International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-4, November 2019

Network Simulation of a Transportation System Based On Accelerating Moving Walkway for Efficient and Sustainable Cities

Gurram Narendra Santosh Kumar, A Srinath, Y. Kalyan Chakravarthy, Ratna prasad paladugu

Abstract*: Many transportation systems were developed across the world for rapid transportation of pedestrians in both congested and sustainable cities. This leads to the development of the individual place or area for sure. Perhaps a bit of traffic cannot be controlled at this moment even though many transportation systems were installed as discussed. Accelerating moving walkways are one of the premium techniques involved in the present scenario which has an immense stage of operation in this advanced world. Previous Articles discussed the difference between AMW to other transportation systems, now this paper involves the methodology of this system how the public can transform from one place to another place in an easy way. Here the system prepared in a batch mode transportation technique where limited pedestrians can only be transformed under some parameters like weight, persons and consumption of place. The plots of different speeds were developed using MATLAB and a sample model was drawn in CREO.

***Keywords* : Network simulation, Batch mode, sustainable cities, Pedestrian Transportation, urban development.**

I. INTRODUCTION

Moving pathways are a method of individual's bring that drop hooked on the classification of ceaseless individual's movers like they constantly give transfer limit amid activity. There is no coming up moment intended for travelers who wish to utilize them [1]. Moving causeways canister be originated in generous arenas, shopping centers, exposition auditoriums, also, main extensively, most important shipping conveniences such as airports furthermore train/metro stations. The speed of these walkways is controlled by the requirement for security upon passage and leave, which for the most part restricts it to around half ordinary strolling hustle, otherwise 30– 40m/min. The moderate speediness of the pavement causes restlessness, with travelers frequently stroll on the catwalk itself or on the neighboring bottoms lightly utilize the slower walkway [2]. The view of accelerating walkway is shown in figure 1 below. In recent times many countries across the globe were experiencing rapid growth in their smart cities and metropolitan places due to which a surge of people has been shifting to these areas for improving their living standards. This resulted in the drastic utilization of infrastructural resources between the habitants in the city exceeding its normal utilization limits. The usage of own, public, private transportation for commuting, which is a common sight in every city that results in conge station and pollution. It also affects the pedestrians in these areas as it is very difficult and tiresome for them to travel on footpaths beside the vehicular traffic. To avoid conge station a new public transportation system that operates form departure door to arrival door continuously without any transit time is needed to be employed.

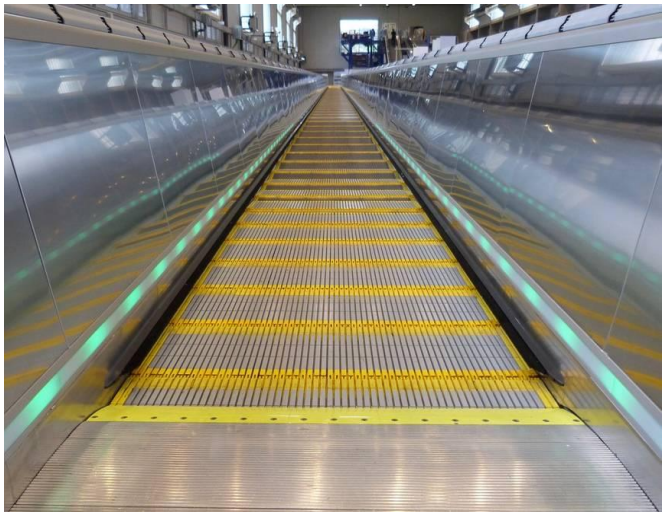

Figure1: Existed Accelerating moving walkway

Existing public transportation systems require more transit time, whereas a moving walkway system operates continuously allowing lower latencies and higher throughput. Till date, only a minor role is played by moving walkways as a transportation system because they were only preferred to install within airports and shopping malls.

Manuscript published on November 30, 2019.
* Correspondence Author
Gurram Narendra Santosh Kumar* Research scholar, Department of Mechanical Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram (A.P.) India. Email: santoshnarendra1@gmail.com
A Srinath, Professor, Department of Mechanical Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram (A.P.) India. Email: srinath@kluniversity.in
Y. Kalyan Chakravarthy, Associate professor, Department of Mechanical Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram (A.P.) India. Email: kalyan_me@kluniversity.in
Ratna Prasad Paladugu, Assistant professor, Department of Mechanical Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram (A.P.) India. Email: prprasadc_me@kluniversity.in

The first continuous moving walkway in history was a continuous moving pavement which is a concept developed with an intention to reduce New York city conge station in 1874. The first-ever working system of a moving walkway was constructed and deployed during worlds Colombian fair in 1893 in Chicago it does not become common until 1950. 1900 Paris exposition has seen a longest people moving platform that spans over a length of 3360m with a capacity to move 57,600 passengers/hr. From the late 1950s, moving walkways were installed within many airports to assist passengers for travelling from one terminal to another terminal [7].

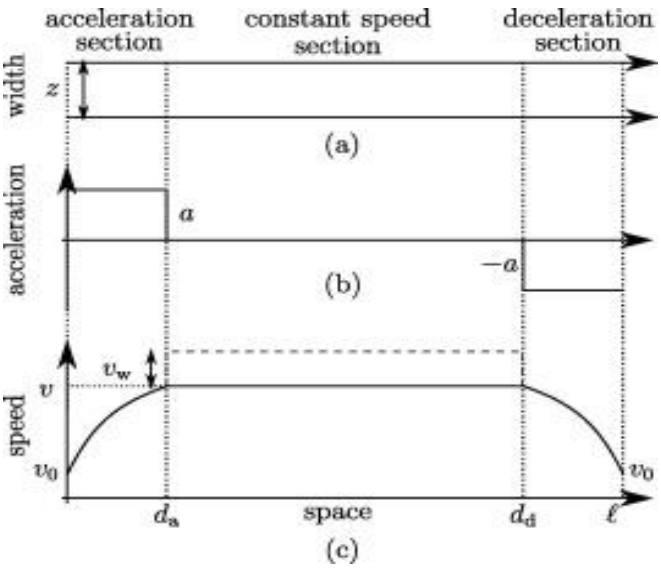

Figure 2: various sections of AMW

Moving walkways use either a belt or a chain of metal pallets as a moving platform. They were also classified based on their angle of inclination as a horizontal moving walkway and inclined moving walkways. Belt type moving walkways excel in every way when compared with metal pallet walkway by means of smooth, noiseless operation along with the compactness and stability[8]. Whereas a metal pallet system is slightly noisier and requires more recirculating space underneath the walkway surface. Walkways are innovated from time to time with many sophisticated technologies. Many of the Transporting systems are found and finally decided that this walkway system is more accurate to transform people from one place to another place. For a considerable length of time specialists have talked about moving walkways for separations near 150m and 1,000m, which would move at 0.65m/s toward the start and end, and quicken to 2m/s in the center, twice as quick as normal strolling speed[9]. The difference in speed is made conceivable by an arrangement of collapsing covering beds, organized like connections in a chain. The further they are pulled separated, the quicker the speed. On the underlying stage the beds slide underneath each other, however, when speed expands the even 'steps' stretch out to full width, stimulating traveler advance. This involves upgrades of the ordinary poignant boardwalks to adapt to the interest meant for little journey point. While a couple of days back, a few makers have grown new plans of moving walkways. These frameworks keep up a similar passage and leave momentums as persons of the customary stirring causeways to oblige secure loading up also landing yet give superior rate in the midriff. Such pitiful sidewalks are identified as Accelerating Touching Walkways. AMW's are projected to be appropriate to suit a substantial activity of walkers on behalf of a moderately dumpy separation up to 1 km Furthermore, expressed that AMWs are relied upon to take care of the expanding require for a public shipper emerging starting the purported carrying hole going around 100 m to 2 km[10]. However, affecting pathways at present just provide removes up to 300 m. It is in this manner intriguing to think about the likelihood to stretch out the movement separate up to the anticipated number beyond, or else even longer.

II. EXISTING METHODS

Riccardo Scarinci, Iliya Markov et.al [3] in their work expressed that diverse factors, for example, contamination, clog and quick urbanistic contemplations prompt of an alteration in the usage private vehicles in swarmed and congested downtown areas. Because of this, the last mile is achieved utilizing open transport, auto and bicycle sharing alongside strolling and cycling. By bookkeeping every one of these elements, they expected a speculative situation in which the utilization of private autos is totally limited or restricted incompletely in congested city territories and inventive transport modes must be utilized. A modern in light of a moving walkway system to help the transportation of people on foot in-vehicle restricted city territories. AMW's can accomplish top rates of 15 Kmph in their steady moving segment, an ordinary moving walkway can't accomplish such speed. They introduced a top to the bottom portrayal of moving walkway framework in a transportation point see and defined a heuristic calculation for the system outline issue and tried it on genuine contextual analysis. For their situation contemplate, there is a system of urban streets and an inception goal request, the streamlining calculation, which consolidate activity task and supply alteration, investigates the exchange off bend between the aggregate travel time and capital cost of the framework. Consequences of this contextual investigation enabled them to pragmatic knowledge about the potential outcomes of this framework alongside ideal system plans and how they shift with a lessening in the accessible spending plan. Their production examines out of the blue the utilization of AMW s at a system scale and gives comes about helpful to dissecting the framework practicality with existing urban conditions. The last outcomes on movement time, speculation spending plan and payback period show that AMWs could be a compelling method of transport in urban areas.

Yoshiharu Abe et.al [4] in his exploration production shared his perspectives on a moving walkway composed by Ishikawajima- Harima Heavy Industries Co., Ltd. Having inexhaustible involvement in materials dealing with, the organization built up a best in class AMW called "ACCEL-LINER". ACCEL-LINER has a Treadway quickening instrument that empowers travellers to move at up to 120 m/min, which is 3 to 4 times quicker than the regular moving walkway, leaving door speed unaltered for happy with loading up and landing. The framework can work either slanted or even a bent course. The organization acclaimed that with a specific end goal to take care of the expanding demand for individuals movers going around 100m to 2 Km ACCEL-LINER is an incredible arrangement.

It helps individuals to conquer the tedious urban activity and a system of these can turn into a key segment in urban transportation arranging.

Katsumi Ikizawa, Hiroyuki Nagai et.al [5] played out their examination on a quickening walkway which was created by NKK. It goes as gradually at the passageway as a regular moving walkway (30– 40 m/min), later moves at its most elevated speed (54–72 m/min) amidst the walkway after increasing speed. The walkway is decelerated to an indistinguishable low speed at the exit from utilized at the passage. The quickening walkway is intended to guarantee wellbeing and comfort of the clients for this the handgrips at the two sides are synchronized with the nearby walkway beds.

Ayan Das et.al [6] had directed a contextual analysis on Linear Induction Motor based People Mover for round Routes. They expressed that Congestion in India has turned into an intense issue as it comes about into an expanding rate of mishaps, contamination and so on. Extremely congested places, for example, shopping centres and commercial centres have this major issue which at last outcomes in the affliction of people on foot. To defeat this the creators, play out a contextual investigation on Connaught put in New Delhi and proposed a straight acceptance engine moved moving stage which can transport individuals from one place to other. They additionally talked about plan and investigation of the proposed individual's mover and defended the business suitability of the framework.

III. PROPOSED METHOD

From figure 3. It is shown that a limit of 3000kgs was permitted because of the availability of the laps and the system is arranged in such a way that, when the weight on the walkway got increased to 3000kgs automatically it is moved to the high-speed zone where if it is less than 3000kgs, it is tuned into the low-speed zone. Hence when the passenger's weight reached to the limit, no additional passengers can step on the platform to travel and waiting time can be created for that a flow chart has been developed as shown in figure 3. The flow chart contains different flow simulations in order to develop a smoother operation. At low-speed zone, it is fixed to 2m/s and at high speed, it is showcased as 8m/s. if any error developed during the operation, a feedback controller used to give feedback to the system using various mechatronic systems[11-20].

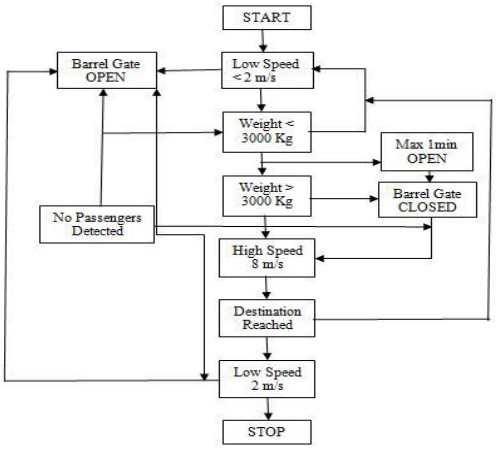

Figure 3: flow chart for AMW developed

IV. MODELLING AND SIMULATION

A model has been developed in Creo parametric software version 5.0 in such a way that the existing dimensions of walkway and escalators, but it is normalized to have at least 25 people at worst case. It is drawn using various commands like pad, fillet, chamfer, extrude.. e.t.c. It is developed by using material stainless steel. Similarly, two plots have been developed in Matlab for both existing and non-existing walkway models. And were displayed below with inputs time and speed. Where some differences are initiated between them and discussed as well.

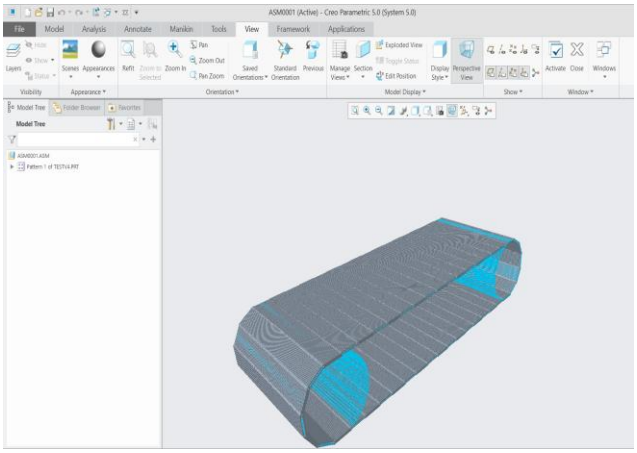

Figure 4: Creo parametric model for walkway

Model-1

```
x=0:60;
y=2*ones(61);
plot(x,y,'b');
xlabel('Time(sec)');
ylabel('Speed(m/sec)');
title('Existing Walkway');
```

Model -2

```
x=0:10;
y=2*ones(11);
plot(x,y,'b');
hold on;
x =10:20;
y =-(-2.2)/11 * x;
plot(x,y,'b');
hold on;
x=20:40;
y=4*ones(21);
plot(x,y,'b');
hold on;
x=40:50;
m=0.2;
x1=40;
y1=4;
y = m*(x1 - x) + y1;
plot(x,y,'b');
hold on;
x =50:60;
y =2*ones(11);
plot(x,y,'b');
xlabel('Time(sec)');
ylabel('Speed(m/sec)');
```

title('Accelarating Moving Walkway ');

V. RESULTS

From the data available we developed a programme by considering time in the horizontal axis and speed in vertical axis. The terms like X-label, Y-label and plot were individual terms which have a unique character and plays an important role in developing the results. It is observed that a straight horizontal line has attained due to the constant speed of the drive motor or rotary part. Hence by considering speed as constant parameter the motion of the pallets will stay constant. And hence speed is not changed with respect to unit time. But this does not happen in the accelerating speeds where from figure it is observed that from 0-10 seconds of time it is moving constantly and slowly speed got increased to the next 10 seconds which means it is going to accelerating zone and then with increasing the speed i.e. acceleration has been issued to the system. Hence the acceleration moment will stay constant up to the end mark and finally when the point of departure it again automatically reduces the speed to 2m/s as usually. And same scenario will repeat under closed-loop control system by delivering feedback to the controller.

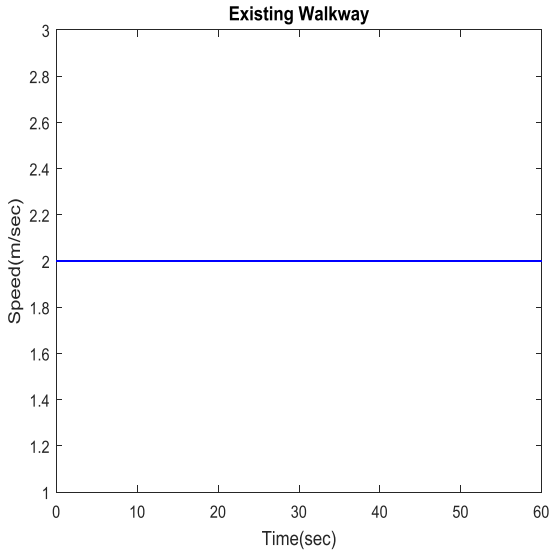

Figure 5: simulation of Existing walkway

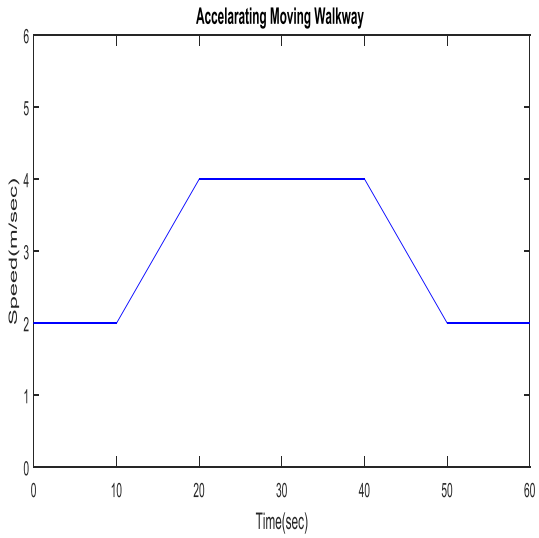

FIGURE 6: simulation of Accelerating Moving walkway

VI. CONCLUSION

This paper deals the differentiation of a normal walkway to accelerating moving walkway, where it shows how the speed regulation changes with respect time, weight and space. However, the utilization time of accuracy indicates the gain of the theme. Where 8m/s is the absolute time of speed compared to the normal walkways. Prior to that the methodology involved in this paper reaches the touchpoint to an extreme level of possibilities. Thus, it shows the time path at which the speed can regulate at unit point of time.

REFERENCES

1. P Sreejith, "Accelerating Moving walkway- An in-depth study an in-depth analysis of pros and cons of Accelerating moving walkway." 27d4pai9ji3et-25.(2017)
2. Kusumaningtyas, G. Lodewijks, (2008)," Accelerating Moving Walkway: A review of the characteristics and potential application", Transportation Research Part A, Vol. 42, pp. 591–609.
3. Riccardo Scarinci, Iliya Markov, Michel Bierlaire, "Network design of a transport system based on accelerating moving walkways", École PolytechniqueFédérale de Lausanne (EPFL), School of Architecture, Civil and Environmental Engineering (ENAC), Transport and Mobility Laboratory (TRANSP-OR), Switzerland. (2017)
4. Yoshiharu Abe, Yoshiyuki Beniya and Haruo Masuda, "Accelerating Moving Walkway "ACCELLINER"", Senior Manager, Materials Handling Equipment Division, Ishikawajima-Harima Heavy Industries Co., Ltd., 1-19-10 Mori, Koto, Tokyo, JAPAN 135-8322; PH +81-3-3846-3394. (2004)
5. Katsumi Ikizawa, Hiroyuki Nagai, Shin-ichiroAoe, Tomoaki Sato, RyuichiOkuno and Takeshi Yanagisawa, "Development of an Accelerating Walkway". NKK TECHNICAL REVIEW No. 84. (2001)
6. Kayam, S. K., Raghava Rao, K., Srinivasakumar, C., Narender, G., Sreenivasa Rao, A., & Ahammad, S. H. (2019). Efficient 1024-point low power radix-22 FFT processor with MFFMD. International Journal of Innovative Technology and Exploring Engineering, 8(7), 2419-2425. Retrieved from www.scopus.com.
7. Raj Kumar, A., G. N. S. Kumar, J. K. Chithanoori, K. S. K. Mallik, P. Srinivas, and S. Hasane Ahammad. 2019. "Design and Analysis of a Heavy Vehicle Chassis by using E-Glass Epoxy & S-2 Glass Materials." International Journal of Recent Technology and Engineering 7 (6): 903-905. www.scopus.com.
8. Kumar, G. N. S. and A. Srinath. 2018. "An Ergonomical condition's of Pedestrians on Accelerating Moving Walkway: A People Mover System." International Journal of Mechanical and Production Engineering Research and Development 8 (Special Issue 7): 1376-1381. www.scopus.com.
9. Kumar, Gurram Narendra Santosh, and A. Srinath. "Exploration of Accelerating Moving Walkway for Futuristic Transport System in Congested and Traffical Areas." (2018): 616-624.
10. Mallik, K.S.K., Kumar, G.N.S., Balasubramanyam, S., Swetha, D. A review on preparation and structural characterization studies of graphitic carbon nitride (2017) Journal of Advanced Research in Dynamical and Control Systems, 9 (Special Issue 14), pp. 1869-1880.
11. A, Y., Santosh Kumar, G. N., & A, S. (2018). Design of a New Generation moving Malkway for Congested City Areas. 2018 International Conference on Automation and Computational Engineering (ICACE). doi:10.1109/icace.2018.8687112.
12. Ahammad, S. H., V. Rajesh, K. Saikumar, S. Jalakam, and G. N. S. Kumar. 2019. "Statistical Analysis of Spinal Cord Injury Severity Detection on High Dimensional MRI Data." International Journal of Electrical and Computer Engineering 9 (5): 3457-3464. doi:10.11591/ijece.v9i5.pp3457-3464. www.scopus.com.
13. Danthala, S., S. Rao, K. Mannepalli, and D. Shilpa. 2018. "Robotic Manipulator Control by using Machine Learning Algorithms: A Review." International Journal of Mechanical and Production Engineering Research and Development 8 (5): 305-310. doi:10.24247/ijmperdoct201834. www.scopus.com.

14. Kishore Kumar, K., A. Srinath, P. Sri Naga Venkat, and M. Harish. 2017. "Simulation of Delta Parallel Manipulator for Medical Applications." Journal of Advanced Research in Dynamical and Control Systems 9 (Special Issue 18): 1810-1817. www.scopus.com.
15. Yugandhar, A., A. Srinath, P. Ratna Prasad, Y. Kalyan Chakravarthy, and R. Venkatesh. 2018. "Design and Analysis of a Multi-Drive Moving Walkway for Public Transportation." Journal of Advanced Research in Dynamical and Control Systems 10 (2 Special Issue): 1468-1474. www.scopus.com.
16. Dharniju Reddy, T. and G. Yedukondalu. 2016. "Chest Compression for Cardiopulmonary Resuscitation with a 3-PRR Parallel Manipulator." International Journal of Mechanical Engineering and Technology 7 (6): 660-667. www.scopus.com.
17. Kalyana Chakravarthy, Y., A. Srinath, T. Vijaya Aditya, K. P. S. S. S. Abhiwed, G. End, and N. S. Ram. 2016. "A Systematic Approach to Controlling the Prosthetic LEG using an EMG (Electromyography)." ARPN Journal of Engineering and Applied Sciences 11 (12): 7905-7911. www.scopus.com.
18. Srinath, A., K. U. Rao, R. P. Paladugu, and Y. K. Chakravarthy. 2019. "Design & Optimization of Rehabilitation Exoskeleton Device for Indian Amputees." International Journal of Innovative Technology and Exploring Engineering 8 (7): 2088-2094. www.scopus.com.
19. Kalyan Chakravathy, Y., R. P. Paladagu, N. S. R. Gopisetti, D. Dinesh Reddy, and A. Srinath. 2019. "Prototyping Evaluation of Prosthetic Leg: A Case Study.". doi:10.1016/j.matpr.2019.05.116. www.scopus.com.
20. Saikumar, K., V. Rajesh, N. Ramya, S. H. Ahammad, and G. N. S. Kumar. 2019. "A Deep Learning Process for Spine and Heart Segmentation using Pixel-Based Convolutional Networks." Journal of International Pharmaceutical Research 46: 278-282. www.scopus.com.