This data will then be stored in the database to create a move plan.

The website client page runs under Linux, Windows and macOS. Since it is only a web browser, most applications can connect to the web client. Important web browsers like Firefox, Chrome, Edge and Safari that support ES6 or higher will be supported. The internet speed must be 30 Mbit / s. The amount of RAM required to run load.in properly is 4 GB. The purpose of this website is to give the vendor a place where he can register to view the analysis of all the moves stored in the database.

Case Study

The day in the life of the average Load.in user is a family of three with a family dog. This family is looking for a cheap and resourceful solution to help them move across town. The family searched the internet for a solution and found Load.in in the google play store. Then the family downloads the application and registers for an account with Load.in. The family then verifies the account by going to their email and clicking on the verified link. Now that the family's account is verified, they can use the application.

Now that the app is opened on the phone, the family is greeted with instructions on how to use the app. The family goes through the steps and is now ready to scan boxes. With a click of a button, the camera opens and the family begins to focus on the boxes to load. The application

starts to create a 3D model of the boxes for the family. Weight categorizes each box and the user is prompted whether the item is fragile or not. One of the family members does not understand how to put fine porcelain in a box and searches for tips in the application. After searching, an article is found that describes how to package porcelain and the family rates the tip five stars. Once all the boxes have been scanned, the family then use the app to search for where to rent a truck. A cost analysis is projected to the family to estimate the cost of the move and to reserve a truck. The application successfully finds a truck that only needs one trip to complete the move at the local rental company.

Now the family has the rental truck, the load in plan is now created for the truck size. The family notices they have many boxes and then create additional movers to collaborate on loading the truck. Now the whole family has access to the load plan, each now can take turns loading the truck. One by one each step of the loading process is shown on the screen on where to place a box. One of the family members isn't please with where the application tells him//her where to place a box and press the reconfigure button. This moves the box in a new location and the family continues to load the truck. The family finishes with loading the truck and drives to the new home.

The family arrives at the new home and wants to unload the boxes with the kids toys first. Using the application, the family can locate where the toy box is located and unloads this box first. The family completed the move and returns the truck to the rental company. The family then rates if the application operated correctly during the moving process.

Product Prototype Description

1.1. Prototype Architecture (Hardware/Software)

1.2. Prototype Features and Capabilities

1.3. Prototype Development Challenges

Glossary

Algorithm - A finite sequence of well-defined, computer-implementable instructions, typically to solve a class of problems or to perform a computation.

Analytics - The analysis of data, typically large sets of business data through mathematics, statistics and computer software.

Artificial intelligence - The capacity of a computer, robot, or other programmed mechanical device to perform operations and tasks analogous to learning and decision making in humans, as speech recognition or question answering.

Chat-bot - An automated software designed to imitate human interactions and provide information to the user.

Equilibrium - A state of balance due to the equal action of opposing forces, in this case weight within a moving truck.

Heat map - A representation of data in the form of a map or diagram in which data values are represented as colors.

Machine learning - a field of computer science that aims to teach computers how to learn and act without being explicitly programmed. More specifically, machine learning is an approach to data analysis that involves building and adapting models, which allow programs to "learn" through experience. Machine learning involves the construction of algorithms that adapt their models to improve their ability to make predictions.

Packing problems - Are a class of optimization problems in mathematics that involve attempting to pack objects together into containers. The goal is to either pack a single container as densely as possible or pack all objects using as few containers as possible.

Photogrammetry - Photogrammetry is the science and technology of obtaining reliable information about physical objects and the environment through the process of recording, measuring and interpreting photographic images and patterns of electromagnetic radiant imagery and other phenomena.

Professional movers - Professionals who move all your belongings for you from one place to another.

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