Enhancement of Skywalk Automation Technique

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ABSTRACT : Currently, sporadic operating escalator and walkator are gaining vogue on the market. Moving walkway is another mode of individual's conveyance. One of the latest innovations in this field is the Moving Walkator named as SKYWALK, which provides higher transport speed. However, the application of Escalator is finite to short-span travel up to 200 m. This paper models (accelerating) moving walkways, which aims to be a part of Smart city project in Raipur. We come up with the application of skywalks for the conveyance of pedestrian over long span travel. Subsequently, the methodology related to the concept of long-distance auto-walks is briefly introduced as topics for further research. This model uses the AB Micrologix 1000 series PLC for controlling the entire system assisted by ladder programming in RS-Logix Micro software.

KEYWORDS:- Auto walk; pedestrian traffic; automation in PLC; skywalks; Induction motor; braking; contactor; overload relay; gears.

I.   INTRODUCTION

Skywalk is a name given to a network of auto walks connected for the means of pedestrian transport. Skywalk has been imagined as a system which w will ease the pedestrian movements along city centers and special routes. Auto walk follows a mechanism that transports people across a horizontal plane at a constant speed. The presence of public and private vehicles in the streets makes congestion in roads and in contrary increases pollution as seen from environment point of view in a developing smart city. The paper explores the technology, mechanism, opportunities and future scope of skywalk. Currently the mechanism for running a successful walkator system is explained by constructing a prototype. We have adopted a multi disciplinary series of action. At first we follow the urbanistic perspective of engineers for developing such a big network of transport. Then we discuss the role of auto walks in urban planning. After this analysis we shift our perspective towards the prototype model which will serve as a basic model as well as for education processes. The idea is to design a network of walkator with practical consideration like speed, components, distance and cost. During the making process of skywalk's prototype model we focused on trip time and constant speed as the initial step. The selection of PLC technology as a base for automation is done while reporting the limitations of other automation techniques. This allows us to analyze the characteristics of the system. As examined based on the engineer's approach we reported certain failures and limitations which are resolved later. The final prototype works with two stations and more. The paper presents findings of the literature study on accelerating moving walkway (AMW).

The remainder of this paper is arranged as follows. Section 2 contains all the research papers studied for the better understanding of the project. Section 3 explains the functions of components of prototype along with methodology. In section 4 we conclude the paper. Section 5 descripts advantages and output the prototype system. The future scope and limitations of the actual large scale skywalk is reported in section 5.

Sections 6 enlist references such as research papers of technologies used and fact sheets of traffic case studies.

Fig 1:- Proposed model of Skywalk with four stations

Source: Sky walks Raipur Published on Jun 16, 2017; retrieved from: YouTube

II.   LITERATURE SURVEY

Abe, Y., Beniya, Y., Masuda, H. [1], discussed the proportional assessment of accelerating moving walkator with other transport modes and matters associated with the conception of long spans. Al-Sharif,[2] describes the maximum allowable electric powers, energy management, total harmonic distortion of auto walk .Dennis P. Connors [3], explained various type of Variable frequency drives (V.F.D) with their limitations. It described basic relationship of torque, speed of motor along with harmonic effect. Emphasis on environmental factors like altitude, temperature and types of driven loads, were outlined. DC. Shirakihara, T., [4] illustrates the basin knowledge of speed walk and their history. P.M. Xavier1, Raju Nedunchezhian[2] [5] describes the different methods to control vehicular traffic which shows lack of pedestrian traffic safety. Rinchen Geongmit Dorjee [6], concludes the need of constant speed with variable load leads to drawback of VFD. R., Kunczynski, Y., (2000) [7] details the planning and selection criteria for construction of autowalks.Shirakihara, T., [8] lists the future demand of skywalk network by considering the road crash factsheet.

The selective information from the literatures were noted and rolled up, and then the range of values for each characteristic was approximated.
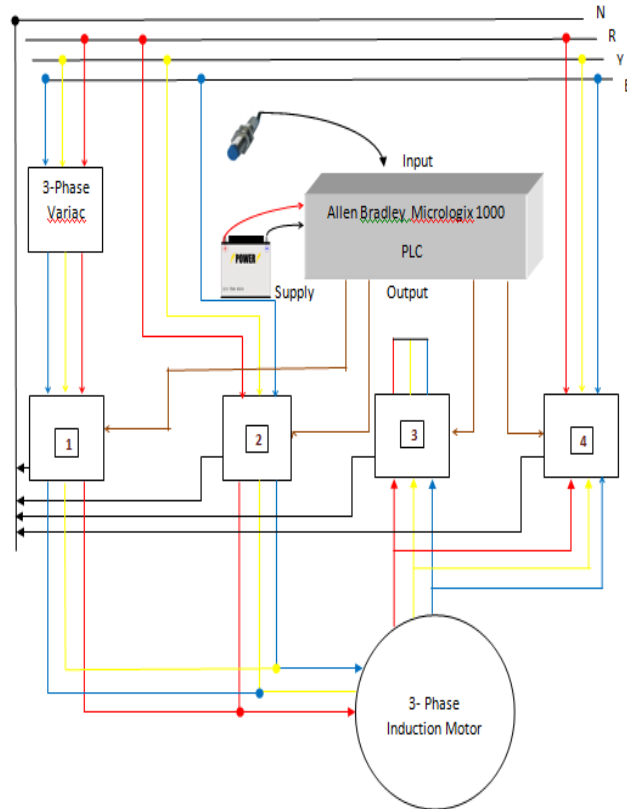
III.   METHDOLOGY

The skywalk is located at a specific height from the ground so public will use escalator to reach the platform.

In this paper we are using PLC (Programmable logic control) to initiate the motor. The processes as follows when person enters the conveyor belt the Photo-electric sensor senses the pulse obtained from feet of the person entered. Then the sensor passes this pulse to PLC. The ladder programming fed in the PLC will start the main contactor. Contactor is an electrically controlled switch (relay) used for switching an electrical power circuit.

Simultaneously star contactor also switches on. This ultimately starts the induction motor. In addition the speed of auto-walk is controlled by Compound gear system coupled with the motor shaft. In this prototype gear ratio is 22 (by calculation). This gear ratio varies with the desired speed of conveyor. After 4 sec of starting of induction motor to switch into running mode star contactors switches off and delta contactor gets on. The belt runs at constant speed for variable load as the number of person travelling varies at peak traffic and low traffic durations.

At overload condition the overload relay connected with main contactor will trip the circuit by sending a signal to PLC. The contactors are tripped until the load in the auto-walk decreases. Suppose the conveyor is empty then after a wait of 15 sec braking action takes place in motor by braking contactors. There are two stations connected in prototype and people can easily travel from one station to another but for live smart city project as proposed there will be four stations connected.

1-Breaking Contactor. 2-Main Contactor. 3-Star Contactor. 4-Delta Contactor.

Fig 2:- Electrical Connection of Motor

Fig 3:- Hardware Implemented
Source: Actual hardware system made for the project work

IV.   EXPERIMENTAL RESULT

The application of Skywalks to transport people over longer distances including four stations is still a new concept. This paper has described an initial study on the competitiveness of an interlinked auto walk system. The system focuses on the constant speed the output from the components is varied according to the input conditions. The initial input is obtained from three sensors namely starts sensor, stop sensor, sensor for tripping situation. This paper is based on the implementation of only this three situations and their respective output is shown in below figure 4.
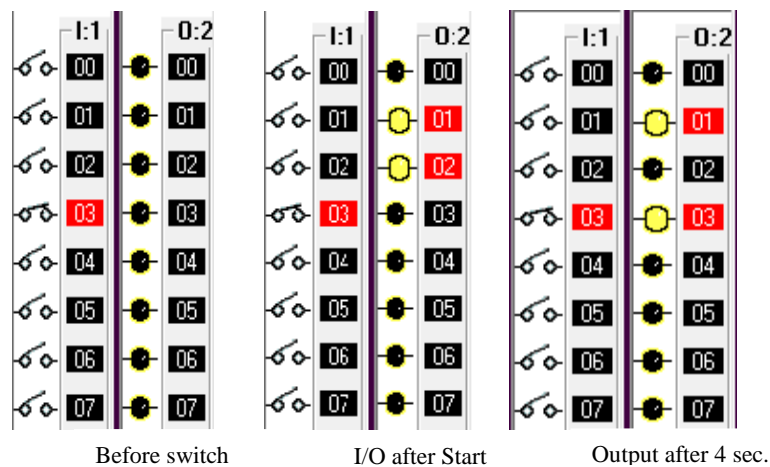

Before switch   I/O after Start   Output after 4 sec.

Fig 4:- Output of the PLC at different sensor conditions
Source: Output of RS Logix pro Simulator

V.   CONCLUSION AND FUTURE SCOPE

The selective assessment has described the characteristics of the Skywalk compared to those of the discontinuous transport systems. Due to its competitive features, we predict that Skywalks can be an interesting alternative for the conveyance of people over longer distances. Further this interlinking network can be applied to connect hospitals which play a crucial role in sorting emergencies, reduce pedestrian accidents etc.

Investigation towards the non-technical aspects may involve a comprehensive assessment of the system's cost, eﬀectiveness, safety, access, eﬀectiveness, reliability, flexibility and environmental impacts. These aspects are typical criteria commonly used in the judgments of a transport system and will not be elaborated further in this paper.

The ecological consciousness, increasing pollution and environment consequences an urge to plan an alternative such as pedestrian auto walk. In future there will be increase in stations; the network will extend to multi-specialist hospitals connected via wide network. The emergency in the particular conveyor will be serviced first. The SKYWALK is helpful in creating a sustainable environment in urban cities.

The main limitations of the system are the acceptance of skywalk by the users, high capital investment and architectural barriers & varying pedestrian traffic data. These points should be resolved in further implementation of this prototype.

REFERENCES

[1] Abe, Y., Beniya, Y., Masuda, H., (2001). Accelerating moving walkway 'ACCEL-LINER'. In: Proceedings of the Eighth International Conference on Automated People Movers, San Francisco, California.
[2] Al-Sharif, L., (1996). Escalator Handling Capacity. Elevator World, December, pp. 134–137.
[3] Dennis p. Connors, and Dennis a. Jarc (May/June 1983).Application considerations for AC drives.IEEE Transactions on Industry Applications, Vol. IA-19, no. 3, pp. 455-460.

[4] DC. Shirakihara, T., (1997.) Speed-walk—an accelerating moving walkway. In: Proceedings of the Sixth International Conference on Automated People Movers, Las Vegas, Nevada, pp. 624–633.

[5] P.M. Xavier1 , Raju Nedunchezhian[2] (Dec-2014).A Comparative Study on Road Traffic Management Systems IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308.

[6] Rinchen Geongmit Dorjee (October 2014).Monitoring and Control of a Variable Frequency Drive Using PLC and SCADA.ISSN: 2321-8169, International Journal on Recent and Innovation Trends in Computing and Communication, Volume: 2 Issue: 10. http://www.ijritcc.org

[7] R., Kunczynski, Y., (2000). Planning criteria for Automated People Movers: defining the issues. Journal of Urban Planning and Development 126 (4), 166–188.

[8] Road Crash Fact Sheet 2016:Chhattisgarh[1] (2016). Journal of Systems Applications, Engineering & Development Issue 3, Volume 2

[9]Figure 1 Source: Sky walk in Raipur, (Jun 16, 2017).Retrieved from YouTube

[10] Figure 4, Output of the PLC at different sensor conditions; Screenshot of the Output of RS Logix pro Simulator.

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