Project Plan

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# Introduction

## Background Information

The project consists of three parts to not only solve the traveling salesperson problem but to also implement database storage and a user interface implementation. The traveling salesman (sales person) problem has multiple different alterations of it that change what kind of solution they require. This allows reuse of the problem and is why it is widely documented.

For this project, it was tasked to solve symmetrical TSP problems with the use of Euclidean distance, calculated from a given city in the form of coordinates. The problem states that given a list of nodes n with points (x, y) you need to find the shortest path that a sales person can take without going to the same node twice and then returning to the starting point. Euclidean distance is just using Pythagoras theorem to calculate the hypotenuse to get the direct distance from point A to point B.

## Scope

Part A consists of three main parts; Project Plan, TSP solver and Report. The Project plan breaks down the project into smaller tasks (deliverables) allowing an outline of what is needed, as well as allowing each task to be time managed and tracked. The WBS and activity breakdown shows estimations of the deliverables allowing a Gantt chart to be created and tracked as the project is completed. The TSP solver solution is programmed in python to allow command line argument to accept a file (one of the problems) and output the solution to standard output. It is broken down into four parts to allow easier merging of part B. These parts consist of the input, the representation of the data, the solution and the output. The Report covers the traveling salesman problem in more depth and shows how the solution is implemented. It also covers the test data used from the TSPLIB and the results.

Part B continues from the completion of part A it uses the current TSP solver and alters it to work with a database schema (SQLite). Since the solver was broken down the implementation of the database isn’t all too difficult. Part B shows how the database is represented and how it interacts with the solver. This allows solutions and problems to be stored to the database as well as fetched and displayed.

Part C is graphic interface and again continues after part B. And consists of creating an interface with a wireframe, implementing and coding it as well as allowing access to the database through the program. It should be able to allow the user to upload a new problem to the database, load a problem from the database, solve the loaded problem, save the solution to the database and display the solution.

## Contents

### Introduction

The introduction covers an outline of the whole project. It briefly gives background information on the TSP and what kind of TSP it is. It also covers what will be completed in each section of the project.

### Work Breakdown Structure

This breaks down the larger task part A, part B and part C into smaller task (deliverables) allowing labelling of each task. This shows what each larger contains and all the deliverables needed to complete before it will be finished.

### Activity Definition & Estimation

This shows a further break down of the tasks and gives estimates of the time needed and when it should be started. It allows the Gantt chart to be easily created and plotted. It uses weekdays as a time scale since that’s the time the project would be completed. It also starts at day 20 because we were given the assignment in week 4. With each milestone finishing at the due dates.

### Gantt Chart

The Gantt chart shows all the tasks labelled to match the activity estimation table. This allows an overall view of the project and the ability to track progress as it is completed.

# Work Breakdown Structure

1. **Part A** 
   1. **Project Plan**
      1. **Introduction**
         1. **Background Information**
         2. **Scope**
         3. **Contents**
      2. **WBS**
      3. **Activity Definition & Estimation**
         1. **Activities Part A**
         2. **Activities Part B**
         3. **Activities Part C**
      4. **Gantt Chart**
   2. **TSP Solver**
      1. **File Input**
      2. **Internal problem representation**
      3. **Solver**
      4. **Solution Output**
   3. **Report**
      1. **Problem Description**
      2. **Implementation details**
      3. **Results**
2. **Part B**
   1. **Update Project Plan**
   2. **ERD**
   3. **Database Creation**
      1. **Schema Design**
      2. **Database Definition File**
   4. **Solver Update**
      1. **Adding a problem to the database**
      2. **Reading a problem from the database**
      3. **Storing a solution to the database**
3. **Part C**
   1. **Wireframe (Paper)**
   2. **Wireframe (Digital)**
   3. **Implementation of wireframe**
   4. **Program Alterations**
      1. **Upload a new problem to the database**
      2. **Load a problem from the database**
      3. **Solve a loaded problem**
      4. **Save a solution to the database**
      5. **Load a solution from the database**

# Activity Definition & Estimation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Name** | **Time (week days)** | **start** | **end** |
| 1 | Part A | 20 | 20 | 40 |
| 1.1 | Project Plan | 20 | 20 | 40 |
| 1.1.1 | Introduction | 20 | 20 | 40 |
| 1.1.1.1 | Background Information | 2 | 20 | 22 |
| 1.1.1.2 | Scope | 2 | 20 | 22 |
| 1.1.1.3 | Contents | 5 | 35 | 40 |
| 1.1.2 | WBS | 3 | 20 | 23 |
| 1.1.3 | Activity Definition & Estimation | 3 | 23 | 26 |
| 1.1.3.1 | Activities Part A | 1 | 23 | 24 |
| 1.1.3.2 | Activities Part B | 1 | 24 | 25 |
| 1.1.3.3 | Activities Part C | 1 | 25 | 26 |
| 1.1.4 | Gantt Chart | 1 | 25 | 26 |
| 1.2 | TSP Solver | 10 | 26 | 36 |
| 1.2.1 | File Input | 2 | 26 | 28 |
| 1.2.2 | Internal problem representation | 2 | 28 | 30 |
| 1.2.3 | Solver | 4 | 30 | 34 |
| 1.2.4 | Solution Output | 2 | 34 | 36 |
| 1.3 | Report | 6 | 34 | 40 |
| 1.3.1 | Problem Description | 2 | 34 | 36 |
| 1.3.2 | Implementation details | 2 | 36 | 38 |
| 1.3.3 | Results | 2 | 38 | 40 |
| 2 | Part B | 5 | 40 | 45 |
| 2.1 | Update Project Plan | 1 | 40 | 41 |
| 2.2 | ERD | 1 | 40 | 41 |
| 2.3 | Database Creation | 2 | 41 | 43 |
| 2.3.1 | Schema Design | 1 | 41 | 42 |
| 2.3.2 | Database Definition File | 1 | 42 | 43 |
| 2.4 | Solver Update | 3 | 42 | 45 |
| 2.4.1 | Adding a problem to the database | 1 | 42 | 43 |
| 2.4.2 | Reading a problem from the database | 1 | 43 | 44 |
| 2.4.3 | Storing a solution to the database | 1 | 44 | 45 |
| 3 | Part C | 17 | 45 | 62 |
| 3.1 | Wireframe (Paper) | 3 | 45 | 48 |
| 3.2 | Wireframe (Digital) | 3 | 48 | 51 |
| 3.3 | Implementation of wireframe | 4 | 48 | 52 |
| 3.4 | Program Alterations | 12 | 50 | 62 |
| 3.4.1 | Upload new problem to the database | 2 | 50 | 52 |
| 3.4.2 | Load a problem from the database | 2 | 52 | 54 |
| 3.4.3 | Solve a loaded problem | 2 | 54 | 56 |
| 3.4.4 | Save a solution to the database | 3 | 56 | 59 |
| 3.3.5 | Load a solution from the database | 3 | 59 | 62 |

# Gantt Chart

