Intelligent Transportation Systems along with the COVID-19 Guidelines will Significantly Change the Transportation Market

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Abstract

Reducing human presence in vehicles and transportation infrastructure is a common concept of Intelligent Transportation Systems and COVID-19 guidelines. However, the motivation for the reduced human presence is different. Intelligent Transportation Systems aims at improving transportation services by innovative technologies that can replace human handling and supervision; whereas COVID-19 guidelines aim at not busy transportation means, because a busy bus or a busy train make more opportunities for a potential infection of passengers. These two major factors in the transportation market will significantly change the transportation means we know.

1. Introduction

Astoundingly, Intelligent Transportation Systems and COVID-19 guidelines have a common central theme – both set sights on taking out human presence; however, their reasons for taking out human presence is different. Intelligent Transportation Systems aims at shifting the burden of managing vehicles and transportation infrastructure from humans to automatic technologies, so as a result there will be fewer humans in vehicles and transportation infrastructure [1]; whereas COVID-19 guidelines aim at keeping people away from each other, so they will not spread the pandemic and because of this aim, fewer humans in vehicles and transportation infrastructure is clearly advantageous [2].

Freight transportation is very affected by these aims [3]. While many people work in the freight transportation industry, Intelligent Transportation Systems can facilitate reducing the number of people needed to operate many freight transportation supply lines. This is aligned with the restrictions stipulated by the COVID-19 regulations which endeavor to reduce the number of deaths and illnesses, by presence of fewer people in any thinkable location.

Public transportation will be also very affected by both the Intelligent Transportation Systems penetration and the COVID-19 pandemic. The authors of [4] explain why public buses can remain cost-effective in a world with intelligent private vehicles only in large and dense zones. This paper was written before the COVID-19 has been emerged. Nowadays the public buses have a much smaller demand and as a result the public buses cost-effectiveness is even poorer.

Even when a vaccine for COVID-19 is available, a significant percentage of the population will still be afraid to travel in crowded buses. Some will be afraid that the vaccine is not effective enough and some will be afraid of other viruses [5]. Moreover, in a poll in the US, about thirty percent of the respondents answered that they are unlikely to take any vaccine

for COVID-19 and about fifty percent of the respondents answered that they are unlikely to take any kind of vaccine for COVID-19 that has been made outside the US [6]. So crowded public transportation means will still be an unsolved problem for a significant portion of the population even when a COVID-19 vaccine is offered.

Another issue is the way of driving. While each human driver drives in his own way, vehicles operated by Intelligent Transportation Systems take turns similarly. Such vehicles also accelerate or apply the brakes in almost the same way. Many researches have shown that the different way of human driving is one the key reasons for almost every traffic jams or traffic congestions [7,8]; therefore, vehicles equipped with Intelligent Transportation Systems will intensely reduce incidents of traffic jams [9,10]. Because traffic jams are one of the chief reasons in favor of public transportation, Intelligent Transportation Systems will reduce the motivation for public transportation.

COVID-19 will also reduce the motivation for public transportation, but because of another reason. In public transportation the passengers are not surrounded by metallic barriers like in private vehicles, so the passengers will be much less protected from the COVID-19 virus. Clearly, separated vehicles can protect their passengers from the unwelcome virus much more than a simple cloth mask.

Another concern regarding the COVID-19 guidelines is the conflict with the concept of High Occupancy Vehicle (HOV) lanes that give priority for more occupied vehicles. The COVID-19 guidelines aim at reducing the number of people in each vehicle; whereas the HOV lanes aim at exactly the opposite – increasing the number of people in each vehicle with the purpose of eliminating traffic congestions [11].

However, anyway the success of HOV lanes in eliminating traffic congestion is doubtful because HOV accomplishes the task of avoiding traffic congestion, only if there are traffic congestions. That is to say it is essential to have ongoing congestions in the general purpose lanes in order to motivate the drivers to shift to the HOV lane, otherwise the drivers will continue to use the general purpose lanes [12].

2. Autonomous vehicles and Platooning

When it comes to fully autonomous vehicles which is the top level of Intelligent Transportation Systems, these vehicles will be able to travel in platoons [13] which is actually a formation of a long train of autonomous vehicles where each vehicle keeps an equal distance from the vehicle ahead and in addition all the vehicle go in the same speed [14]. Such platoons will be put into operation both in freight transportation where autonomous trucks will be platooned and in autonomous passenger cars.

These platoons will provide much better service, because a traditional train can only take a large group of passengers from one central station to another central station and often a connection to another transportation means is necessitated [15]; whereas a platoon of autonomous vehicles can be easily split and combined so the vehicles will be able to take passengers from various locations and give each of them a ride to anywhere a road is present [16].

The concept of platoons is very suitable for the COVID-19 regulations that require distancing and separation. Separate vehicle for each passenger is more than suitable for avoiding infection of COVID-19.

Currently, fully autonomous vehicles without the necessity of a safety driver are approved only in a few states in the U.S. - Arizona, California, Michigan, and Ohio [17]. However, autonomous vehicles are about to be approved in many other locations [18] and platoons of autonomous vehicles are on the horizon.

3. Intelligent Transportation Systems and COVID-19 Influence – Case Study

Even before the COVID-19 outbreak, the trains in Israel on a regular basis run at a massive loss and therefore Israel Railways is subsidized by an enormous ratio of 85% [19]. While there are occasionally overloaded trains, most of the routes are commonly unfilled and actually in average they are 70% empty [20]. Even with these openhanded conditions, the trains in Israel serve only 5% of the travels [19].

In a few years autonomous vehicles will be prevalent all over the world including Israel. The competition between the traditional trains and the new trains of autonomous vehicles platoons will be hopeless for the traditional trains. The autonomous vehicles platoons will have several substantial competitive advantages:

- Better service. No need for connections with other means of transportation.

- No need for massive subsidies.

- Good response for the public panic that the COVID-19 has generated.

In Israel, the expansion of road no. 1 to Jerusalem from 2 to 3 lanes has been carried out concurrently to the construction of the adjacent new railroad to Jerusalem. The expansion cost of road no. 1 was NIS 2.35 billion [21] and 133,000 vehicles averagely travel on this road every day; whereas the construction cost of the adjacent railroad is estimated between NIS 6.9 billion to NIS 9 billion [22] and 9,300 passengers averagely travel in this train every day [23]. The rate of car occupancy in Israel is 1.24 to 1.34 of only private cars [24]. 133,000 of all kinds of vehicles including buses are about 200,000 people, which give an unreasonable relative amount. The 9,300 train passengers are a small portion of the passengers and the investment in railroad is out of all proportion.

With the outbreak of the COVID-19 pandemic, all the passenger trains traffic in Israel has been stopped [25]. However, this is not an indication for a permanent close, because Israel ministry of transportation uses this temporal stoppage for electrifying parts of the railways throughout the country.

4. Conclusion

It seems that the influence of the intense Intelligent Transportation Systems development and the impact of the COVID-19 outbreak are still underestimated by many governments; hence they continue to invest in traditional transportation, instead of moving forward for a new generation of transportation.

New transportation technologies that provide a private space or a space for very few people are the forthcoming transportation technologies. There are such emerging transportation technologies like SkyTran which is a transportation means with private compact carriages that goes on dedicated tracks installed at a height of several feet and employs magnetic levitation in order to move these private compact carriages without contacting its tracks or the ground [26]. Also platoons of private autonomous cars provide a space for very few people in each car.

Such transportation technologies can both offer a better service without any need for connections and a better protection from viruses.

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