CS22510 - C, C++ and Java Programming Paradigms Assignment 1

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1 Introduction

This document aims to explain my design and implementation decisions during the process of writing the programs

2 The program(s) algorithm

All of the three implementations of the program follow a similar pattern in the way they deal with the data files. It is being treated as a stream in order to simulate a GPS receiver which gathers data about locations. There are multiple types of messages that the receiver can give and they need to be processed according to their type.
The significant ones are the GSV and RMC messages. GSV signals come in up to 3 sentences and they all need to be received in order to get information about the current state of the receiver. GSV sequences give readings about the visibility of the receiver from satellites, the number of satellites that are in view of the receiver, quality of the signal and other information about the connection. Each sentence can contain information on up to 4 satellites.
RMC messages are actual GPS data. They contain information such as the latitude and longitude at a particular time. These sentences are then used for the output of the program which is a GPX file with the route that was taken.
RMC and GSV sentences are both received as a comma-separated string, which simplifies the way that they are processed.
In order to begin the recording of correct GPS data, the two streams first need to be aligned with one another and a pair of locations should be found. To do this synchronization the program waits for a pair of RMC sentences received at the same time. After such a pair is found, the program goes into a "listener mode" and waits for other pairs of GPS data in order to determine the better fix between the two and give optimal reading for the current position. A simple technique is used to achieve that. One of the streams is considered a "leading" stream and is always with a higher priority to the other. However, if the receiver has a bad connection with the satellites, the data from the second stream is taken. In order to get a better and more accurate reading, the offset between each pair of coordinates is remembered every time readings are received. This offset is calculated and then used to calculate the correct position, even if one of the receivers cannot give data.
GPS data is considered good if there is a minimum of three satellites and their Signal-to-Noise Ratio more than 30. If one of the receivers does not cover this requirement, it's connection is not good and readings from the other are taken.
For the purpose of the task, it is considered that a stream ends when all data from a file is read and processed. During the stream capturing, all data about the locations is stored in some sort of data structure (depending on the language) and a GPS file is generated at the end. This type of file is an XML based file and can be used in many applications.