

Flowing City: Solving the Urban Traffic Issue with Low Cost Substitution of Subway

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Abstract. Nowadays urban traffic is one of the most serious urban issues deeply influencing the normal operation and sustainable development of metropolitans. Despite many practices being implemented to solve this problem, none of them could work as a set of core schemes with high efficiency and low cost. Based on the technology of conveyor belt, the paper will discuss a new public transportation system, which has significant advantages in terms of space, time, energy consumption, investment and safety and is best applied in a large urban area where subways are not yet fully developed.

Keywords: Flowing City, Conveyor Belt, Low Cost, the Substitution of Subway

1. Introduction

The “Flowing City” actually is made up of “Flowing Streets”. Obviously, streets in all cities around the world are static, in comparison with mobile pedestrians and vehicles. Let’s reverse our thinking by assuming that streets could move and simultaneously the pedestrians and vehicles keep static, then we can get the concept what we call the “Flowing Streets”. Thousands of “Flowing Streets” could be combined to form a “Flowing City”- streets are flowing as rivers and the whole city becomes the water system of pedestrian. “Flowing City” is defined as a kind of a totally new public transit system that uses high-speed conveyor belts as main routes, which is a sort of technology already sophisticated-e.g conveyor belts in terminals of airports(moving pavement), as the base to structure the traffic network of the whole city. It is assumed that the currently patented network has a performance with the same efficiency as the subway, but only a 1/15 cost and a 1/5 construction period of its’ respectively.

As illustrated in the Fig. 1, primarily the system has three parts including the main route, the in/out route and the transferring route which all are made up of 5-20 meters-long and 1-2 meters wide electron motion-conveyor belts and set up on viaducts or in shallow underpasses enclosed by glass curtain walls. Specifically the main route and the transferring route would be designed as fixed uniform motion-conveyor belts, on the other hand, the in/out route is running at gradually incremental or decremental variable speed.

1. Main Route: The time pedestrians take to walk to the Main Route from anywhere of urban region would not exceed five minutes. There are two kinds of infrastructure for the main route, i.e. viaducts and underpasses, which resemble mini-type viaduct track system and subway system respectively, with approximate freight volume but much less quantity of construction.

2. In/out Route (Fig. 2): The In/out Route is the road section that connects the ground to the Main Route. It can be set up in sites where we have enough space for the platform.

When passengers are entering the system, the conveyor belt would be accelerated gradually to achieve the synchronization with the Main Route for passengers to enter it through their lateral movement. For

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passengers' leaving the system, the conveyor belt of the Main Route only needs to implement a reversal procedure, decelerating gradually to gain the synchronization with the conveyor belt of the Section of Exit.

3. Transferring Route. Transferring Route is the route that connects two Main Routes, with which passengers can change their routes without deceleration.

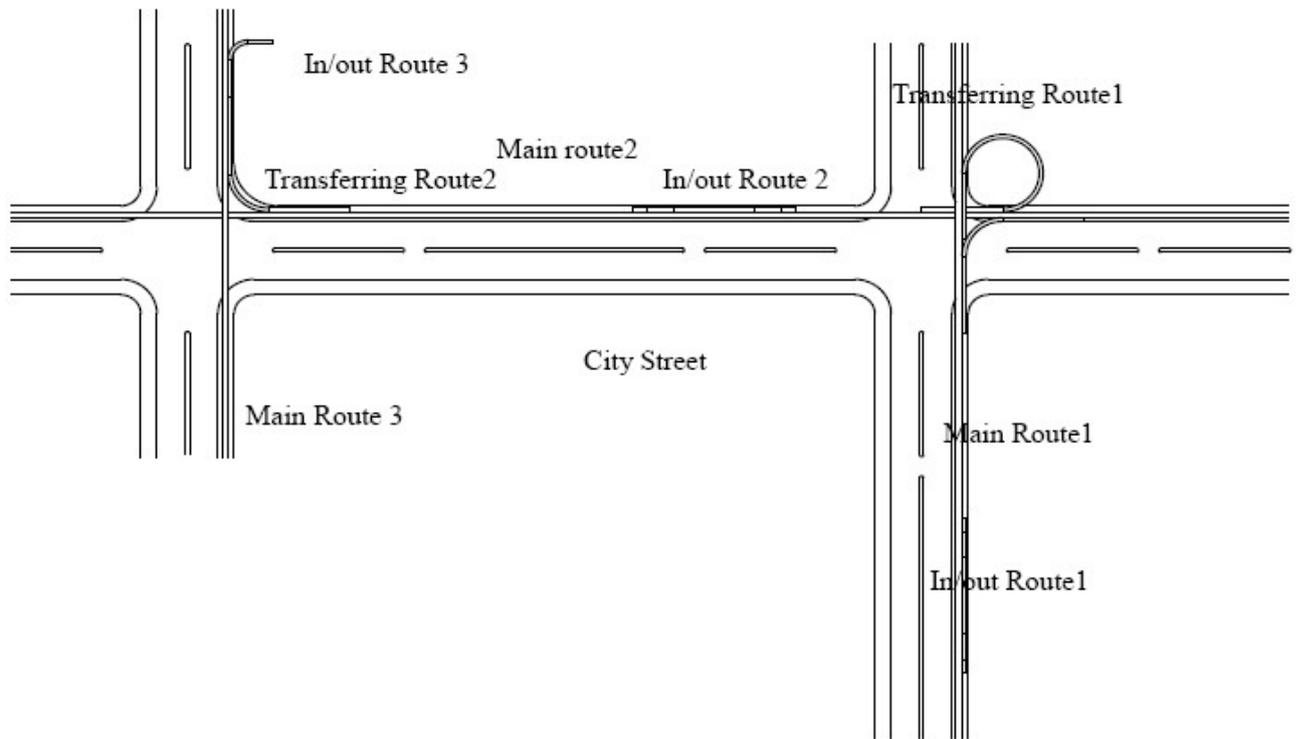


Fig. 1

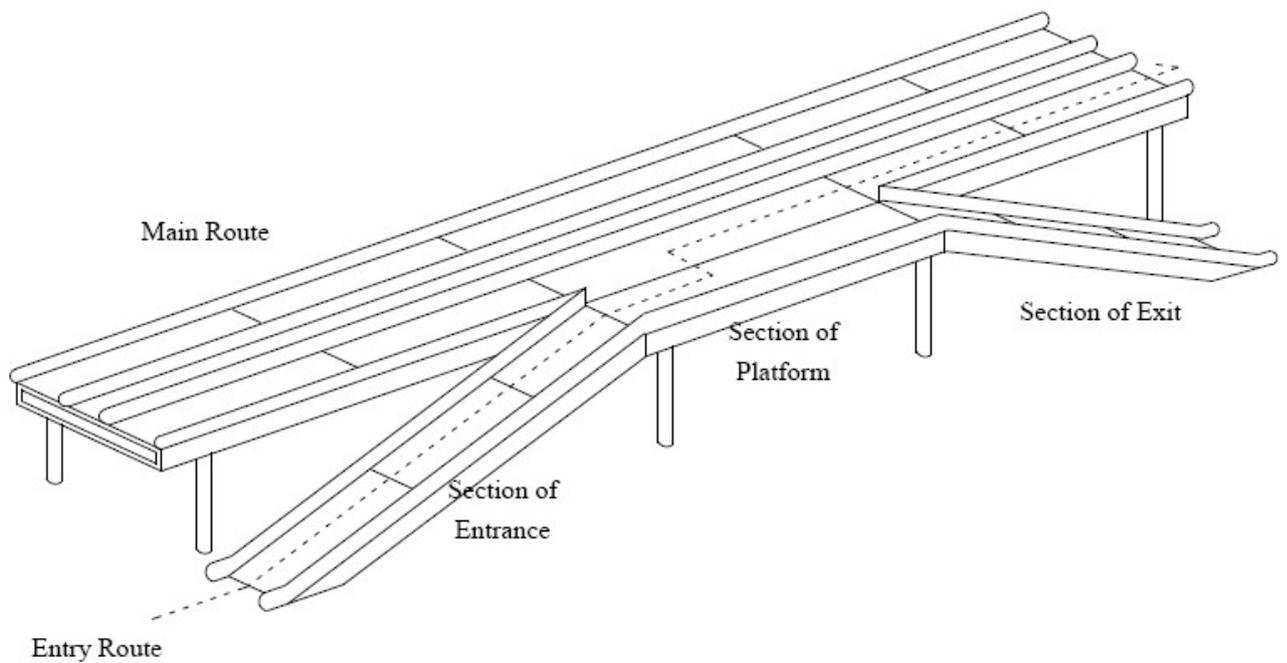


Fig. 2

2. The Innovations of the Flowing City

It has five innovations as following:

2.1. Space: Unused Space of Roads Can Be Utilized Adequately.

Constructed easily and quickly without any impacts on ground transportation, the viaduct version that uses spaces above pedestrian walks and green belt can provide shade, protect pedestrians on the ground from rain and sun. On the other hand, to build the underpass version is just as easy as excavating sewers, expensive and large scale equipment such as shield machine are not required.

2.2. Time: Unnecessary Time Wasting Can Be Avoided or Reduced.

For traditional vehicles, “moving off – accelerating - moving at maximal speed - decelerating-stopping-moving off again...” is an unavoidable process which hinders the travel speed greatly. Besides this, a lot of time also is wasted because passengers need to walk to subway stations and carry on the procedure of “alighting – transferring – waiting - reboarding” at transfer stations.

Through operating at even speed and transferring without deceleration, the Flowing City avoids the two aforementioned time wasting situations thoroughly. Furthermore, proprietors can apply for the permission for constructing an affordable sub-system of it, resulting in time saving for passengers walking to their destinations from stops, such as interior areas of department stores/office building/residence communities, which is unimaginable for other public transportation vehicles.

2.3. Energy Consumption: Only Transporting Net Weights.

When transporting passengers, vehicles actually are transporting their own weights (more than 90% of themselves⁷). However, what the Flowing City system is carrying are precisely the real transport objects, passengers themselves. In addition, even the floors and the handrail are counted in; the total transporting weights are only equal to 1/5 of that of traditional vehicle systems.

More advantages include energy conservation and improved ventilation. Considerable power consumption of air conditioners is curtailed because all journeys are finished in enclosed spaces in extreme weather and large waiting rooms are not necessary in this system. At the same time natural wind can be injected into through opening windows thoroughly in mild weather, so the air inside would not be as foul as that of the subway (Fig. 3).



Fig. 3

Minimal electric power is required to maintain the whole system’s operation, because the Flowing City’s mainlines are running at an even speed to avoid frequent moving off, stopping, accelerating and decelerating, resulting in great energy consumption reduction. Energy conservation means carbon emission reduction, ecological city, life quality and a large sum of money.

2.4. Investment: the only “subway” which can make profits.

In terms of construction, expenses of projects are greatly reduced due to a 1/15 cost of that of the subway.

In terms of operation, substantial income can be ensured by charging mode like subway.

For the aspect of promoting business values for urban region, the “Flowing City” not only can stimulate the commercial cycles merely around dozen stations but the whole line, even the whole city.

Considering the aspect of impacts of construction, the economic losses caused by its construction also would be reduced greatly.

2.5. Safety: The most serious accident is nothing but falling.

No matter what kind failures happen, the personal injury caused would be extremely limited, because like the bicycle, the highest operational speed of the system is only 20-30kph, far below that of automobiles which are driving by hundreds of millions drivers individually at a speed of more than 60kph, and stuffy subways which are running underground at a depth of more than 10 meters.

Last but not least, over bridges and underpasses of the “Flowing City” can be built in all junctions to protect pedestrian from dangerous cars once for all, because whole system is completely independent of ground transportation, in the air or under the ground entirely.

3. Reason of the Conveyor Belt Not Be Used For Urban Traffic in History

Most of the engineering technologies used for the "Flowing City" are mature technologies around the world. However why has the high speed conveyor belt not been applied to urban traffic of each country systematically? It is assumed that economical efficiency and safety would be the main reasons.

1. Economical efficiency

a. The Conveyor Belts cannot form traffic networks because of lack of passenger flow.

b. A charging system cannot be established with the traditional Conveyor Belt, thus huge sum of losses cannot be avoided.

c. In comparison with the public bus system, traditional Conveyor Belt may be more expensive, but once compared with the subway ticket, its commuting cost absolutely is much cheaper.

2. Safety

a. Traditional Conveyor Belt that is built on the ground has poor safety because of level crossing with urban roads. The Flowing City solves this issue precisely.

b. All alighting/boarding technologies in the history are still facing the problem that passengers cannot find their right directions but collide the railings in the separating point between two conveyor belts. A movable screen door of the Flowing City system has preventive measures which solve this issue radically.

In the case of failure, spoiled sections of traditional Conveyor Belt cannot be removed out like vehicles on roads, which would cause the whole system paralyzed.

Attached list: Flowing City and Subway system (Table 1)

Table 1

Indexes	Subway system	Flowing City
Travelling speed on board(km/h)	35	20-30
Time for 10 km with one change(min)	25	24
Ridership for one hour(ten thousands)	3-6	5
Minimal distance between stations(m)	500	100
Construction cost(\$10 millions/km)	6	0.4
Construction cycle for each line(year)	4	0.5
Impact road traffic or not	Seriously	Almost no impact
Is it noisy when travelling?	Yes	No

Promoting business values	Around stations	The whole line
Energy consumption	High	Low
Anticipated time for a network established in an urban region with a population of 5 millions (year)	25	3
Time consumed for the travel between every two stations in a network established(min)	15	<5

4. Summary

Conveyor belt with a history of more than one hundred years has become a kind very mature and reliable general technology. As long as it could be improved slightly, our urban traffic would experience a revolution. No matter from which aspect, Flowing City would bring a bright future to every city.

5. References

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