Smart parking in the city

Topic: smart parking, traffic, critical thinking, collaborative skills

Introduction

Many city centers experience extra traffic due to difficulties in finding parking. In some cities it has been estimated to be around 30% of the traffic which is affiliated with the driving around for parking. This increases the CO2 emissions significantly and car owners as well as pedestrians are not very happy about this searching for parking.

Context

With technology it is possible to create a smart sensor, internet-based system in the city to optimize the search time for parking and direct cars towards nearest available parking facilities, called smart parking, the parking problem can be diminished and herby the CO2 emissions. However, the establishment of the smart sensor internet infrastructure comes with a cost as do the establishment of parking facilities.

The smart sensor internet infrastructure must be built to fit the roads and the parking facilities and therefore, there must be internet coverage in the city so that the smart parking system works. The parking facilities need to be established in a city where there probably not are many vacant spots in the city centre for the smart parking facility. Therefore, a negotiation needs to take place among the stakeholders of the city in relation to whether it is best to tear down existing buildings to build smart parking spaces or to live with the traffic. Additionally, some inhabitants of the city do not favor the idea of having cars in the city center and will therefore possibly argue against the idea of smart parking.

Following are suggestions for roles that students may undertake:

Role 1: The city mayor

The mayor can give permission to build internet infrastructure, establish smart parking lots, build building, and tear down existing buildings. Also, the maire is a person in the city that needs to make all inhabitants happy. The mayor therefore, must keep an eye on

creating happiness for inhabitants and car owners, but also to lower pollution, and keeping the city's money at a good, sound level. The mayor must work to establish compromises amongst the other roles of the scenario game. The mayor has many interests: to increase happiness in the city, to increase the revenue of the city, and to reduce air pollution in the city.

Role 2: The internet service provider

The internet service provider has an interest in building as much internet infrastructure in the city as possible and best so that the city has 100% coverage. The internet service provider can build ISP buildings to ensure the internet infrastructure but at the same

Figure 1. Internet service infrastructure helps the network connectivity of the city.

time this role needs permission by the mayor of the city, and needs money to establish the ISP buildings. The internet service provider additionally needs to talk with the parking contractor to figure out where to prioritize the ISP buildings and internet coverage first. The internet service provider has an interest in establishing internet in the city but also to increase the revenue of the role.

Role 3: The parking contractor

The parking contractor has a commercial interest in establishing smart parking lots. The parking contractor an only establish smart parking lots with a permission from the maire to tear down or establish the smart parking facilities. Additionally, the parking contractor needs to agree with the internet service provider where the

Figure 2. Parking facilities facilitate easy access to the city center.

internet must have best coverage to support the smart parking. The parking contractor can tear down existing buildings and establish a smart parking facility in agreement with the internet service provider. The parking contractor has an interest in establishing smart parking in the city reducing traffic in the city center, which is a special traffic focused area in the game. He also has an interest to build revenue from parking services.

Role 4: The lobbyist

The lobbyist is both a city inhabitant as well as an individual that has a saying in the city administration. The lobbyist is not fond of cars in the city center. She has an overall goal to reduce pollution as well as traffic. The lobbyist is not fond of tearing down buildings to establish more parking in the city center. She works against promoting more effective public transport. The lobbyist works towards influencing the mayor to give fewer or less admissions to tear down buildings and to approve the smart parking.

Figure 3. Residential areas and industries create increased needs for parking.

The lobbyist aims to make inhabitants happy and to reduce pollution in the city center as a result of less traffic.

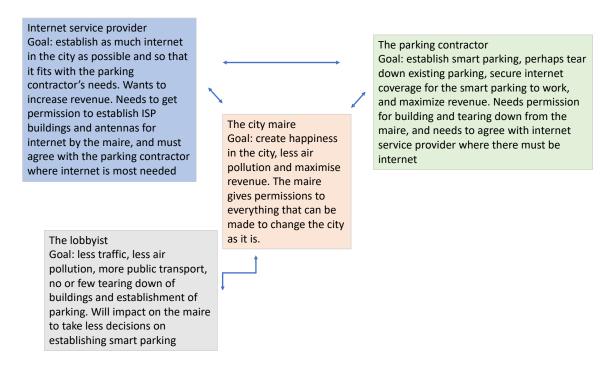The following figure demonstrates the roles and the interactions between them.

Internet service provider
Goal: establish as much internet in the city as possible and so that it fits with the parking contractor's needs. Wants to increase revenue. Needs to get permission to establish ISP buildings and antennas for internet by the maire, and must agree with the parking contractor where internet is most needed

The parking contractor
Goal: establish smart parking, perhaps tear down existing parking, secure internet coverage for the smart parking to work, and maximize revenue. Needs permission for building and tearing down from the maire, and needs to agree with internet service provider where there must be internet

The city maire
Goal: create happiness in the city, less air pollution and maximise revenue. The maire gives permissions to everything that can be made to change the city as it is.

The lobbyist
Goal: less traffic, less air pollution, more public transport, no or few tearing down of buildings and establishment of parking. Will impact on the maire to take less decisions on establishing smart parking

Figure 4. Roles actions and interactions.

Learning goals

Upon completion of the activity students will:

- Understand the connections between environmental, social, and economic aspects of everyday life.

- Have experienced how to achieve cooperation between different parties with different goals and needs.

- Built competence in taking an integrative approach in researching city management and related economic and environmental issues.

- Created the conditions necessary for navigating the challenges modern society and environmental changes pose for the public and private sector.

Prerequisites

Students need to understand how the HERA game works. It could be a good idea, to start building a scenario from the beginning to let the students try this, and then as the second exercise to do the scenario on the smart parking city. Also, students must know something about what is needed for creation of smart parking – ISP buildings and fiber network, to support the internet-based support for parking. Additionally, students must be willing to work together and find compromises to satisfy all suggested rolls.

Audience

The suggested activity targets economics and engineering students. The design and implementation of smart parking requires knowledge on urban planning, behavioral science, and effectively managing a project within the constraints of a pre-defined budget, subjects that are of interest to broad groups of higher education students.

Core concepts

- **Air pollution:** Encouraging decision making in terms of environmental protection and the impact of human activities on their surroundings both short- and long-term.

- **Ecosystem services:** Services and systems that directly or indirectly benefit communities.

- **Smart parking:** A complete system that allows drivers to find parking when needed by regulating supply and demand.

- **City management:** Managing the services, revenues, and expenses of a city.

- **Transversal skills:** Collaboration, critical thinking, analytical thinking, innovative thinking.

Description of the scenario

The overall purpose of the smart parking scenario is to allow students to experience the conflicts of interest there are in a real city when it comes to establishment of just one part of a city's infrastructure (parking). It demands good collaborative skills, compromises, critical thinking, and of course a good flair for complex problem solving.

The smart parking scenario explores the full HERA game using the communication and planning facilities in the game to discuss, negotiate, and agree on decisions that then can be implemented in the simulation of the scenario.

Participants can explore the consequences of their decisions and insights to what it means in real life to work with complex decisions. As a prerequisite of the game there should be established a city, that has a city center with shops, roads and culture, to resemble the old town of the city. Around there must be a number of other roads, culture, industry and all the elements of the large city which typically has traffic issues. There can be created different cities with variations in size and infrastructure to vary the differences in challenges and solutions. The game will be more challenging the bigger the city is and the more possibilities there exists for smart parking, and need for removing existing infra-structure to build the smart parking.

As an additional prerequisite the students must be aware of that there is a need to exchange arguments, knowledge and use skills to persuade other rolls in the game to permissions or various actions. Therefore, the board and chat tools in the game can be used with great advantage amongst the players.

Class activity

1. The teacher presents the problem to the class and introduces the scenario and game.

2. The students brainstorm in order to understand the problem and the parameters within which they have to work. This includes the available city budget, the city plans that restrict the locations on which parking spaces may be built and may influence their capacity, installation and management costs, citizens commuting patterns, and more.

3. The students are encouraged to come up with as many ideas as possible through brainstorming. Techniques of design thinking could be used for promoting innovative design and the introduction of a human-centered solution that address actual needs of city citizens.

4. The students are asked to jointly decide on the ideas to implement from the pool of suggestions that they came up with considering restrictions, such as city plans, budget, and commute patterns.

5. The teacher forms groups and gives students their roles in the game.

6. The students play the game according to their roles.

7. The students discuss the game results and their roles; the teacher gives feedback.

Assessment methods

This is a collaborative, open ended activity in which not a single solution exists. Self-assessment is useful in this scenario offering students the benefit of taking responsibility of their learning. Students will discuss their roles within their group and reach a decision on whether they achieved their goal or not. Students may further present their solution to the entire class receiving evaluation from their peers. Finally, the class may decide on the more creative solutions among all teams.