# 1 Introduction

One of the most studied variants of the Traveling Salesman Problem (TSP) is the Traveling Purchaser Problem (TPP), thanks to its double nature. The TPP can be summarized into two problems: purchasing and transporting goods. The purchaser has to decide which suppliers are visited. In each supplier, the purchaser has to decide what goods must be bought and, at the same time, the most convenient quantity. The suppliers must be visited in a way where the route has minimum cost. Thus, this problem leads to computational complexity.

In general, the problem aims to find an optimal purchasing plan, where the demand for each good is satisfied and where it is minimized the traveling and purchasing costs. For each good, the purchaser has to decide which suppliers will visit and what quantity to satisfy the demand. This problem has applications in the industry since a great number of costs of companies come from purchasing the goods. In other words, an optimal solution for this problem can impact, considerably, the expenditure of a company.

The study of Vehicle Routing Problems, particularly the TSP, are well-known problem within the academy. The main goal of a Vehicle Routing Problem is to find a circuit of minimum cost visiting all locations. Usually, the first and last locations are the same, the depot.

The set of problems that consider purchasing and routing is a recent field in Routing Problems, and the TPP belongs to this set of problems. Given a list of goods and the quantity for each good, the purchaser must find an optimal purchasing plan that satisfies the demand through a set of suppliers. Not all the suppliers must have all the goods for instance if the purchaser is looking for apples, it may be sold in just one supplier. The purchaser also has to find a single route to visit every supplier. The objective of the purchaser is to minimize the cost associated with purchasing and traveling the goods. In the classic version of the TPP there is only one vehicle, however, other versions with multiple vehicles have already been studied.